FP7-ICT-2007-3-231161

Deliverable D2.1.3

AV Data Model: Final Specification

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07/02/2011

Document administrative table

Document Identifier	PP_WP2_D2.1.3_AV_Data_Model_R0	Release	0
Filename	PP_WP2_D2.1.3_AV_Data_Model_R0_v1.00.pdf		
Workpackage and Task(s)	WP2 Models and environments for long-term audiovisual preservation WP2T1 Models for audiovisual preservation		
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Internal Reviewers (company)	Andy Stauder (UIBK); Laurent Boch (RAI); Bailer Werner (Joanneum Research)		
Date	07/02/2011		
Status	Release		
Type	Deliverable		
Deliverable Nature	R- Report		
Dissemination Level	PU- Public		
Planned Deliv. Date	31/12/2010		
Actual Deliv. Date	7/02/2011		

Abstract

The PrestoPRIME Audio Visual Data Model described in this report provides a specification of the PREMIS-based digital preservation approach implemented by PrestoPRIME, including support for the special digital preservation requirements of audiovisual content.
The main objective of the document is to describe the key information package of the Open Archival Information System (OAIS) digital preservation standard: the AIP (Archival Information Package) and its constituent pieces, including illustrative examples to assist audiovisual preservation systems implementers.

DOCUMENT HISTORY

Version	Date	Reason of change	Status	Distribution
V0.1	23/08/2010	First Draft (Nir Kashi)	Outline	Confidential
V0.2	26/10/2010	Edition by Nir Sherwinter, Nir Kashi	Working Draft	Confidential
V0.5	11/12/2012	Edited by R. Wright	Working Draft	Confidential
v0.6	11/12/2012	Reviewed by A Stauder, L Boch, W Bailer. Amendments by R. Wright	Final Draft	Confidential
V0.9	17/1/2011	Final adjustments	Final Draft	Confidential
V1.00	7/2/2011	Delivered and published	Release	Public

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Scope

This report is provided as part of the PrestoPRIME project. It contains the description of the PrestoPRIME data model followed by technical details and examples.

Executive summary

The PrestoPRIME Audio Visual Data Model given in this report provides a specification of the PREMIS-based digital preservation approach implemented by PrestoPRIME, including support for the special digital preservation requirements of audiovisual content.

The approach that was taken during the research is that the data model must be flexible enough to include all the major types of metadata elements related to audiovisual files.

The report is divided into four main parts:

1. The first part begins with a diagram illustrating the entities which are part of the data model, and then it provides details on each single entity that plays a role in the data model.
2. The second part explains about the four different metadata types that are part of the data model:
    a. Technical Metadata
    b. Descriptive Metadata
    c. Rights Metadata
    d. Preservation Events
3. The third part is dedicated to demonstrating the flexibility of the data model by providing examples of the different types of metadata in the context of a METS container
4. The last part provides details about Ex Libris DNX (see section 4) and its usage

The data model is designed to be useful for all file-based audiovisual management and preservation systems, providing a simple but quite flexible way to deal with the main types of audiovisual metadata (MPEG-7, Dublin Core, EBU Core, PBCore, SMPTE).
The data model follows PREMIS and OAIS guidelines and is compatible with different types of metadata. This approach allows the implementation of the data model by any existing and future digital preservation systems that follow OAIS and PREMIS.

The relationship between this document and D5.2.1 (Architecture Design) is that this document is intended to describe the data model which will be implemented by PrestoPRIME implementations while the physical architecture is described in D5.2.1. The work described in D5.2.2 (Prototype Implementation) will implement the data model described in this document using the architecture described in D5.2.1.

As part of the project, the main entities of PrestoPRIME data model will be demonstrated using the Ex Libris digital preservation system, Rosetta.

1 Introduction

The first objective of PrestoPRIME is[1]:

> **"To research and develop means of ensuring the permanence of digital audiovisual content in archives, libraries, museums and other collections."**
>
> *To be achieved by:*
>
> **"Comparing strategies for audiovisual preservation, including multivalent, emulation and migration approaches, and creating a standard data model for audiovisual content preservation."**

This document describes that data model.

The purpose of the data model is two-fold:

1. The data model is used within PrestoPRIME, as the data model for the systems integration required to build an integrated platform for the testing and demonstrating of PrestoPRIME tools and technology;
2. The data model will, we hope, be useful to others – as audiovisual archives move from physical items on shelves to file-based content, and so find themselves in need of a system – or at least a systematic approach – for the preservation of that content.

This document has been the primary responsibility of Ex Libris, a commercial company which is a major supplier of library systems to academic libraries, and which has significant experience with digital libraries and digital preservation systems[2].

[1] PrestoPRIME Description of Work, p9: FP7-ICT-3_PrestoPrime_DoW_v0.1.1.pdf
[2] Ex Libris produce the Rosetta digital preservation system, based on their work as prime contractor for the New Zealand NHDA = National Heritage Digital Archive. http://www.natlib.govt.nz/about-us/current-initiatives/ndha

2 Working Assumptions

2.1 Use of the OAIS standard

The only comprehensive, standardized approach to the preservation of file-based content is OAIS, the Open Archival Information System[3]. Much of the terminology that follows, in particular all references to *information packages*, is used because we are following the OAIS standard and its associated concepts. *Information packages* need to be specified to become anything more than vague generalizations. The data model supplies specific entities (and their definitions) for constructing *information packages* (e.g. SIP, AIP, DIP), more information can be found in D5.2.1 section 3.1 (See References, p 48).

2.2 Conclusions from D5.2.1_WD_ArchitectureDesign

PrestoPRIME Deliverable 5.2.1 is headed “Definition and Design of a PrestoPRIME Reference Architecture for the Integration Framework”. Sections 3 and 4 of that document are dedicated to the description of the SIP (Submission Information Package). This work was done in order to define what the platform is allowed to accept as an input.
It was decided to adopt METS[4] as a wrapper for the PrestoPRIME SIP. The use of METS for the SIP is described in D5.2.1, Section 4, and is summarized in the context of this document in Section 2.2.1.

2.2.1 METS - Metadata Encoding and Transmission Standard

The following paragraphs summarize the definition of PrestoPRIME SIP as described in D5.2.1. However, the discussion carried out in D5.2.1 can be widened to embrace all kinds of Information Packages (AIP, DIP). In general, the SIP information elements are a subset of those of an AIP, but the high level structure is the same.
SIP definition in D5.2.1 is only on the METS level and does not specify which metadata formats can be embedded or referenced in the various METS sections. A list of the types of metadata which are present in a SIP can be found in D5.2.1, Tables 5 and 6 (p. 58-59). Each of these types of metadata is associated with the most appropriate METS section. The association between METS sections and metadata categories is represented in D5.2.1, Figure 19 (p. 72) and summarised in D5.2.1, Table 9 (p. 73). For convenience we report the list here:

- *Identification metadata* for the Editorial Entity are placed in the Descriptive Metadata Section. The use of `dc:identifier` is recommended.
- *Descriptive metadata* are placed in the Descriptive Metadata Section
- *Technical metadata* are placed in the Administrative Metadata Section - Technical Metadata subsection
- *Rights metadata* are placed in the Administrative Metadata Section - Rights Metadata subsection
- *Ingest and Preservation Options and Service Terms* are placed in the Administrative Metadata Section - Technical Metadata subsection
- *Provenance* is placed in the Administrative Metadata Section - Technical Metadata subsection
- *Update and access permissions Ingest and Preservation Options* are placed in the Administrative Metadata Section - Technical Metadata subsection

[3] The ISO standard: http://www.iso.org/iso/catalogue_detail.htm?csnumber=24683. A tutorial: http://www.icpsr.umich.edu/dpm/dpm-eng/foundation/oais/index.html
[4] http://www.loc.gov/standards/mets/

The one Editorial Entity represented by a SIP may be made up of one or more audiovisual files, which can be related to each other in a number of different ways, e.g. files to be played in sequence, separate files for audio and video to be played at the same time, or more complicated structures. These relationships are described in detail in D5.2.1, Section 4.1 (in particular see Tables 3 and 4, p. 53-54 and Figures 16 and 17 p. 55-56).
We decided to represent these relationships through the use of METS `structuralMap`. METS also makes available elements for representing structural information in the `fileSection`, but we decided not to adopt these elements for PrestoPRIME SIP to avoid inconsistencies with the `structuralMap` section. The way these relationships have to be represented in the Structural map is described in D5.2.1, Section 4.3 p.67.

3 The AV Data Model

This section contains a diagram illustrating the relations among all the entities in the AV data model, followed by a list of the entities with their attributes.

3.1 Entities – Diagram

The following diagram illustrates all the entities that are part of the PrestoPRIME data model. The entities can be divided as follows:

1. SIP, AIP and DIP – all taken from the OAIS model, yellow coloured
2. Editorial Entity, Representation, File and Bit Stream, orange coloured
3. Descriptive MD, Rights MD, Access Rights, Technical MD, Structural Map and Events, blue coloured

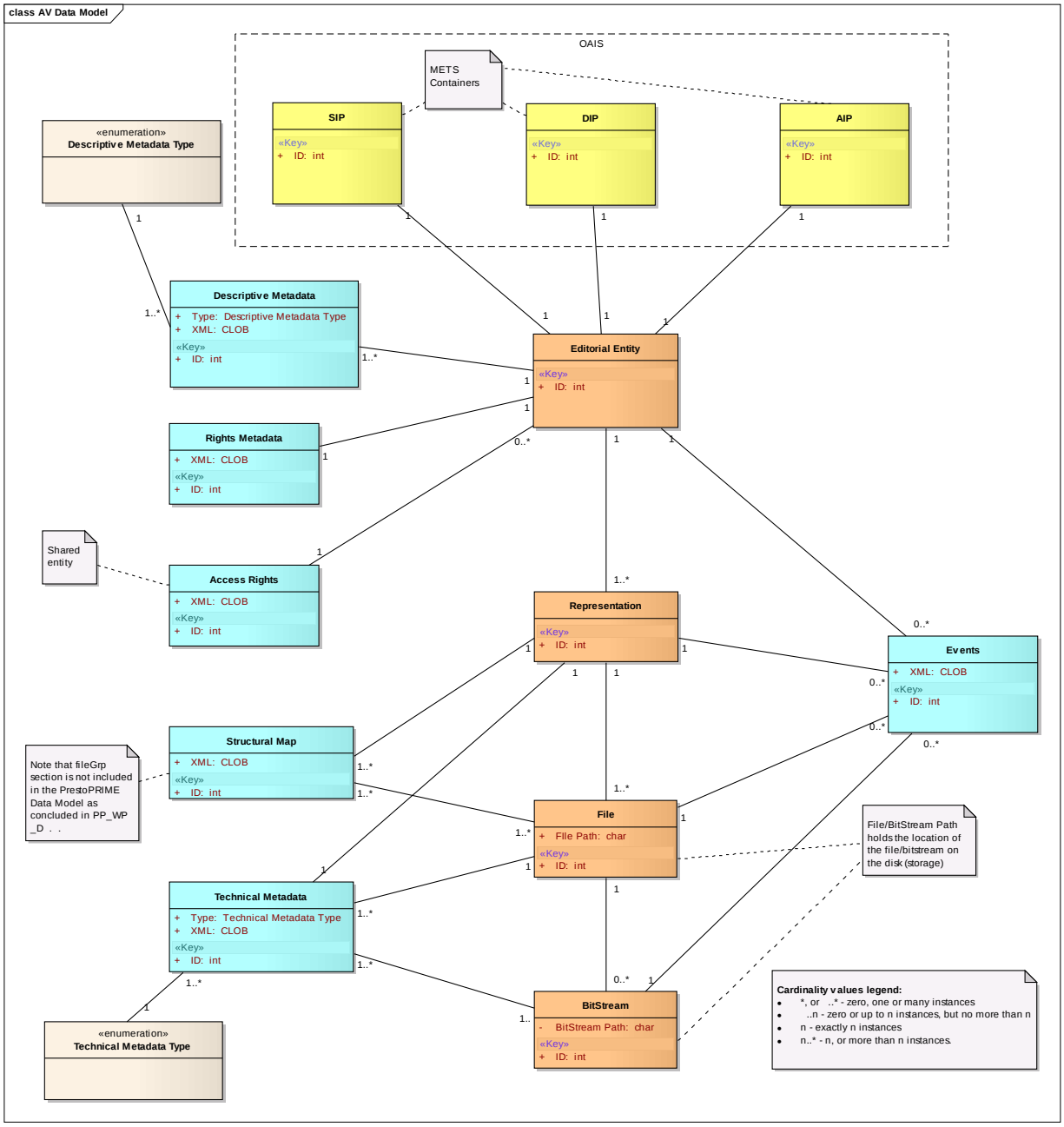

Figure 1: AV Data Model

3.2 Entities – List

3.2.1 AIP

Name: AIP, Archival Information Package
Definition: An Archival Information Package (AIP) is a specialization of the Information Package. The AIP is defined to provide a concise way of referring to a set of information that has, in principle, all the qualities needed for permanent, or indefinite, Long Term Preservation of a designated Information Object.[5]
Data held by the entity: A METS file which holds complete EE.
Entity category: EE level
Consist of: One EE
Example: See section 2.2.1
Relationships:

Columns	Association
ID	1 AIP.
ID	1 Editorial Entity.

3.2.2 Access Rights

Name: Access Rights, stored as ACL - Access Control List.
Definition An ACL specifies which users or system processes are granted access to objects, as well as what operations are allowed on given objects.
Data held by the entity: A group or groups of conditions which should be validated by the access/delivery system.
Entity category: EE level
Consists of: XML Record which holds the ACL, see section 5.3
Example:
The following XML restricts the access to a specific user and specific user group:

```
<amdSec ID="a001">
    <rightsMD ID="r001" ADMID="acl001">
        <mdRef LOCTYPE="URL" MDTYPE="OTHER" OTHERMDTYPE="PPAVRO"
xlink:href="pprai014.owl"/>
    </rightsMD>
    <rightsMD ID="acl001" ADMID="r001">
        <mdWrap MDTYPE="OTHER" OTHERMDTYPE="PPACL">
            <xmlData>
                <acl:ACL xsi:schemaLocation="http://eu.prestoprime/xsd/2010/acl prestoprime-acl.xsd">
                    <acl:Entry type="user" permissions="rw">Annarita</acl:Entry>
                    <acl:Entry type="group" permissions="rw">RAI.Rights.Officers</acl:Entry>
                    <acl:Entry type="user" permissions="r">RAI.Rights.Users</acl:Entry>
                </acl:ACL>
            </xmlData>
        </mdWrap>
    </rightsMD>
</amdSec>
```

The rightsMD section having ID=”r001” (marked in yellow) contains the reference to the rights ontology file (stored in an owl file); the rightsMD section with ID=”acl001” (marked in green) contains the list of permissions for access to the content of what is defined in the owl file.
Rights as defined by ACL, can hold different permissions to different entities, for example, a specific user can view the EE only while a specific group of users can view a specific file

[5] For more information see "Reference Model for an Open Archival Information System (OAIS)" (http://public.ccsds.org/publications/archive/650x0b1.pdf)

only. Even though the ACL contains specific permission per entity – the relationship is to the EE level in order to simplify the data model.
Additionally, see section 5.3

Relationships:

Columns	Association
ID	0..* Editorial Entity.
ID	1 Access Rights.

3.2.3 BitStream

Name: BitStream
Definition: Contiguous or non-contiguous data within a file that has meaningful properties for preservation purposes.[6]
Data held by the entity: ID, File Location and XML records.
Entity category: BitStream Level
Consists of: XML Records which hold the Events and the TechMD.
Example:

```
<mets:amdSec ID = "FL1218-amd">
    <!--FILE amdsec -->
    </mets:amdSec>
<!--First BitStream *.ogg file amdsec -->
<mets:amdSec ID = "FL1218-bitstream-amd">
    <mets:techMD ID = "FL1218-bitstream-BS23217-amd-tech">
        <mdWrap MDTYPE = "OTHER" OTHERMDTYPE = "DNX">
            <xmlData>
                <dnx:dnx>
                    <dnx:section id = "significantProperties">
                        <dnx:record>
                            <dnx:key id = "significantPropertiesType">smpte:Duration</dnx:key>
                            <dnx:key id = "significantPropertiesValue">1500</dnx:key>
                        </dnx:record>
                        <dnx:record>
                            <dnx:key id = "significantPropertiesType">smpte:CodecName</dnx:key>
                            <dnx:key id = "significantPropertiesValue">Realtek High Definition</dnx:key>
                        </dnx:record>
                        <dnx:record>
                            <dnx:key id = "significantPropertiesType">smpte:SampleRate</dnx:key>
                            <dnx:key id = "significantPropertiesValue">11807</dnx:key>
                        </dnx:record>
                        <dnx:record>
                            <dnx:key id = "significantPropertiesType">smpte:Author</dnx:key>
                            <dnx:key id = "significantPropertiesValue">Werner Bros</dnx:key>
                        </dnx:record>
                    </dnx:section>
                </dnx:dnx>
            </xmlData>
        </mdWrap>
    </mets:techMD>
</mets:amdSec>
<!--Second BitStream *.mp2 file amdsec -->
<mets:amdSec ID = "FL1218-bitstream-amd">
    <mets:techMD ID = "FL1218-bitstream-BS23218-amd-tech">
        <mdWrap MDTYPE = "OTHER" OTHERMDTYPE = "DNX">
            <xmlData>
                <dnx:dnx>
                    <dnx:section id = "significantProperties">
```

[6] For more information see: http://www.loc.gov/standards/premis/v2/premis-dd-2-0.pdf

```
                        <dnx:record>
                            <dnx:key id = "significantPropertiesType">smpte:Duration</dnx:key>
                            <dnx:key id = "significantPropertiesValue">1500</dnx:key>
                        </dnx:record>
                        <dnx:record>
                            <dnx:key id = "significantPropertiesType">smpte:CodecName</dnx:key>
                            <dnx:key id = "significantPropertiesValue">DivX H.264 Decoder</dnx:key>
                        </dnx:record>
                        <dnx:record>
                            <dnx:key id = "significantPropertiesType">smpte: DisplayHeight</dnx:key>
                            <dnx:key id = "significantPropertiesValue">34</dnx:key>
                        </dnx:record>
                        <dnx:record>
                            <dnx:key id = "significantPropertiesType">smpte: DisplayWidth</dnx:key>
                            <dnx:key id = "significantPropertiesValue">28</dnx:key>
                        </dnx:record>
                    </dnx:section>
                </dnx:dnx>
            </xmlData>
        </mdWrap>
    </mets:techMD>
</mets:amdSec>
```

In the example above there are three bit streams extracted from one file. The file is defined as FL1218 where the bit stream is defined as FL1218-bitstream-BS23219 (the ID of the bit stream contains the ID of the file it was extracted from).

Relationships:

Columns	Association	
ID	1	File.
ID	0..*	BitStream.
ID	1	BitStream.
ID	0..*	Technical Metadata.
ID	0..*	Events.
ID	1	BitStream.

3.2.4 DIP

Name: DIP, Dissemination Information Package
Definition: The Information Package, derived from one AIP, received by the Consumer in response to a request to PrestoPRIME Repository.[7]
Data held by the entity: A METS file which holds complete EE.
Entity category: EE level
Consists of: One EE
Example: See section 2.2.1

Relationships:

Columns	Association	
ID	1	DIP.
ID	1	Editorial Entity.

[7] See OAIS Model, http://public.ccsds.org/publications/archive/650x0b1.pdf.

3.2.5 Descriptive Metadata

Name: Descriptive Metadata
Definition: This entity holds the Descriptive Metadata of the EE as an XML record having type 'attribute', which defines the type of the metadata (e.g. Dublin Core, MPEG-7 or PBCore).[8]
Data held by the entity: Descriptive Metadata elements.
Entity category: EE level
Consists of: An XML record which holds the descriptive metadata.
Example:

```
<dc:record xmlns:dc="http://purl.org/dc/elements/1.1/"
xmlns:dcterms="http://purl.org/dc/terms/"
xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance">
    <dc:creator>Selenium</dc:creator>
    <dc:title>A Sample Video File</dc:title>
    <dc:description>Selenium Description selenium</dc:description>
    <dc:type>Video</dc:type>
    <dcterms:created>10/09/2010</dcterms:created>
    <dc:publisher />
    <dc:description />
</dc:record>
```

Relationships:

Columns	Association	
ID	1	Descriptive Metadata Type.
ID	1..*	Descriptive Metadata.
ID	1	Editorial Entity.
ID	1..*	Descriptive Metadata.

3.2.6 Descriptive Metadata Type

Name: Descriptive Metadata Type
Definition: This is an enumeration of Descriptive Metadata Types; the idea is to have maximum flexibility in the data model in such a way that more types will be able to be added in the future.
Data held by the entity: Name and ID.
Entity category: EE level
Consists of: list of types
Example: N/A

Relationships:

Columns	Association	
ID	1	Descriptive Metadata Type.
ID	1..*	Descriptive Metadata.

[8] For more information see section 6.2

3.2.7 Editorial Entity

Name: Editorial Entity
Definition: "Editorial Entity" (EE) is here considered synonymous with "Intellectual Entity" (PREMIS[9]) and "Editorial Object" (PrestoSpace[10] and PrestoPRIME D5.1.1[11]).
Data held by the entity: A METS file which holds complete EE.
Entity category: EE level
Consists of: All the following elements:

1. Access Rights, see section 5.3.2
2. Descriptive Metadata, see section 5.2
3. Events, see section 5.4
4. Representation, see section 3.2.10
5. Rights Metadata, see section 5.3

Example: See section 2.2.1

Relationships:

Columns	Association
ID ID	1 Editorial Entity. 1..* Representation.
ID ID	1 Editorial Entity. 1..* Descriptive Metadata.
ID ID	1 Rights Metadata. 1 Editorial Entity.
ID ID	1..* Editorial Entity. 1 Access Rights.
ID ID	0..* Events. 1 Editorial Entity.
ID ID	1 SIP. 1 Editorial Entity.
ID ID	1 DIP. 1 Editorial Entity.
ID ID	1 AIP. 1 Editorial Entity.

[9] http://www.loc.gov/standards/premis/v2/premis-dd-2-0.pdf
[10] PrestoSPACE Project. Homepage. http://prestospace.org/.
[11] https://prestoprimews.ina.fr/public/deliverables/PP_WP5_D5.1.1_Scenarios_v1.02.pdf

3.2.8 Events

Name: Events
Definition: The Event metadata holds the information about actions that have affected the object. Each object level has different types of actions that should be captured, see section 5.4.
Data held by the entity: Event details such as: Date, Time, Action, User etc.
Entity category: All levels
Consists of: XML Record per event.
Example: see section 5.4.
Relationships:

Columns	Association
ID ID	0..* Events. 1 Editorial Entity.
ID ID	0..* Events. 1 Representation.
ID ID	0..* Events. 1 File.
ID ID	0..* Events. 1 BitStream.

3.2.9 File

Name: File
Definition: A file is a named and ordered sequence of bytes that is known by an operating system. One or more files compose any given Representation, together with some metadata (Technical Metadata); this entity is synonymous with the PREMIS file entity.[12]
Data held by the entity: File Details for storing purposes and Technical Metadata.
Entity category: File level.
Consists of: XML Record of the Technical Metadata, file details.
Example:

```
<mets:mets>
    - - <mets:amdSec ID = "FL1022-amd">
        - <mets:techMD ID = "FL1022-amd-tech">
            - <mets:mdWrap MDTYPE = "OTHER" OTHERMDTYPE = "dnx">
                <mets:xmlData>
                    <dnx>
                        <section id = "internalIdentifier">
                            <record>
                                <key id = "internalIdentifierType">SIPID</key>
                                <key id = "internalIdentifierValue">2</key>
                            </record>
                            <record>
                                <key id = "internalIdentifierType">PID</key>
                                <key id = "internalIdentifierValue">FL1022</key>
                            </record>
                            <record>
                                <key id = "internalIdentifierType">DepositSetID</key>
                                <key id = "internalIdentifierValue">24</key>
                            </record>
```

[12] http://www.loc.gov/standards/premis/v2/premis-dd-2-0.pdf

```
                    </section>
                    <section id = "objectCharacteristics">
                        <record>
                            <key id = "objectType">FILE</key>
                            <key id = "creationDate">2010-12-26 15:16:30</key>
                            <key id = "createdBy">admin1</key>
                            <key id = "modificationDate">2010-12-26 15:18:42</key>
                            <key id = "modifiedBy">admin1</key>
                            <key id = "owner">CRS00.INS00.DPR00</key>
                        </record>
                    </section>
                    <section id = "fileFormat">
                        <record>
                            <key id = "formatRegistry">PRONOM</key>
                            <key id = "formatRegistryId">fmt/200</key>
                            <key id = "formatName">fmt/200</key>
                            <key id = "formatVersion"/>
                            <key id = "formatDescription">Material Exchange Format</key>
                            <key id = "mimeType"/>
                            <key id = "exactFormatIdentification">false</key>
                            <key id = "agentSignatureVersion">38</key>
                            <key id = "agentVersion">5.0</key>
                            <key id = "agent">TA</key>
                            <key id = "formatNote"/>
                        </record>
                    </section>
                    <section id = "generalFileCharacteristics">
                        <record>
                            <key id = "label">test</key>
                            <key id = "note">note to test</key>
                            <key id = "fileCreationDate"/>
                            <key id = "fileModificationDate"/>
                            <key id = "FileEntityType"/>
                            <key id = "compositionLevel"/>
                            <key id = "fileLocationType">FILE</key>
                            <key id = "fileLocation"/>
                            <key id =
"fileOriginalName">PrestoPRIME_RAI_007.mxf</key>
                            <key id = PrestoPRIME_RAI_007.mxf</key>
                            <key id = "fileOriginalID">/1- _RAI_007.mxf</key>
                            <key id = "fileExtension">mxf</key>
                            <key id = "fileMIMEType">application/mxf</key>
                            <key id = "fileSizeBytes">469258240</key>
                            <key id = "storageID"/>
                            <key id = "streamRefId"/>
                            <key id = "formatLibraryId">fmt/200</key>
                            <key id = "riskLibraryIdentifiers"/>
                        </record>
                    </section>
                    <section id = "fileFixity">
                        <record>
```

```
                    <key id = "agent">REG_SA_JAVA5_FIXITY</key>
                    <key id = "fixityType">MD5</key>
                    <key id =
"fixityValue">28c9332614912738881202f3d657c88f</key>
                </record>
                <record>
                    <key id = "agent">REG_SA_JAVA5_FIXITY</key>
                    <key id = "fixityType">SHA1</key>
                    <key id = "fixityValue">8cb651372e917e6bc51167c</key>
                </record>
                <record>
                    <key id = "agent">REG_SA_JAVA5_FIXITY</key>
                    <key id = "fixityType">CRC32</key>
                    <key id = "fixityValue">43176ec7</key>
                </record>
            </section>
            <section id = "fileVirusCheck">
            </section>
            <section id = "fileValidation">
                <record>
                    <key id = "agent">MXFTechMdExtractor , Version 1.0</key>
                    <key id = "status"/>
                    <key id = "format"/>
                    <key id = "version"/>
                    <key id = "mimeType"/>
                    <key id = "profile"/>
                    <key id = "isValid">true</key>
                    <key id = "isWellFormed">true</key>
                </record>
            </section>
            <section id = "significantProperties">

                <record>
                    <key id =
"significantPropertiesType">video.SampledYOffset</key>
                    <key id = "significantPropertiesValue">0</key>
                </record>
                <record>
                    <key id =
"significantPropertiesType">video.DisplayXOffset</key>
                    <key id = "significantPropertiesValue">0</key>
                </record>
                <record>
                    <key id = "significantPropertiesType">video.EditRate</key>
                    <key id = "significantPropertiesValue">25:1</key>
                </record>
                <record>
                    <key id = "significantPropertiesType">video.Duration</key>
                    <key id = "significantPropertiesValue">1500</key>
                </record>
                <record>
```

```
                    <key id = "significantPropertiesType">video.DisplayWidth</key>
                    <key id = "significantPropertiesValue">720</key>
                </record>
                <record>
                    <key id =
"significantPropertiesType">video.SampledHeight</key>
                    <key id = "significantPropertiesValue">304</key>
                </record>
                <record>
                    <key id =
"significantPropertiesType">video.DisplayYOffset</key>
                    <key id = "significantPropertiesValue">16</key>
                </record>

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                    <key id = "significantPropertiesValue">D10 Mapping</key>
                </record>
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                    <key id = "significantPropertiesValue">4:3</key>
                </record>                    <record>
                    <key id = "significantPropertiesType">video.StoredWidth</key>
                    <key id = "significantPropertiesValue">720</key>
                </record>
                <record>
                    <key id =
"significantPropertiesType">video.SampledWidth</key>
                    <key id = "significantPropertiesValue">720</key>
                </record>
                <record>
                    <key id =
"significantPropertiesType">video.ComponentDepth</key>
                    <key id = "significantPropertiesValue">8</key>
                </record>
                <record>
                    <key id =
"significantPropertiesType">video.SampledXOffset</key>
                    <key id = "significantPropertiesValue">0</key>
                </record>
                <record>
                    <key id =
"significantPropertiesType">video.FrameLayout</key>
                    <key id = "significantPropertiesValue">1</key>
                </record>
                <record>
                    <key id =
"significantPropertiesType">video.DisplayHeight</key>
                    <key id = "significantPropertiesValue">288</key>
                </record>
```

```
                        <record>
                            <key id = "significantPropertiesType">video.StoredHeight</key>
                            <key id = "significantPropertiesValue">304</key>
                        </record>
                        <record>
                            <key id =
"significantPropertiesType">video.OperationalPattern</key>
                            <key id = "significantPropertiesValue">OP1a</key>
                        </record>
                    </section>
                    <section id = "vsOutcome">
                        <record>
                            <key id = "checkDate">Sun Dec 26 15:18:41 IST 2010</key>
                            <key id = "vsAgent">REG_SA_JAVA5_FIXITY</key>
                            <key id = "type">CHECKSUM</key>
                            <key id = "result">PASSED</key>
                            <key id = "resultDetails"/>
                            <key id = "vsEvaluation">PASSED</key>
                            <key id = "vsEvaluationDetails"/>
                        </record>
                        <record>
                            <key id = "checkDate">Sun Dec 26 15:18:41 IST 2010</key>
                            <key id = "vsAgent">REG_SA_DPS</key>
                            <key id = "type">VIRUSCHECK</key>
                            <key id = "result">PASSED</key>
                            <key id = "resultDetails"/>
                            <key id = "vsEvaluation">PASSED</key>
                            <key id = "vsEvaluationDetails"/>
                        </record>
                        <record>
                            <key id = "checkDate">Sun Dec 26 15:18:42 IST 2010</key>
                            <key id = "vsAgent">REG_SA_DROID , Version 5.0 , 38</key>
                            <key id = "type">FILE_FORMAT</key>
                            <key id = "result">PASSED</key>
                            <key id = "resultDetails"/>
                            <key id = "vsEvaluation">PASSED</key>
                            <key id = "vsEvaluationDetails"/>
                        </record>
                        <record>
                            <key id = "checkDate">Sun Dec 26 15:18:42 IST 2010</key>
                            <key id = "vsAgent">MXFTechMdExtractor , Version 1.0</key>
                            <key id = "type">TECHMD</key>
                            <key id = "result">PASSED</key>
                            <key id = "resultDetails"/>
                            <key id = "vsEvaluation">PASSED</key>
                            <key id = "vsEvaluationDetails"/>
                        </record>
                        <record>
                            <key id = "checkDate">Sun Dec 26 15:18:42 IST 2010</key>
                            <key id = "type">RISK_ANALYSIS</key>
                            <key id = "vsAgent">REG_SA_DPS</key>
```

```
                        <key id = "result">PASSED</key>
                        <key id = "resultDetails"/>
                        <key id = "vsEvaluation">PASSED</key>
                        <key id = "vsEvaluationDetails"/>
                    </record>
                </section>
            </dnx>
        </mets:xmlData>
    </mets:mdWrap>
</mets:techMD>
- <mets:rightsMD ID = "FL1022-amd-rights">
    - <mets:mdWrap MDTYPE = "OTHER" OTHERMDTYPE = "dnx">
        <mets:xmlData>
            <dnx/>
        </mets:xmlData>
    </mets:mdWrap>
</mets:rightsMD>
- <mets:sourceMD ID = "FL1022-amd-source">
    - <mets:mdWrap MDTYPE = "OTHER" OTHERMDTYPE = "dnx">
        <mets:xmlData>
            <dnx>
                <section id = "metaData">
                    <record>
                        <key id = "MID">DNX_FL1022</key>
                        <key id = "UUID">20995</key>
                        <key id = "creationDate">2010-12-26 15:16:30</key>
                        <key id = "createdBy">admin1</key>
                        <key id = "modificationDate">2010-12-26 15:18:42</key>
                        <key id = "modifiedBy">admin1</key>
                        <key id = "metadataType">21</key>
                        <key id = "description"/>
                        <key id = "externalSystem"/>
                        <key id = "externalRecordId"/>
                    </record>
                </section>
            </dnx>
        </mets:xmlData>
    </mets:mdWrap>
</mets:sourceMD>
- <mets:digiprovMD ID = "FL1022-amd-digiprov">
    - <mets:mdWrap MDTYPE = "OTHER" OTHERMDTYPE = "dnx">
        <mets:xmlData>
            <dnx>
                <section id = "event">
                    <record>
                        <key id = "eventDateTime">2010-12-26 15:17:11</key>
                        <key id = "eventType">VALIDATION</key>
                        <key id = "eventIdentifierType">DPS</key>
                        <key id = "eventIdentifierValue">27</key>
                        <key id = "eventOutcome1">SUCCESS</key>
                        <key id = "eventOutcomeDetail1"> PROCESS_ID=21010</key>
```

```
                                    <key id = "eventDescription">Fixity check performed le</key>
                                    <key id = "linkingAgentIdentifierType1">SOFTWARE</key>
                                    <key id = "linkingAgentIdentifierValue1"> JAVA5_FIXITY</key>
                                </record>
                            </section>
                        </dnx>
                    </mets:xmlData>
                </mets:mdWrap>
            </mets:digiprovMD>
        </mets:amdSec>
        - - <mets:fileSec>
            <mets:fileGrp USE = "VIEW" ID = "REP1021" ADMID = "REP1021-amd">
                <mets:file ID = "FL1022" MIMETYPE = "application/mxf" ADMID = "FL1022-amd">
                    <mets:FLocat LOCTYPE = "URL" xlin:href = /V1-FL1022.mxf"/>
                </mets:file>
            </mets:fileGrp>
        </mets:fileSec>
</mets:mets>
```

Relationships:

Columns	Association
ID ID	1 Representation. 1..* File.
ID ID	1 File. 0..* Technical Metadata.
ID ID	1 File. 1..* BitStream.
ID ID	1 File. 1..* Structural Map.
ID ID	0..* Events. 1 File.

3.2.10 Representation

Name: Representation
Definition: Representation is the set of files, including structural metadata, needed for a complete and reasonable rendition of an EE.
Data held by the entity: ID and Structural Map.
Entity category: Representation level
Consists of: XML Record for the Structural Map and Representation Metadata.
Example:

```
<mets:mets>
    <mets:amdSec ID = "REP1021amd">
        <mets:techMD ID = "REP1021amdtech">
            <mets:mdWrap MDTYPE = "OTHER" OTHERMDTYPE = "dnx">
                <mets:xmlData>
                    <dnx>
                        <section id = "generalRepCharacteristics">
                            <record>
                                <key id = "preservationType">PRESERVATION_MASTER</key>
                                <key id = "usageType">VIEW</key>
                                <key id = "RevisionNumber">1</key>
```

```
                        <key id = "label">test</key>
                    </record>
                </section>
                <section id = "internalIdentifier">
                    <record>
                        <key id = "internalIdentifierType">SIPID</key>
                        <key id = "internalIdentifierValue">2</key>
                    </record>
                    <record>
                        <key id = "internalIdentifierType">PID</key>
                        <key id = "internalIdentifierValue">REP1021</key>
                    </record>
                    <record>
                        <key id = "internalIdentifierType">DepositSetID</key>
                        <key id = "internalIdentifierValue">24</key>
                    </record>
                </section>
                <section id = "objectCharacteristics">
                    <record>
                        <key id = "objectType">REPRESENTATION</key>
                        <key id = "creationDate">20101226 15:16:30</key>
                        <key id = "createdBy">admin1</key>
                        <key id = "modificationDate">20101226 15:16:30</key>
                        <key id = "modifiedBy">admin1</key>
                        <key id = "owner">CRS00.INS00.DPR00</key>
                    </record>
                </section>
            </dnx>
        </mets:xmlData>
    </mets:mdWrap>
</mets:techMD>
<mets:rightsMD ID = "REP1021amdrights">
    <mets:mdWrap MDTYPE = "OTHER" OTHERMDTYPE = "dnx">
        <mets:xmlData>
            <dnx/>
        </mets:xmlData>
    </mets:mdWrap>
</mets:rightsMD>
<mets:sourceMD ID = "REP1021amdsource">
    <mets:mdWrap MDTYPE = "OTHER" OTHERMDTYPE = "dnx">
        <mets:xmlData>
            <dnx>
                <section id = "metaData">
                    <record>
                        <key id = "MID">DNX_REP1021</key>
                        <key id = "UUID">20999</key>
                        <key id = "creationDate">20101226 15:16:30</key>
                        <key id = "createdBy">admin1</key>
                        <key id = "modificationDate">20101226 15:16:30</key>
                        <key id = "modifiedBy"/>
                        <key id = "metadataType">21</key>
                        <key id = "description"/>
                        <key id = "externalSystem"/>
                        <key id = "externalRecordId"/>
                    </record>
                    <record>
                        <key id = "MID">REP10212</key>
                        <key id = "UUID">20996</key>
                        <key id = "creationDate">20101226 15:16:30</key>
                        <key id = "createdBy">admin1</key>
                        <key id = "modificationDate">20101226 15:16:47</key>
                        <key id = "modifiedBy"/>
```

```
                                <key id = "metadataType">32</key>
                                <key id = "description"/>
                                <key id = "externalSystem"/>
                                <key id = "externalRecordId"/>
                            </record>
                            <record>
                                <key id = "MID">REP10211</key>
                                <key id = "UUID">20998</key>
                                <key id = "creationDate">20101226 15:16:30</key>
                                <key id = "createdBy">admin1</key>
                                <key id = "modificationDate">20101226 15:16:47</key>
                                <key id = "modifiedBy"/>
                                <key id = "metadataType">32</key>
                                <key id = "description"/>
                                <key id = "externalSystem"/>
                                <key id = "externalRecordId"/>
                            </record>
                        </section>
                    </dnx>
                </mets:xmlData>
            </mets:mdWrap>
        </mets:sourceMD>
        <mets:digiprovMD ID = "REP1021amddigiprov">
            <mets:mdWrap MDTYPE = "OTHER" OTHERMDTYPE = "dnx">
                <mets:xmlData>
                    <dnx/>
                </mets:xmlData>
            </mets:mdWrap>
        </mets:digiprovMD>
    </mets:amdSec>
    <mets:fileSec>
        <mets:fileGrp USE = "VIEW" ID = "REP1021" ADMID = "REP1021amd">
            <mets:file ID = "FL1022" MIMETYPE = "application/mxf" ADMID = "FL1022amd">
                <mets:FLocat LOCTYPE = "URL" xlin:href = “/file_1/V1FL1022.mxf"/>
            </mets:file>
        </mets:fileGrp>
    </mets:fileSec>
    <mets:structMap ID = "REP10212" TYPE = "LOGICAL">
        <mets:div LABEL = "Test Struct Map">
            <mets:div LABEL = "Table of Contents">
                <mets:div LABEL = "Chapter 1">
                    <mets:div LABEL = "Page 1" TYPE = "FILE">
                        <mets:fptr FILEID = "FL1022"/>
                    </mets:div>
                </mets:div>
            </mets:div>
        </mets:div>
    </mets:structMap>
    <mets:structMap ID = "REP10211" TYPE = "PHYSICAL">
        <mets:div LABEL = "PRESERVATION_MASTER;VIEW">
            <mets:div LABEL = "Table of Contents">
                <mets:div LABEL = "test" TYPE = "FILE">
                    <mets:fptr FILEID = "FL1022"/>
                </mets:div>
            </mets:div>
        </mets:div>
    </mets:structMap>
</mets:mets>
```

Relationships:

Columns	Association	
ID	1	Editorial Entity.
ID	**1..***	Representation.
ID	1	Representation.
ID	**1..***	File.
ID	**1..***	Structural Map.
ID	1	Representation.
ID	0..*	Events.
ID	1	Representation.

3.2.11 Rights Metadata

Name: Rights Metadata
Definition: Rights to exploit the intellectual properties of the EE, see section 5.3.1
Data held by the entity: Rights MD.
Entity category: EE level
Consists of: XML Record which holds the rights MD.
Example: see section 5.3.1.
Relationships:

Columns	Association	
ID	1	Rights Metadata.
ID	1	Editorial Entity.

3.2.12 SIP

Name: SIP, Submission Information Package
Definition: see section 4 in D5.2.1.
Data held by the entity: A METS file which holds complete EE.
Entity category: EE level
Consists of: One EE
Example: see section 4 in D5.2.1.
Relationships:

Columns	Association	
ID	1	SIP.
ID	1	Editorial Entity.

3.2.13 Structural Map

Name: Structural Map
Definition: The structural map outlines an hierarchical structure for the digital object, and links the elements of that structure to content files and metadata that pertain to each element. The number of structMap elements related to AV content is limited to one element, which MUST have the attribute LABEL=‘‘PPRIME-AV’’. See page 67 in D5.2.1 (Structural Map sub section in section 4.3).
Data held by the entity: XML with the Structural Map information
Entity category: Representation level
Consists of: XML
Examples:

This example display a PrestoPRIME structural map with div having TYPE="MultiCopy" (one of the structural maps defined in PP_WP5_D5.2.1_ArchitectureDesign)

```
<structMap LABEL="PPRIME-AV" TYPE="Multi">
    <div TYPE="MultiCopy">
        <div TYPE="AudioVisual" LABEL="Master">
            <fptr FILEID="f001"/>
        </div>
        <div TYPE="AudioVisual">
            <fptr FILEID="f002"/>
        </div>
    </div>
</structMap>
```

Relationships:

Columns	Association
ID ID	**1..*** Structural Map. 1 Representation.
ID ID	**1..*** Structural Map. **1** File.

3.2.14 Technical Metadata

Name: Technical Metadata
Definition: Technical information extracted by one of the extraction tools and stored as an XML record. More than one technical metadata type can be part of the same technical metadata section, see sections 6.1 and References. The specific syntax for storing multiple types of technical metadata is yet to be determined; several options are applicable such as:

1. Specify a use of OTHERMDTYPE with a prefix/suffix syntax (prefix referencing the format and suffix referencing the specific metadata type)
2. By using the Mets ID, when known by component/application making the access (it could be known from Mets parsing StructMap->File->TechMD)

More options are applicable.

Data held by the entity: The output of technical metadata extraction tools mapped to the DNX key and values.
Entity category: File level
Consists of: One or more technical metadata sections.
Example: see the example in section 3.2.9

Relationships:

Columns	Association	Notes
ID ID	1..* Technical Metadata. 1 Technical Metadata Type.	
ID ID	1 File. 0..* Technical Metadata.	
ID ID	1 BitStream. 0..* Technical Metadata.	
ID ID	**1** **Representation**. **1** **Technical Metadata**.	This is a special case of a relation; the technical metadata in this case is used by the representation in order to identify a group of files with the same type of technical metadata (which is the reason why they belong to one representation). For example: one representation with low resolution video files and a different one with high resolution video files.

3.2.15 Technical Metadata Type

Name: Technical Metadata Type
Definition: This is an enumeration of Technical Metadata Types, the idea is to have maximum flexibility in the data model in a way which more types will be able to be added in the future.
Data held by the entity: Name and ID.
Entity category: File level
Consists of: list of types
Example: NA

Relationships:

Columns	Association	
ID	1..*	Technical Metadata.
ID	1	Technical Metadata Type.

4 DNX – Rosetta Normalized XML

The DNX schema is a simple and unified XML schema, for holding the administrative Metadata of the EE in the Permanent repository. It contains all the important data elements in a simple flat structure, divided according to the PREMIS data model and including the important technical metadata that is relevant for Preservation.

A technical metadata is in use by a preservation system in several areas: risk analysis, evaluating migration alternatives and more. Since there are several types of technical metadata which make use of different syntaxes, there is a need to have some kind of simple and unified syntax that will not require the preservation system to "know" how to render each and every syntax. DNX provides such simple but yet flexible syntax. Additionally, a comparison between different types of technical metadata can be easily performed when both are mapped to DNX.

DNX is in use by Ex Libris' Rosetta and proven to be simple and flexible when used by Ex Libris' Rosetta customers. Yet, PrestoPRIME data model is not limited to the use of DNX and different implementations can make use of different schemas.

The Administrative Metadata that needs to be stored arrives from various sources:

- Technical MD that is being generated by the MD extraction tools (JHOVE, NLNZ , MXF tools)
- CMS information (system and record ID)
- Provenance information – Producer, Producer Agent information, Events information.
- Miscellaneous information – Links to external events, other Intellectual Entities etc.

Since all this information comes from different sources, with different standards, some of it is duplicated or organized in a way that is not useful.

Therefore the DNX profile is designed to hold all this information in a clear and organized way, with a clear mapping to the original source that allows converting it back and forth.

The DNX is written inside the METS XML file, when the METS is created at the SIP Submission phase.

The Provenance information is written in the DNX upon moving to permanent stage since the information is still gathered along the SIP processing stage.

4.1 DNX section structure

The DNX format is built from logical groups of metadata fields called "Sections". Each DNX section contains a group of fields that are related to each other. For example the section 'generalRepCharacteristics' (General Representation Characteristics) includes the fields that describe the parameters of the Representation – Preservation Type, Usage Type, Revision Number etc.)

Most of the sections come from the PREMIS data dictionary, but some of them are unique to the AV Data Model. The structure of a DNX section is as follows:

- <section id=" Section Name ">
  - <record>
    - <key id="Field Name">Field Value</key>

        - …
    - </record>
- </section>

Each record holds the fields of the section, in the form of:

- <key id>Value</key>

As shown in the following example:

```
- <dnx xmlns="http://www.exlibrisgroup.com/dps/dnx">
  - <section id="generalRepCharacteristics">
    - <record>
        <key id="preservationType">PRESERVATION_MASTER</key>
        <key id="usageType">VIEW</key>
        <key id="RevisionNumber">1</key>
        <key id="DigitalOriginal">false</key>
      </record>
    </section>
```

Figure 8 – DNX section structure

4.2 Structure of a Repeatable Section

In case a DNX section is repeatable, there will be multiple records of the same structure as shown in the following example:

```
- <section id="internalIdentifier">
  - <record>
      <key id="internalIdentifierType">SIPID</key>
      <key id="internalIdentifierValue">20</key>
    </record>
  - <record>
      <key id="internalIdentifierType">PID</key>
      <key id="internalIdentifierValue">REP1101</key>
    </record>
  - <record>
      <key id="internalIdentifierType">DepositSetID</key>
      <key id="internalIdentifierValue">41</key>
    </record>
  </section>
```

Figure 9 – Repeatable DNX section structure

4.3 Significant Properties

In order to have a scalable structure that supports additions of technical metadata over the years, the DNX section that holds the extracted technical metadata has the following structure:

```
- <section id="significantProperties">
  - <record>
      <key id="significantPropertiesType">image.planarConfiguration</key>
      <key id="significantPropertiesValue">1</key>
      <key id="significantPropertiesExtension" />
    </record>
  - <record>
      <key id="significantPropertiesType">image.maxSampleValue</key>
      <key id="significantPropertiesValue">[1]</key>
      <key id="significantPropertiesExtension" />
    </record>
  - <record>
      <key id="significantPropertiesType">image.minSampleValue</key>
      <key id="significantPropertiesValue">[0]</key>
      <key id="significantPropertiesExtension" />
    </record>
  - <record>
      <key id="significantPropertiesType">image.newSubfileType</key>
      <key id="significantPropertiesValue">0</key>
      <key id="significantPropertiesExtension" />
    </record>
```

This structure allows defining the technical attributes as the values of the “significantPropertiesType” field, and their value as the value of the “significantPropertiesValue” field.

4.4 DNX and PREMIS

Most of the DNX sections and fields come from the PREMIS data dictionary. The AV Data Model implements PREMIS as a whole, and all PREMIS objects and semantic units are represented in the DNX profile.

Note: Not all the PREMIS fields in DNX are managed automatically by the AV Data Model. These fields can only be filled and monitored manually. For example, the fields which hold the relationships between different EEs (DNX section ‘relationship’)

4.5 Non-PREMIS DNX Sections

The following DNX sections are unique for Rosetta and they don’t appear in PREMIS:

- General EE/Rep/File Characteristics (generalIECharacteristics, generalRepCharacteristics, generalFileCharacteristics,) – These sections contain administrative as well as control attributes that determine how objects are delivered, published and searched for.
- Object Characteristics (objectCharacteristics) – This section can be at each level (EE, Rep, File) and it contains control attributes that are relevant at all levels such as dates and user information.
- CMS – This section holds the Collection Management System details. Each EE in Rosetta can have a “handle” to descriptive metadata that is managed in the ILS such as Aleph or Voyager. Since this information might be relevant for many EEs and in order to allow single point of update, the EE holds only the reference to this information, without the need to duplicate it in Rosetta.

- Web Harvesting (webHarvesting) – This section contains the information regarding Web Harvesting. It describes the tool that was used for building the Web Archive file and some other parameters of this action.
- File Virus Check (fileVirusCheck) – This section holds the outcome of the virus check that is performed as part of the validation stage.
- Validation Stack Outcome (vsOutcome) – This section holds the information about the Validation routines that were used to validate the files. The Validation includes – Virus check, Fixity check, Format identification and Technical Metadata extraction. Different plug-ins can be used and their details are captured in this section.
- Producer, Producer Agent (producer, producerAgent) – These sections hold the details taken from the user records of the Producer and the Producer Agent, as they are stored in Rosetta DB.
- Granted Rights Statement (grantedRightsStatement) – This section holds the copyrights statement that was presented to the producer agent when he deposited the EE. (Boilerplates as part of the Material Flow)
- Metadata (metadata) – This record holds the source metadata that is kept as is in the sourceMD METS section. For example, descriptive metadata that is not in DC form (MODS, MARC 21) can be stored in this section.

4.6 DNX and the AV Data Model

The technical metadata as extracted from audiovisual content should be mapped to DNX and stored as a DNX section in the METS techMD section.

The following XML is an example of MXF extractor output that was mapped to a DNX format:

```
<mets:techMD ID = "FL1025-amd-tech">
  <mets:mdWrap MDTYPE = "OTHER" OTHERMDTYPE = "dnx">
    <mets:xmlData>
      <dnx xmlns = "http://www.exlibrisgroup.com/dps/dnx">
        <section id = "significantProperties">
          <record>
            <key id = "OperationalPattern">value</key>
            <key id = "EssenceContainer">value</key>
            <key id = "EditRate">value</key>
            <key id = "Duration">value</key>
            <key id = "FrameLayout">value</key>
            <key id = "AspectRatio">value</key>
            <key id = "ActiveFormatDescriptor">value</key>
            <key id = "StoredWidth">value</key>
            <key id = "StoredHeight">value</key>
            <key id = "SampledWidth">value</key>
            <key id = "SampledHeight">value</key>
            <key id = "SampledXOffset">value</key>
            <key id = "SampledYOffset">value</key>
            <key id = "DisplayHeight">value</key>
            <key id = "DisplayWidth">value</key>
            <key id = "DisplayXOffset">value</key>
            <key id = "DisplayYOffset">value</key>
            <key id = "HorizontalSubsampling">value</key>
            <key id = "VerticalSubsampling">value</key>
            <key id = "ComponentDepth">value</key>
            <key id = "PictureEssenceCoding">value</key>
            <key id = "AudioSamplingRate">value</key>
            <key id = "AudioChannelCount">value</key>
            <key id = "AudioQuantizationBits">value</key>
            <key id = "SoundEssenceCoding">value</key>
            <key id = "AudioFormat">value</key>
            <key id = "VideoActiveLinesPerFrame">value</key>
```

```
            <key id = "FrameLayoutName">value</key>
          </record>
        </section>
      </dnx>
    </mets:xmlData>
  </mets:mdWrap>
</mets:techMD>
```

5 Metadata Types

5.1 AV Technical Metadata

The different types of technical metadata are well described in the document PP_WP2_D2.2.2_MetadataModels_InteroperabilityGaps.
Implementation of the Technical Metadata in the AV Data Model is described in section 6.

5.2 Descriptive Metadata

The different types of descriptive metadata are covered in the document PP_WP2_D2.2.2_MetadataModels_InteroperabilityGaps.
Implementation of the Descriptive Metadata in the AV Data Model is described in section 6.

5.3 Rights Metadata

The concept of Rights within the PrestoPRIME project may fall under one of the following three separate areas:

- Permission to exploit intellectual property rights
- Permissions to access/modify the repository information packages

5.3.1 Rights to exploit the intellectual properties

This area is covered by the work carried out in the task 4 of WP4, in the following tasks:

1. ID405B (Common Rights Ontology) as part of D405,
2. D5.2.1 (page 65)
3. ID402A

The exploitation rights metadata have to be saved and managed within the audiovisual digital archive. The exploitation metadata allow archive users to determine whether they are allowed to exploit the archival AV-items.
Limited to this scope, the permission to preserve is here taken for granted.
According to D5.2.1, these rights metadata are submitted to the archive (input for ingest and update) and disseminated for access (output) as OWL files, referenced by the METS container used for SIP and DIP.

```
<mets:rightsMD>
  <mets:mdRef MIMETYPE= application/rdf+xml MDTYPE=OTHER
    OTHERMDTYPE=pprime-rights xlink:href=rightsmdfile.owl/>
</mets:rightsMD>
```

Each OWL file imports the PrestoPRIME AudioVisual Rights Ontology (PPAVRO) which is defined in ID4.0.5B and which extends (and imports) the Media Value Chain Ontology (MVCO http://purl.oclc.org/NET/mvco.owl ; part 19 of MPEG-7).
The rights metadata represent the information about Permissions (issued by original rights holder) which permit actions such as the “Communication to the public”, acted over IP-Entities by the principal of the right. The Permissions may not be absolute, but may require that a set of Facts, such as conditions and or constraints, are tested to determine the validity of the Permissions
The AV IP-Entity described by the Rights metadata must be the same as that which is under the responsibility of the archive, and this must be reflected by the value of the DataProperty: **RelatedIdentifier**.
To model the need for Rights metadata to make reference to specific parts of the whole IP-Entity, the format of the RelatedIdentifier must be that of a URI which may contain a suffix

for fragment identification, according either to the syntax defined by MPEG-7 part 17 or by the draft W3C standard on media fragment (http://www.w3.org/TR/media-frags).
Thus, as explained in more detail in Chapter 7 of ID405B, it is possible to have individual items of the IP-Entity class which are indeed a fragment of the main entity, and which may be identified though a combination of various segmentation modalities (temporal, spatial, track, named).

5.3.2 Rights to access: Access Control List (ACL)

An XML schema supporting PrestoPRIME ACL has been created as part of the PrestoPRIME data model. It uses the METS RightsMD section with attribute MDTYPE="OTHER" and attribute OTHERMDTYPE="PPACL" for holding the ACL information in the RightsMD section.[13]
The RightsMD section is also used for IP-Entitity Exploitation Rights, covered by PrestoPrime AV Rights Ontology (PPAVRO). This was already true, and is confirmed. For distinguishing this use of RightsMD from other uses (such as ACL) the following must be done: attribute MDTYPE="OTHER" and attribute OTHERMDTYPE="PPAVRO".

The aim of this metadata area is to represent and support management of the information that determines which users or system processes are granted access to archival items, as well as what operations are allowed.
The concept of *access control list* must be applied to all the components of the information package, i.e. the audiovisual digital objects, the descriptive metadata, the rights metadata.
The users and the group of users to be taken into account can be "producers" and "consumers" as intended in the OAIS terminology, or agents working within an OAIS repository.

5.4 Preservation Events

The Event metadata holds the information about actions that have affected the object structure or data or information about the objects' authenticity. Each object level has different types of actions that should be captured. The events that are recorded in the AIP are called Provenance Events while many other events are captured in the system but do not become part of the AIP metadata and do not part of this document.
Events can be created prior to the actual deposit and should be part of the SIP (Pre Deposit Provenance Events), the system will get theses events and store them in the AIP. In addition, events can be created by the system and stored as part of the AIP (Post Deposit Provenance Events).

5.4.1 Pre Deposit Provenance Events

Provenance Events can be created prior to depositing, the system should get these events and store them as part of the AIP as provenance and authenticity information.
As part of the analysis that was performed in order to define the best approach for storing provenance information, two approaches have been analysed. The first one is the DNX approach already in use by Ex Libris' Rosetta, and the second one is the OPM (Open Provenance Model) [14] approach which regards as the state-of-the-art technique for collection, storing and exchanging provenance information.
The DNX approach provides the ability to map key-value pairs of provenance information to key-value pairs of DNX events while the OPM approach provides the ability to store

[13] At this stage of the project only allow/disallow will be supported. However, this mechanism can be extended in later phases of the project.
[14] http://openprovenance.org/

provenance information with complex relationships in an hierarchical XML (OPMX[15]) which can be displayed as a graph which presents the complex relationships.
Since DNX is a simple Key-Value syntax and cannot be used to store complex hierarchies, there is a need to support both OPM and DNX as provenance information containers (providing both simple and complex depositors to use an appropriate approach).
Another reason for supporting the OPM is that as part of PrsetoPRIME project, a tool for vocabulary alignment and annotation is under development (Deliverable ID4.0.1b - contributes to D4.0.1), this tool outputs OPM provenance information (that must be kept as part of the AV AIPs).
Therefore, two types of provenance information will be supported by the data model:

1. DNX based, provenance information will be stored as key-value data, for example:

```
<section id = "event">
    <record>
        <key id = "eventDateTime">2011-01-18 14:14:43</key>
        <key id = "eventType">Provenance</key>
        <key id = "eventIdentifierType">PP</key>
        <key id = "eventIdentifierValue">27</key>
        <key id = "eventOutcome1">Success</key>
        <key id = "eventOutcomeDetail1>Agent=Indigo Submission Application Tool</key>
        <key id = "eventDescription">Provenance Information as outputted from Indigo SA Tool</key>
        <key id = "linkingAgentIdentifierType1">SOFTWARE</key>
        <key id = "linkingAgentIdentifierValue1">INDIGO</key>
    </record>
</section>
```

2. OPM based, an RDF chunk (or an OPMX chunk) will be inserted into the METS as a whole, for example:

```
<mets:digiprovMD ID="FL1294-amd-digiprov">
    <mets:mdWrap MDTYPE="OTHER" OTHERMDTYPE="rdf">
        <mets:xmlData>
            <!ENTITY opmv 'http://purl.org/net/opmv/ns#'>
            <!ENTITY pprime 'http://semanticweb.cs.vu.nl/prestoprime/'>
            <!ENTITY rdf 'http://www.w3.org/1999/02/22-rdf-syntax-ns#'>
            <!ENTITY xsd 'http://www.w3.org/2001/XMLSchema#'>]>
            <rdf:RDF xmlns:opmv="&opmv;" xmlns:pprime="&pprime;" xmlns:rdf="&rdf;" xmlns:xsd="&xsd;">
                <opmv:Process>
                    <opmv:used rdf:resource="http://g.bbcredux.com/programme/bbcone/2010-11-21/22-00-00"/>
                    <opmv:wasControlledBy rdf:resource="&pprime;user/lourens"/>
                    <opmv:wasPerformedBy rdf:resource="&pprime;user/johan"/>
                    <opmv:wasPerformedBy rdf:resource="&pprime;user/michiel"/>
                    <opmv:wasStartedAt rdf:datatype="&xsd;date">2010-11-23T16:24:38</opmv:wasStartedAt>
                    <pprime:session rdf:resource="7283-de2e-9c1c-67b2.eculture"/>
                    <rdf:type rdf:resource="&pprime;Game"/>
                </opmv:Process>
            </rdf:RDF>
        </mets:xmlData>
    </mets:mdWrap>
</mets:digiprovMD>
```

5.4.2 Post Deposit Provenance Events

The following types of events are considered Provenance:

- New version of the EE – Due to adding a new Representation or adding MD (Descriptive, Access Rights).
- Validation checks - validity and integrity checks on files.

Each such event will be written in the events (mets:digiprovMD) section that belongs to the relevant object level. (EE, Representation or File)
Each event will be written in a DNX format and will include the following:

- Agent – The agent who triggered this event. Agent is not necessarily a person. Agent may refer also to a process, plug-in tool, etc.

[15] http://openprovenance.org/model/opmx

- Event details – such as: Creation date, description, parameters, etc.

The following is an example of an event that is stored in the digiProvMD section of a file: This section holds the events in a DNX format:

```
- <section id="event">
  - <record>
      <key id="eventDateTime">2010-01-07 16:35:50</key>
      <key id="eventType">VALIDATION</key>
      <key id="eventIdentifierType">DPS</key>
      <key id="eventIdentifierValue">27</key>
      <key id="eventOutcome1">SUCCESS</key>
      <key
        id="eventOutcomeDetail1">PROCESS_ID=22000;PID=FL1022;SIP_ID=4;
      <key id="eventDescription">Fixity check performed on file</key>
      <key id="linkingAgentIdentifierType1">SOFTWARE</key>
      <key id="linkingAgentIdentifierValue1">REG_SA_JAVA5_FIXITY</key>
    </record>
```

Figure 6 – An event record describing a Fixity check on a file

In addition to events, the digiprovMD section in the EE level stores the details of the Producer and the Producer Agent who made the Deposit of the EE.

```
- <mets:digiprovMD ID="ie-amd-digiprov">
  - <mets:mdWrap MDTYPE="OTHER" OTHERMDTYPE="dnx">
    - <mets:xmlData>
      - <dnx xmlns="http://www.exlibrisgroup.com/dps/dnx">
        - <section id="producer">
          - <record>
              <key id="userName" />
              <key id="address1">6740</key>
              <key id="address2">Willow Lane</key>
              <key id="address3">Dallas</key>
              <key id="address4">Texas</key>
              <key id="address5">U.S.A</key>
              <key id="defaultLanguage">en</key>
              <key id="emailAddress">marek.melichar@nkp.com</key>
              <key id="firstName">University of Oklahoma</key>
              <key id="jobTitle" />
              <key id="lastName">Legal Department</key>
              <key id="middleName" />
              <key id="telephone1">972-456-6547</key>
              <key id="telephone2" />
              <key id="authorativeName">Library of Legal Department</key>
              <key id="producerId">34366</key>
              <key id="userIdAppId">34362</key>
              <key id="webSiteUrl" />
              <key id="zip" />
            </record>
          </section>
        - <section id="producerAgent">
          - <record>
              <key id="firstName">John</key>
              <key id="lastName">Smith</key>
              <key id="middleName" />
            </record>
          </section>
        </dnx>
      </mets:xmlData>
    </mets:mdWrap>
  </mets:digiprovMD>
```

Figure 7 – The details of the Producer and the Producer Agent stored in the <mets:digiProvMD> section.

6 Implementation

6.1 Technical Metadata

For the purposes of the PrestoPRIME data model, technical metadata (specifically Audio/Visual technical metadata) is an XML file. The contents are expected to be extracted from a file in the SIP, by a metadata extraction tool that understands the kind of file, and the kind or kinds of metadata in the file. This is a difficult area for the implementation of a working system, because there are many kinds of audiovisual files, and many kinds of metadata. However the specification of technical metadata for the purposes of the PrestoPRIME data model is much simpler: the model merely has to have a place (an XML) file to hold the results of the metadata extraction tool. It is the extraction tool that needs to be complicated, to deal with the wide range of audiovisual content.
But there is still a problem for the data model, because the items within the XML file are meant to be usable by a digital preservation system. The system may wish to take action on, for example, all files with a given type of technical content, such as a specific kind of encoding, or number of lines per frame, or aspect ratio. PrestoPRIME has a *metadata mapping tool* that maps common audiovisual metadata standards to one another. The tool makes use of an intermediate general metadata language that could be very useful for the implementation of a management or preservation system that would support direct understanding and use of all the technical metadata terms used in all the metadata systems supported by the tool (MPEG-7, PBCore, EBU-Core and P-Meta are currently supported).
For simplicity, the data model definition only specifies that technical metadata will reside in an XML file. For powerful implementations of file management and digital preservation, the PrestoPRIME project will build on the metadata mapping tool so that the actual entities within the XML file can be correctly understood. In practice the metadata mapping tool is used immediately after metadata extraction, mapping the extracted terms into a common terminology, the coomon terminology that will be used in PrestoPRIME project is the DNX, see section 4 DNX – Rosetta Normalized XML, page 28 for complete details about the DNX.
The data model will make use of technical properties originating from different vocabularies, e.g. EBU Tech3301 and SMPTE RP210. In order to identify the vocabulary, a namespace prefix will be used, e.g. ebu3301:EditRate. It is recommended that the prefix used is formally defined as namespace in the METS document, pointing to a URI of the specification, e.g. xmlns:ebu3301="http://tech.ebu.ch/docs/tech/tech3301.pdf". This approach serves two purposes: (i) Defining the data type and semantics of the property by referring to the definition of the property in the source format, and (ii) disambiguating case where properties of the same name exist in different formats (for example, Field Rate exists both in EBU Tech3301 and in SMPTE RP210, the first with data type Rational 8Byte / Controlled Code, the second as Uint16.

6.2 Descriptive Metadata

The PrestoPRIME data model is flexible in a way that any AV descriptive MD should be supported by the implementer. Each and every implementation of the data model will specify which descriptive metadata types will be supported by it; the support is simplified by use of the metadata mapping tool developed by JRS for the PrestoPRIME project (Part of WP4T1). As part of the PrestoPRIME project a reference implementation for testing purposes will be used. The descriptive metadata types that will be part of the reference implementation will be determine according to the sample sets that will be provided by PrestoPRIME members. As a result of the evaluation done on D2.2.2 (see References section) descriptive metadata of the types MPEG-7 EBU-Core, EBU P/Meta, and PBCore should be supported by the datamodel along with Dublin Core (because of its implementation simplicity).

6.2.1 Dublin Core

The Dublin Core set of metadata elements provides a small and fundamental group of text elements through which most resources can be described and catalogued. A Dublin Core metadata record can describe physical resources such as books, digital materials such as video, sound, image, or text files, and composite media like web pages. Metadata records based on Dublin Core are intended to be used for cross-domain information resource description and have become standard in the fields of library science and computer science. Implementations of Dublin Core typically make use of XML and are Resource Description Framework based. The following is an example of Dublin Core MD in a PrestoPRIME METS:

```
<mets:dmdSec ID = "ee-dmd">
    <mets:mdWrap MDTYPE = "DC">
        <mets:xmlData>
            <dc:record>
                <dc:creator>Selenium</dc:creator>
                <dc:identifier/>
                <dc:identifier>ISBN 1-56389-668-0</dc:identifier>
                <dc:identifier/>
                <dc:date>2010</dc:date>
                <dc:publisher/>
                <dc:description/>
                <dcterms:alternative>Selenium Title</dcterms:alternative>
                <dc:title>my_mp3_9</dc:title>
            </dc:record>
        </mets:xmlData>
    </mets:mdWrap>
</mets:dmdSec>
```

6.2.2 MPEG-7

MPEG-7 is an ISO/IEC standard developed by MPEG (Moving Picture Experts Group), the committee that also developed the Emmy Award winning standards MPEG-1, MPEG-2 and MPEG-4[16].

MPEG-7, formally named "Multimedia Content Description Interface", is a standard for describing the multimedia content data that supports some degree of interpretation of the information meaning, which can be passed onto, or accessed by, a device or a computer

[16] http://en.wikipedia.org/wiki/H.264/MPEG-4_AVC

code. MPEG-7 is not aimed at any one application in particular; rather, the elements that MPEG-7 standardizes support as broad a range of applications as possible.[17]

MPEG-7 provides the world's richest set of audio-visual descriptions; these descriptions are based on catalogue (e.g., title, creator, rights), semantic (e.g., the who, what, when, where information about objects and events) and structural (e.g., the colour histogram, the amount of colour associated with an image or the timbre of a recorded instrument) features of the AV content, and leverages on AV data representation defined by MPEG-1, 2 and 4.

MPEG-7 uses XML Schema as the language of choice for content description and interoperability with other leading standards such as SMPTE Metadata Dictionary, Dublin Core, EBU P/Meta, and TV Anytime.

The following is an example of MPEG-7 descriptive metadata as proposed by EBU for standardization which will be used by PrestoPRIME. The time dimension can be seen in the AudioVisualSegment elements which represent each of the shots (yellow marked):

```
<?xml version="1.0" encoding="utf-8"?>
<Mpeg7 xsi:schemaLocation = "urn:mpeg:mpeg7:schema:2004 avdp-2010.xsd" xmlns = "urn:mpeg:mpeg7:schema:2004"
xmlns:mpeg7 = "urn:mpeg:mpeg7:schema:2004" xmlns:xsi = "http://www.w3.org/2001/XMLSchema-instance">
    <DescriptionProfile profileAndLevelIndication = "urn:mpeg:mpeg7:profiles:2011:AVDP"/>
    <DescriptionMetadata>
        <Instrument>
            <Tool>
                <Name>davp2avdp conversion stylesheet</Name>
            </Tool>
        </Instrument>
    </DescriptionMetadata>
    <Description xsi:type = "mpeg7:ContentEntityType">
        <MultimediaContent xsi:type = "mpeg7:AudioVisualType" xmlns:mpeg7 = "urn:mpeg:mpeg7:schema:2004">
            <AudioVisual mediaTimeUnit = "PT1N1000F" mediaTimeBase =
"mpeg7:MediaInformation/mpeg7:MediaProfile/mpeg7:MediaInstance/mpeg7:MediaLocator" id = "av_1">
                <MediaInformation>
                    <MediaProfile>
                        <MediaFormat>
                            <Content href = "urn:mpeg:mpeg7:cs:ContentCS:2001:2"/>
                        </MediaFormat>
                        <MediaInstance>
                            <InstanceIdentifier>mii1</InstanceIdentifier>
                            <MediaLocator>
                                <MediaUri>$LI_SYSINTDATA1;/20041116_110000_CCTV4_NEWS3_CHN.mpg</MediaUri>
                            </MediaLocator>
                        </MediaInstance>
                    </MediaProfile>
                </MediaInformation>
                <StructuralUnit href = "urn:x-mpeg-7-davp:cs:StructuralUnitCS:2005:av.programme"/>
                <MediaTime>
                    <MediaRelIncrTimePoint>0</MediaRelIncrTimePoint>
                    <MediaIncrDuration>1038037</MediaIncrDuration>
                </MediaTime>
                <TemporalDecomposition id = "TRECVID2005_1_TD_1" criteria = "urn:x-davp_criteria:visual_shots" gap = "false"
overlap = "false">
                    <Header xsi:type = "mpeg7:DescriptionMetadataType">
                        <Instrument>
                            <Tool>
                                <Name>unknown</Name>
                            </Tool>
                        </Instrument>
                    </Header>
                    <AudioVisualSegment id = "shot1_1_AV">
                        <StructuralUnit href = "urn:x-mpeg-7-davp:cs:StructuralUnitCS:2005:vis.shot"/>
                        <MediaTime>
                            <MediaRelIncrTimePoint>0</MediaRelIncrTimePoint>
                            <MediaIncrDuration>116116</MediaIncrDuration>
                        </MediaTime>
                        <MediaSourceDecomposition criteria = "http://www.ebu.ch/metadata/cs/mpeg/avdp/DecompositionCS#10" id
= "shot1_1_MSD_mod">
```

[17] http://mpeg.chiariglione.org/standards/mpeg-7/mpeg-7.htm

```
                        <VideoSegment id = "shot1_1">
                            <StructuralUnit href = "urn:x-mpeg-7-davp:cs:StructuralUnitCS:2005:vis.shot"/>
                            <MediaTime>
                                <MediaRelIncrTimePoint>0</MediaRelIncrTimePoint>
                                <MediaIncrDuration>116116</MediaIncrDuration>
                            </MediaTime>
                        </VideoSegment>
                    </MediaSourceDecomposition>
                    <MediaSourceDecomposition criteria = "http://www.ebu.ch/metadata/cs/mpeg/avdp/DecompositionCS#11"
gap = "true" overlap = "false" id = "shot1_1_MSD_key">
                        <VideoSegment id = "shot1_1_RKF_AV">
                            <StructuralUnit href = "urn:x-mpeg-7-davp:cs:StructuralUnitCS:2005:vis.keyframe"/>
                            <MediaTime>
                                <MediaRelIncrTimePoint>57057</MediaRelIncrTimePoint>
                            </MediaTime>
                        </VideoSegment>
                    </MediaSourceDecomposition>
                </AudioVisualSegment>
                <AudioVisualSegment id = "shot1_2_AV">
                    <StructuralUnit href = "urn:x-mpeg-7-davp:cs:StructuralUnitCS:2005:vis.shot"/>
                    <MediaTime>
                        <MediaRelIncrTimePoint>116116</MediaRelIncrTimePoint>
                        <MediaIncrDuration>504504</MediaIncrDuration>
                    </MediaTime>
                    <MediaSourceDecomposition criteria = "http://www.ebu.ch/metadata/cs/mpeg/avdp/DecompositionCS#10" id
= "shot1_2_MSD_mod">
                        <VideoSegment id = "shot1_2">
                            <StructuralUnit href = "urn:x-mpeg-7-davp:cs:StructuralUnitCS:2005:vis.shot"/>
                            <MediaTime>
                                <MediaRelIncrTimePoint>116116</MediaRelIncrTimePoint>
                                <MediaIncrDuration>504504</MediaIncrDuration>
                            </MediaTime>
                        </VideoSegment>
                    </MediaSourceDecomposition>
                    <MediaSourceDecomposition criteria = "http://www.ebu.ch/metadata/cs/mpeg/avdp/DecompositionCS#11"
gap = "true" overlap = "false" id = "shot1_2_MSD_key">
                        <VideoSegment id = "shot1_2_RKF_AV">
                            <StructuralUnit href = "urn:x-mpeg-7-davp:cs:StructuralUnitCS:2005:vis.keyframe"/>
                            <MediaTime>
                                <MediaRelIncrTimePoint>367367</MediaRelIncrTimePoint>
                            </MediaTime>
                        </VideoSegment>
                    </MediaSourceDecomposition>
                </AudioVisualSegment>
            </TemporalDecomposition>
        </AudioVisual>
    </MultimediaContent>
</Description>
</Mpeg7>
```

6.2.3 PBCore

The PBCore metadata standard[18] (Public Broadcasting Metadata Dictionary) was created by the public broadcasting community in the United States of America for use by public broadcasters and related communities. PBCore is a metadata dictionary, used to describe many different types of media items. It is useful for locating, sharing and exchanging media items.

PBCore can be used as the descriptive metadata in the METS container. The following is an example of PBCore embedded into PrestoPRIME METS:

```
<mets:dmdSec ID = "ee-dmd">
  <mets:mdWrap MDTYPE = "OTHER">
    <mets:xmlData>
      <PBCoreDescriptionDocument xsi:schemaLocation =
"http://www.pbcore.org/PBCore/PBCoreNamespace.html
```

[18] http://www.pbcore.org/

```
http://www.pbcore.org/PBCore/PBCoreXSD_Ver_1-2-1.xsd">
      <pbcoreIdentifier>
        <identifier>xyz2006</identifier>
        <identifierSource>Call Number</identifierSource>
      </pbcoreIdentifier>
      <pbcoreIdentifier>
        <identifier>8e8de03e-03c0-4080-985d-93e2000d32a5</identifier>
        <identifierSource>pbcore XML database UUID</identifierSource>
      </pbcoreIdentifier>
      <pbcoreTitle>
        <title>Press Conference on Scholarships</title>
      </pbcoreTitle>
      <pbcoreDescription>
        <description>Description of Press Conference</description>
        <descriptionType>Abstract</descriptionType>
      </pbcoreDescription>
      <pbcoreGenre>
        <genre>Action</genre>
        <genreAuthorityUsed>PBCore Genre Picklist</genreAuthorityUsed>
      </pbcoreGenre>
    </PBCoreDescriptionDocument>
  </mets:xmlData>
 </mets:mdWrap>
</mets:dmdSec>
```

6.2.4 EBU

EBU Tech 3293 (v.1.2 – July 2010) and named EBUCore is based on the Dublin Core and has been designed as a minimum list of attributes to describe audio and video resources for a wide range of broadcasting applications including first of all archives, but also exchange and publication. Ideal for applications and environments where some compliance to Dublin Core is also desired or recommended as common format, the potential uses of EBUCore are not restricted to these cases. [19]

EBU metadata can be used as the descriptive metadata in the METS container. The following is an example of EBU metadata embedded into PrestoPRIME METS:

```
<?xml version="1.0" encoding="UTF-8"?>
<mets:dmdSec ID = "ee-dmd">
    <mets:mdWrap MDTYPE = "OTHER">
        <mets:xmlData>
            <ebucore:ebuCoreMain xsi:schemaLocation = "urn:ebu:metadata-schema:ebuCore_20090928
EBU_CORE_20090928.xsd" xmlns:dc = "http://purl.org/dc/elements/1.1/" xmlns:xsi = "http://www.w3.org/2001/XMLSchema-
instance" xmlns:ebucore = "urn:ebu:metadata-schema:ebuCore_20090928">
                <ebucore:coreMetadata>
                    <ebucore:title>
                        <dc:title>VIZIATI / VIAGGI CHIAMATI AMORE</dc:title>
                    </ebucore:title>
                    <ebucore:creator>
                        <ebucore:contactDetails>
                            <ebucore:name>
                                <ebucore:name>Italo Moscati</ebucore:name>
                            </ebucore:name>
                        </ebucore:contactDetails>
                        <ebucore:organisationDetails>
                            <ebucore:organisationName>RAI - Radiotelevisione Italiana</ebucore:organisationName>
                        </ebucore:organisationDetails>
                        <ebucore:role typeLink = "http://www.ebu.ch/metadata/cs/ebu_RoleCodeCS.xml#22.2" typeLabel = "Author"/>
                    </ebucore:creator>
                    <ebucore:subject>
                        <dc:subject>Societa e cronaca, Temi specifici</dc:subject>
                    </ebucore:subject>
```

[19] http://www.ebu.ch/metadata/documentation/EBUCore1_2/tech3293v1_2.pdf

```
                    <ebucore:description>
                        <dc:description>String</dc:description>
                    </ebucore:description>
                    <ebucore:publisher>
                        <ebucore:organisationDetails>
                            <ebucore:organisationName>RAI - Radiotelevisione Italiana</ebucore:organisationName>
                        </ebucore:organisationDetails>
                    </ebucore:publisher>
                    <ebucore:contributor>
                        <ebucore:contactDetails>
                            <ebucore:name>
                                <ebucore:name>Tiziana Piazza</ebucore:name>
                            </ebucore:name>
                        </ebucore:contactDetails>
                        <ebucore:role typeLink = "http://www.ebu.ch/metadata/cs/ebu_RoleCodeCS.xml#11" typeLabel = "Editor"/>
                    </ebucore:contributor>
                    <ebucore:contributor>
                        <ebucore:contactDetails>
                            <ebucore:name>
                                <ebucore:name>Roberto Carradori</ebucore:name>
                            </ebucore:name>
                        </ebucore:contactDetails>
                        <ebucore:role typeLink = "http://www.ebu.ch/metadata/cs/ebu_RoleCodeCS.xml#11" typeLabel = "Editor"/>
                    </ebucore:contributor>
                    <ebucore:date>
                        <dc:date>2009-07-01</dc:date>
                    </ebucore:date>
                    <ebucore:type>
                        <dc:type>Intrattenimento Spettacolo senza conduttore</dc:type>
                    </ebucore:type>
                    <ebucore:format>
                        <dc:format>String</dc:format>
                        <ebucore:duration>PT0H51M0S</ebucore:duration>
                    </ebucore:format>
                    <ebucore:identifier>
                        <dc:identifier>F557203</dc:identifier>
                    </ebucore:identifier>
                    <ebucore:publicationHistory>
                        <ebucore:firstTransmissionDateTime>2009-07-01T00:09:15</ebucore:firstTransmissionDateTime>
                        <ebucore:firstTransmissionChannel>RAI 3</ebucore:firstTransmissionChannel>
                    </ebucore:publicationHistory>
                </ebucore:coreMetadata>
            </ebucore:ebuCoreMain>
        </mets:xmlData>
    </mets:mdWrap>
</mets:dmdSec>
```

6.2.5 P-META

EBU Tech 3295 (P-META) is a library of xml-based descriptive elements and datatypes designed to reflect the intrinsic structure of AV content (essence) from programme groups down to shots or audio channels, while EBU Tech 3331 (Exchange) uses the P-META tools to specify metadata formats used for information exchanges between broadcasters and also between production systems. P-META can also be combined with other metadata standards such as Mpeg-7 as specified by the European project PrestoSpace.

Designed for business to business exchange, it has also been used for exchange between production systems.[20] P-META can be used as the descriptive metadata in the METS container. The following example shows P-META embedded in PrestoPRIME METS:

```
<?xml version="1.0" encoding="UTF-8"?>
<mets:dmdSec ID = "ee-dmd">
   <mets:mdWrap MDTYPE = "OTHER">
      <mets:xmlData>
         <pmeta:ProgrammeInformation
            xsi:schemaLocation = "urn:ebu:metadata-schema:ebuexchange_20090701 EBU_EXCHANGE_20090701.xsd"
            xmlns:xsi = "http://www.w3.org/2001/XMLSchema-instance"
            xmlns:pmeta = "urn:ebu:metadata-schema:ebupmeta_20090701">
            <pmeta:ProgrammeDetails>
               <pmeta:ProgrammeIdentification>
                  <pmeta:DataDefaultLanguage>
                     <pmeta:LanguageCode>EN</pmeta:LanguageCode>
                  </pmeta:DataDefaultLanguage>
                  <pmeta:Identifier>
                     <pmeta:IdentifierType>
                        <pmeta:IdentifierTypeCode>http://www.ebu.ch/metadata/cs/ebu_IdentifierTypeCodeCS.xml#17</pmeta:Identifie
rTypeCode>
                        <pmeta:IdentifierTypeName>Archive Number</pmeta:IdentifierTypeName>
                     </pmeta:IdentifierType>
                     <pmeta:IdentifierNumber>F557203</pmeta:IdentifierNumber>
                  </pmeta:Identifier>
                  <pmeta:ProgrammeTitleHistory>
                     <pmeta:OriginalProgrammeTitle>
                        <pmeta:Language>
                           <pmeta:LanguageCode>IT</pmeta:LanguageCode>
                        </pmeta:Language>
                        <pmeta:ProgrammeTitle>VIZIATI</pmeta:ProgrammeTitle>
                        <pmeta:ProgrammeSubtitle>E LA TV CREO` IL MONDO</pmeta:ProgrammeSubtitle>
                        <pmeta:ProgrammeEpisodeTitle>VIAGGI CHIAMATI AMORE</pmeta:ProgrammeEpisodeTitle>
                     </pmeta:OriginalProgrammeTitle>
                  </pmeta:ProgrammeTitleHistory>
                  <pmeta:Contribution>
                     <pmeta:DataDefaultLanguage>
                        <pmeta:LanguageCode>EN</pmeta:LanguageCode>
                     </pmeta:DataDefaultLanguage>
                     <pmeta:RoleDetails>
                        <pmeta:RoleType>
                           <pmeta:RoleTypeCode>http://www.ebu.ch/metadata/cs/ebu_RoleCodeCS.xml#22.2</pmeta:RoleTypeCode>
                           <pmeta:RoleTypeName>Author</pmeta:RoleTypeName>
                        </pmeta:RoleType>
                        <pmeta:ContributionDetails>
                           <pmeta:ContributorDetails>
                              <pmeta:PersonDetails>
                                 <pmeta:PersonLastName>Moscati</pmeta:PersonLastName>
                                 <pmeta:PersonFirstName>Italo</pmeta:PersonFirstName>
                              </pmeta:PersonDetails>
                           </pmeta:ContributorDetails>
                        </pmeta:ContributionDetails>
                     </pmeta:RoleDetails>
                     <pmeta:RoleDetails>
                        <pmeta:RoleType>
                           <pmeta:RoleTypeCode>http://www.ebu.ch/metadata/cs/ebu_RoleCodeCS.xml#11</pmeta:RoleTypeCode>
                           <pmeta:RoleTypeName>Editor</pmeta:RoleTypeName>
                        </pmeta:RoleType>
                        <pmeta:ContributionDetails>
                           <pmeta:ContributorDetails>
                              <pmeta:PersonDetails>
```

[20] http://tech.ebu.ch/docs/tech/tech3295v2_1.pdf and http://tech.ebu.ch/docs/tech/tech3331v1_1.pdf

```
                        <pmeta:PersonLastName>Carradori</pmeta:PersonLastName>
                        <pmeta:PersonFirstName>Roberto</pmeta:PersonFirstName>
                     </pmeta:PersonDetails>
                  </pmeta:ContributorDetails>
                  <pmeta:ContributorDetails>
                     <pmeta:PersonDetails>
                        <pmeta:PersonLastName>Piazza</pmeta:PersonLastName>
                        <pmeta:PersonFirstName>Tiziana</pmeta:PersonFirstName>
                     </pmeta:PersonDetails>
                  </pmeta:ContributorDetails>
               </pmeta:ContributionDetails>
            </pmeta:RoleDetails>
         </pmeta:Contribution>
         <pmeta:ProductionEndDate>1967-08-13</pmeta:ProductionEndDate>
         <pmeta:EditorialControlDetails>
            <pmeta:DataDefaultLanguage>
               <pmeta:LanguageCode>EN</pmeta:LanguageCode>
            </pmeta:DataDefaultLanguage>
            <pmeta:EditorialControl>
               <pmeta:EditorialControlCode>http://www.ebu.ch/metadata/cs/ebu_EditorialControlCodeCS.xml#4</pmeta:Editor
ialControlCode>
               <pmeta:EditorialControlName>OWN PRODUCTION</pmeta:EditorialControlName>
            </pmeta:EditorialControl>
            <pmeta:EditorialControlBy>
               <pmeta:OrganisationName>RAI - Radiotelevisione Italiana</pmeta:OrganisationName>
               <pmeta:Country>
                  <pmeta:CountryCode>IT</pmeta:CountryCode>
               </pmeta:Country>
            </pmeta:EditorialControlBy>
            <pmeta:ReferenceYear>2009</pmeta:ReferenceYear>
         </pmeta:EditorialControlDetails>
      </pmeta:ProgrammeIdentification>
      <pmeta:ProgrammeDescription>
         <pmeta:DataDefaultLanguage>
            <pmeta:LanguageCode>IT</pmeta:LanguageCode>
         </pmeta:DataDefaultLanguage>
         <pmeta:Duration>PT0H51M0S</pmeta:Duration>
         <pmeta:ProgrammeSynopsis>Intrattenimento Spettacolo senza conduttore</pmeta:ProgrammeSynopsis>
         <pmeta:ProgrammeScript>Sigla Iniziale, Amore e Viaggi, Segue Amore e Viaggi, Sigla
Finale</pmeta:ProgrammeScript>
         <pmeta:ColourCode>http://www.ebu.ch/metadata/cs/ebu_ColourCodeCS.xml#1</pmeta:ColourCode>
         <pmeta:SubtitleFlag>true</pmeta:SubtitleFlag>
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   </pmeta:ProgrammeDetails>
   <pmeta:TransmissionPublicationDetails>
      <pmeta:PublicationDetails>
         <pmeta:PublicationEventTransmissionService>
            <pmeta:OrganisationName>RAI</pmeta:OrganisationName>
            <pmeta:ServiceName>RAI 3</pmeta:ServiceName>
         </pmeta:PublicationEventTransmissionService>
         <pmeta:FirstPublicationEventStart>
            <pmeta:Date>2009-07-01</pmeta:Date>
            <pmeta:Time>00:09:15</pmeta:Time>
         </pmeta:FirstPublicationEventStart>
      </pmeta:PublicationDetails>
   </pmeta:TransmissionPublicationDetails>
   <pmeta:ItemDetails>
      <pmeta:ItemIdentification>
         <pmeta:Identifier>
            <pmeta:IdentifierType>
               <pmeta:IdentifierTypeName>Archive Number</pmeta:IdentifierTypeName>
            </pmeta:IdentifierType>
            <pmeta:IdentifierNumber>F557203#t=clock:2009-07-01T00:09:15,2009-07-
01T00:09:58</pmeta:IdentifierNumber>
         </pmeta:Identifier>
         <pmeta:ItemTitleHistory>
            <pmeta:OriginalItemTitle>
               <pmeta:ItemTitle>Sigla</pmeta:ItemTitle>
            </pmeta:OriginalItemTitle>
         </pmeta:ItemTitleHistory>
      </pmeta:ItemIdentification>
      <pmeta:ItemDescription>
         <pmeta:DataDefaultLanguage>
            <pmeta:LanguageCode>IT</pmeta:LanguageCode>
         </pmeta:DataDefaultLanguage>
         <pmeta:ItemSynopsis>
            Scorrimento fotogrammi da film " Arancia meccanica " di Stanley Kubrick all' interno di fascia rettangolare su
```

```
sfondo a bande colorate. Animazione in videografica di titolo programma e titolo
                        puntata.
                    </pmeta:ItemSynopsis>
                    <pmeta:SubtitleFlag>true</pmeta:SubtitleFlag>
                </pmeta:ItemDescription>
            </pmeta:ItemDetails>
            <pmeta:ItemDetails>
                <pmeta:ItemIdentification>
                    <pmeta:Identifier>
                        <pmeta:IdentifierType>
                            <pmeta:IdentifierTypeName>Archive Number</pmeta:IdentifierTypeName>
                        </pmeta:IdentifierType>
                        <pmeta:IdentifierNumber>F557203#t=clock:2009-07-01T00:09:58,2009-07-
01T00:34:49</pmeta:IdentifierNumber>
                    </pmeta:Identifier>
                    <pmeta:ItemTitleHistory>
                        <pmeta:OriginalItemTitle>
                            <pmeta:ItemTitle>Amore e viaggi</pmeta:ItemTitle>
                        </pmeta:OriginalItemTitle>
                    </pmeta:ItemTitleHistory>
                </pmeta:ItemIdentification>
                <pmeta:ItemDescription>
                    <pmeta:DataDefaultLanguage>
                        <pmeta:LanguageCode>IT</pmeta:LanguageCode>
                    </pmeta:DataDefaultLanguage>
                    <pmeta:ItemSynopsis>
                        Commento musicale e montaggio audio originale da trasmissioni televisive, sul tema del viaggio e dell'amore:
Proietti canta...
                        sketch di Marchesini nei panni della sessuologa; sequenze videoclip " Ti adoro " di Luciano Pavarotti; sketch di D'
Aquino e Panariello nei panni di Naomo da "
                        Torno sabato " ; sketch in bn di Panelli che interpreta vari personaggi; trasmissione " Amore "condotta da Carra' ;
aereo in caduta libera ..
                    </pmeta:ItemSynopsis>
                    <pmeta:SubtitleFlag>true</pmeta:SubtitleFlag>
                </pmeta:ItemDescription>
            </pmeta:ItemDetails>
        </pmeta:ProgrammeInformation>
    </mets:xmlData>
  </mets:mdWrap>
</mets:dmdSec>
```

Glossary

Term	Definition
AIP	Archive Information Package
DIP	Delivery Information Package
DNX	Digital preservation system (Rosetta) Normalized XML
EBU	European Broadcasting Union
Information Package	The basic *object* in OAIS; there are three types: SIP, AIP, DIP = Submission (input), Archive (storage), Delivery (output)
METS	Metadata Coding and Transmission Standard – one way to build OAIS information packages http://www.loc.gov/standards/mets/
MPEG	Moving Picture Expert Group – the body behind an important range of audiovisual encoding standards http://www.mpeg.org/
MXF	Media Exchange Format – a non-proprietary SMPTE standardised wrapper format for audiovisual content, used in broadcasting and digital cinema and related professional contexts
OAIS	Open Archival Information System – the ISO standard for a digital preservation system http://en.wikipedia.org/wiki/Open_Archival_Information_System http://public.ccsds.org/publications/archive/650x0b1.pdf
P4	PrestoPRIME Preservation Platform
PREMIS	Preservation Metadata: Implementation Strategies, a framework for preservation metadata http://www.loc.gov/standards/premis/
Rosetta	The digital preservation product of Ex Libris
SIP	Submission Information Package
SMPTE	Society of Motion Picture and Television Engineers

References

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   https://prestoprimews.ina.fr/public/deliverables/PP_WP5_D5.2.1_ArchitectureDesign_R0_v1.02.pdf

2. PP_WP2_D2.2.2_MetadataModels_InteroperabilityGaps.

   https://prestoprimews.ina.fr/public/deliverables/PP_WP2_D2.2.2_MetadataModels_InteroperabilityGaps_v1.50.pdf

3. PP_WP5_D5.1.1_Scenarios_v1.02.pdf

   https://prestoprimews.ina.fr/public/deliverables/PP_WP5_D5.1.1_Scenarios_v1.02.pdf