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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 23000-15 was prepared by Joint Technical Committee ISO/IEC JTC 1, *Information technology*, Subcommittee SC 29, *Coding of audio, picture, multimedia and hypermedia information*.

ISO/IEC 23000 consists of the following parts, under the general title *Information Technology — Multimedia application format (MPEG-A)*:

— Part 1: Purpose for multimedia application formats

— Part 2: MPEG music player application format

— Part 3: MPEG photo player application format

— Part 4: Musical slide show application format

— Part 5: Media streaming application format

— Part 6: Professional archival application format

— Part 7: Open access application format

— Part 8: Portable video application format

— Part 9: Digital Multimedia Broadcasting application format

— Part 10: Surveillance application format

— Part 11: Stereoscopic video application format

— Part 12: Interactive music application format

— Part 13: Augmented reality application format

— Part 14: VOID

— Part 15: Multimedia preservation application

Introduction

ISO/IEC 23000 (also known as “MPEG-A”) is an MPEG standard that supports a fast track to standardization by selecting readily tested and verified tools taken from the MPEG body of standards and combining them to form a MAF (Multimedia Application Format). If a needed piece of technology is not provided within MPEG, then additional technologies originating from other organizations can be included by reference in order to facilitate the envisioned MAF.

The application format defined by the Multimedia Preservation Application Format (MP-AF ISO/IEC 23000-15) is focused on Preservation Description Information (PDI [4]) for multimedia content. It aims to enable users to plan, execute, and evaluate preservation operations in order to achieve the objectives of digital preservation by providing all necessary metadata for these operations. Examples of such operations include checking preserved content integrity, migrating content from one system to another system, replicating subparts or entire contents, defining the relationship between the source and output of any transformation process.

The standard also provides the industry with a coherent and consistent approach to manage multimedia preservation metadata supporting a variety of application scenarios, such a digitization, format migration, content restoration, etc. This includes various applications, hardware/software systems and processing methods used in different digital media administrative domains, and being independent of technological changes.

The standard defines a data model for preservation metadata and its related XML serialized format. It thus serves as a interoperable metadata format at the external interfaces of a digital preservation system. The most widely known and adopted reference model for digital preservation is the Open Archival Information System OAIS [4], a framework for understanding and applying concepts necessary for long-term preservation of digital information. In the following the OAIS terminology is adopted for describing the several preservation notions addressed by MP-AF.

OAIS defines information packages (IP) at the ingest (Submission-SIP) and delivery (Dissemination-DIP) side of a preservation system. These packages enfold the target of digital preservation that is made up of the content (one or more) and associated resources and metadata. Different packaging formats can serve as an implementation for the IP and basically the same wrapper can be suitable for submission, dissemination as well as internal IPs. According to the OAIS guidelines, within MPEG technologies the packaging formats fulfilling the needs is the Professional Archival Application Format (PA-AF), which has been designed to provide a standardized packaging format for digital files.

Information Technology — Multimedia application format (MPEG-A) — Part 15: Multimedia Preservation Application

1 Scope

The basic objective of digital preservation is to enable the seamless communication of information over time, and free from loss or corruption. Traditionally, this has been achieved by the conservation of physical media on which the information is inscribed and materially associated. If the physical object persists without alteration, the information remains unchanged and is being communicated to any person or system capable of receiving it.

Even if some physical change occurs, the essential characteristics of the information it carries may remain intact. For example, the ink in a textual document may have faded, but the text can remain fully readable. However, the persistence of digital information is complicated by several factors, mainly technological change. Obsolescence may make digital storage media unreadable and digital encodings indecipherable. Progress may make it desirable to use new software to process old data, but entails the risk that the output is not faithful to the source. For multimedia, the complexity is increased by the variety of formats used and the complexity introduced by the use of compression, codecs and wrappers. For any uses over time where the integrity of the data or fidelity to original properties are important, controls that are independent of the technologies used to store and process the data must be imposed. The foundation for such controls is Preservation Description Information (PDI [4]). PDI is metadata and contextual information that identifies what is being preserved, defines its essential properties, describes requirements for processing it, and identifies processes which generated, used or modified Digital Items as well as their results.

Many organizations collecting multimedia content, such as archives, libraries, museums, etc. already have digital preservation systems in place. These organizations have sometimes the need to exchange multimedia assets and related metadata, for example:

- to exchange assets between preservation systems/repositories within the organization or with related organizations,
- to change/upgrade their preservation systems,
- to exchange content with service providers, or to
- provide preservation services for other organizations.

When they exchange multimedia assets, they need to include PDI that enables the receiving organization both to assess the integrity and fidelity of the assets it receives and to establish a baseline for its own curation and use of the assets. In addition to the metadata described above, the receiving organization also needs information about any preservation processes the assets have undergone, including descriptions of the outcome of such preservation processes. The description may include metadata about content, structure and quality, as well as technical, historical and editorial information, and information about property and use rights and conditions. A standard is needed that defines the content and format of multimedia preservation description information (MPDI), in order to facilitate interoperability between preservation systems, ensure accurate understanding of the resources exchanges, and reduce the risks of corruption both in the exchange and thereafter.

ISO/IEC 23000-15, also known as “Multimedia Preservation Application Format (MP-AF),” specifies the standard representation of the MPDI generated and used by an organization in the process of preserving a

multimedia asset for the purpose of facilitating the exchange of multimedia content between archives or other stakeholders (e.g. publishers, broadcasters, service providers and the like) and also subsequent preservation and use. The purpose of the MP-AF is to:

- Enable the exchange of multimedia assets (multimedia resources plus associated metadata) between different repositories by providing interoperable preservation description information.
- Enable archive management to react to specific events and determine when preservation actions, such as migration, are needed to maintain the accessibility of preserved multimedia content.
- Enable automatic assessment of preservation strategies and their execution.
- Enable archive management to avoid corruption or loss of multimedia assets when changes are made in the hardware, software or storage media used by the archive by providing standardized descriptors to characterize multimedia assets and to describe preservation actions and outcomes for long term preservation.
- Enable producers (originators of assets to be preserved) to provide the archive with sufficient descriptive information to assess, plan for, and carry out preservation processes that maintain the integrity and fidelity of the content.
- Enable consumers who need comprehensive and interoperable preservation description information (e.g., other archives and consumers who wish to use preserved assets in the production of new ones) to receive standard preservation description information together with multimedia assets.

2 Normative references

The following referenced documents are indispensable for the application 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 10646:2012, *Information technology – Universal coded character set (UCS)*

ISO/IEC 15938-2:2002, *Information technology – Multimedia content description interface (MPEG-7) – Part 2: Description definition language*

ISO/IEC 15938-4:2002/Amd 2:2006, *Information technology – Multimedia content description interface (MPEG-7) – High-level descriptors*

ISO/IEC 15938-5:2003, *Information technology – Multimedia content description interface (MPEG-7) – Part 5: Multimedia description schemes*

ISO/IEC 15938-5:2003/Amd 5:2015, *Information technology – Multimedia content description interface (MPEG-7) – Quality metadata, multiple text encodings, extended classification metadata*

ISO/IEC 15938-9:2005/Amd 1:2012, *Information technology – Multimedia content description interface (MPEG-7) – Part 9: Profiles and levels, AMENDMENT 1: Extensions to profiles and levels (Audio visual description profile (AVDP)*

ISO/IEC TR 15938-10:2004, *Information technology – Multimedia content description interface (MPEG-7) – Part 10: Schema definition*

ISO/IEC TR 15938-11:2005/Amd 1:2012, *Information technology – Multimedia content description interface (MPEG-7) – Audiovisual description profile (AVDP) schema*

ISO/IEC 21000-2:2005, *Information technology – Multimedia framework (MPEG-21) – Part 2: Digital Item Declaration*

ISO/IEC 21000-3:2003, *Information technology – Multimedia framework (MPEG-21) – Part 3: Digital Item Identification*

ISO/IEC 21000-3:2003/Amd 1:2007, *Information technology – Multimedia framework (MPEG-21) – Related identifier types*

ISO/IEC 21000-3:2003/Amd 2:2013, *Information technology – Multimedia framework (MPEG-21) – Digital item semantic relationships*

ISO/IEC 21000-5:2004, *Information technology – Multimedia framework (MPEG-21) – Part 5: Rights expression language*

ISO/IEC 21000-19:2010, *Information technology -- Multimedia framework (MPEG-21) -- Part 19: Media Value Chain Ontology*

ISO/IEC 21000-20:2013, *Information technology – Multimedia framework (MPEG-21) – Part 20: Contract expression language*

ISO/IEC 21000-21:2013, *Information technology – Multimedia framework (MPEG-21) – Part 21: Media contract ontology*

ISO/IEC 23000-6:2012*, Information technology – Multimedia application format (MPEG-A) – Part 6: Professional archival application format*

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

ISO 15836:2009, *Information and documentation – The Dublin Core metadata element set*

ISO 15924:2004, *Information and documentation – Codes for the representation of names of scripts*

EBU Tech 3293*, EBU Core Metadata Set v.1.5, 2014*

DCMI Metadata Terms, http://dublincore.org/documents/2012/06/14/dcmi-terms/

Open Annotation Data Model, *W3C Community Draft,* http://www.openannotation.org/spec/core/

RDF 1.1 XML Syntax*, W3C Recommendation, 2014,* http://www.w3.org/TR/rdf-syntax-grammar/

OWL 2 Web Ontology Language XML Serialization (Second Edition), *W3C Recommendation, 2012,* http://www.w3.org/TR/owl2-xml-serialization/

3 Abbreviated terms

List of abbreviated terms.

AVDP	MPEG-7, Audiovisual Description Profile (ISO/IEC 15938-9:2005/Amd 1:2012)
CCDM	EBU, Conceptual Class Description Model
DID	ISO/IEC 21000-2 MPEG-21, Digital Item Declaration
DIDL	ISO/IEC 21000-2 MPEG-21, Digital Item Declaration Language
DII	ISO/IEC 21000-3 MPEG-21, Digital Item Identification
DIP	OAIS, Dissemination Information Package
EIDR	Entertainment Identifier Registry Association
EBU	European Broadcasting Union
ISAN	International Standard Audiovisual Number
MPDI	Multimedia Preservation Description Information
MP-AF	Multimedia Preservation Application Format (subject of this document)
MPEG-A	ISO/IEC 23000, Application Formats
OAIS	Open Archival Information System
PA-AF	MPEG-A, Professional Archival Application Format
PDI	OAIS, Preservation Description Information

PREMIS	Preservation Metadata Maintenance Activity
PRONOM	The National Archives' technical registry (UK)
PUID	PRONOM, Persistent Unique identifier
SIP	OAIS, Submission Information Package
SMPTE	Society of Motion Picture and Television Engineers
UMID	SMPTE 330M, Unique Media Identifier
W3C	World Wide Web Consortium

4 Terminology

For the terms not defined in this section, refer to the normative references for terms and definitions used throughout this document.

4.1 MPEG-21 Terminology

MP-AF terminology is consistent with the terminology adopted in MPEG-21. As the reader of the MP-AF specification may not be familiar with terminology from MPEG-21 Digital Item Declaration (DID), the definitions of the following terms needed for the definition of MP-AF are included in this section.

4.1.1 Digital Item Identification (DII)

The standard (ISO/IEC 21000-3) used by MPEG-21 for identification of digital item and their components.

4.1.2 Resource

A resource is an individually identifiable asset such as a video or audio clip, an image, or a textual asset. A resource may also potentially be a physical object (e.g. a video tape). All resources shall be locatable via an unambiguous address.

The reader is reminded that the term asset in the definition above has a different meaning than the MP-AF term Asset defined in clause 4.2.3.

4.1.3 Container

A container is a structure that allows items and/or containers to be grouped. A container itself is not an item; containers are groupings of items and/or containers. Descriptors allow for the "labeling" of containers with information appropriate for the purpose of the grouping.

4.1.4 Item

The term Item from MPEG-21 DID is used synonymously with Digital Item in this document.

An item is a grouping of sub-items and/or components that are bound to relevant descriptors. These descriptors contain information about the item. An item that contains no sub-items can be considered a whole. An item that does contain sub-items can be considered a compilation. Items may also contain annotations to their sub-parts.

4.1.5 Component

A component is the binding of a resource to a set of descriptors. These descriptors are information concerning all or part of the specific resource instance. A component itself is not an item; components are building blocks of items. Components may be conditional (see MPEG-21 DID for details).

4.1.6 Descriptor

A descriptor associates information with the enclosing entity. This information may be a component (such as a thumbnail of an image, or a text component), or a textual statement. Descriptors may be conditional (see MPEG-21 DID for details).

4.2 MP-AF Structure Terminology

This section introduces the terms of the relevant entities in the MP-AF data model. While this sections provides definitions of the terms, the entities of the model are described in Section 5.1 (including a visualization in Figure 1).

4.2.1 Work

A creation that retains intellectual or descriptive attributes independently of its manifestations. This concept is also referred as creation or intellectual entity in other contexts.

4.2.2 Preservation Object

A Preservation Object combines information describing the intellectual and artistic attributes of a Work together with Digital Items that encode the Work. It includes technical, descriptive and preservation metadata and any other information needed to ensure consistent and reliable access to the Digital Item(s) over time. A Preservation Object may contain Digital Items pertaining to one particular Representation together with information and metadata specific to that Representation. It may also contain metadata common to all Representations. A Preservation Object may contain other Preservation Objects.

4.2.3 Asset

A special type of Preservation Object describing a Work and the associated exploitation rights belonging to a known owner. The entity holding the rights on the digital copies may be different from the one holding the rights on the Work itself.

4.2.4 Group

A group is a logical aggregation of related Preservation Objects. It may represent a physical or virtual collection, a bunch of items, a shipment, etc.

The data model supports Preservation Objects to be composed of other Preservation Objects. A Group is an aggregation of Preservation Objects, but is not a Preservation Object itself.

4.2.5 Representation

A Representation is a specific and complete manifestation of the Work. Representations may differ in terms of technical or descriptive properties while sharing the same intellectual and/or descriptive attributes of the Work (e.g. different performances of the same Work, low vs. high definition representations of a movie).
A Representation aggregates the whole set of Essences plus any additional metadata needed for a complete presentation of a Work.

4.2.6 Essence

Essence is a manifestation of a Work or part of a Work. It refers to the metadata needed for correctly rendering media content including all associated Components.

4.2.7 Component

The Component is the entity holding specific technical metadata supporting the handling of the media resource referenced by a Media Locator. Components can be Files or Bitstreams. It manages a virtual/internal