

1 Preface

1.1 Aim of the specification

This E-ARK specification is part of a family of specifications that provide a common set of requirements for packaging digital information. These specifications are based on common, international standards for transmitting, describing and preserving digital data. They have been produced to help data creators, software developers and digital archives tackle the challenge of short-, medium- and long-term data management and reuse in a sustainable, authentic, cost-efficient, manageable and interoperable way.

The foundation for these specifications is the Reference Model for an Open Archival Information System (OAIS) which has Information Packages at its core. Familiarity with the core functional entities of OAIS is a prerequisite for understanding the specifications. A visualisation of the current specification network can be seen here:

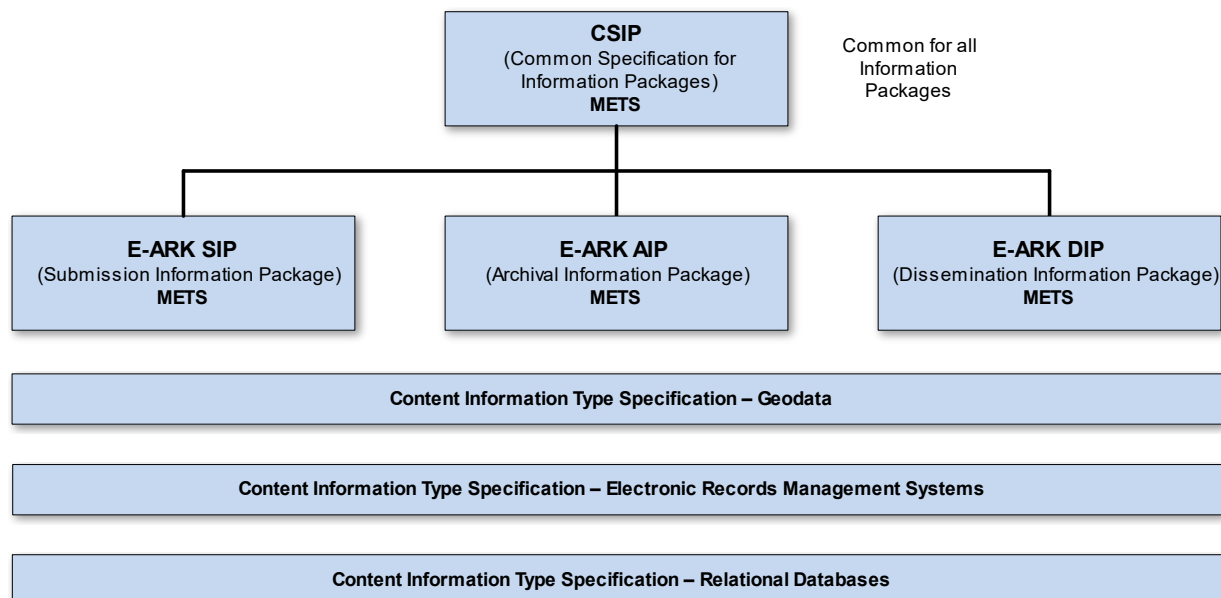


Figure 1: E-ARK specification dependency hierarchy

Table 1: Specification hierarchy aims and goals

Specification	Aim and Goals
Common Specification for Information Packages	<p>This document introduces the concept of a Common Specification for Information Packages (CSIP). Its three main purposes are to:</p> <ul style="list-style-type: none"> • Establish a common understanding of the requirements which need to be met in order to achieve interoperability of Information Packages. • Establish a common base for the development of more specific Information Package definitions and tools within the digital preservation community.

Specification	Aim and Goals
	<ul style="list-style-type: none"> Propose the details of an XML-based implementation of the requirements using, to the largest possible extent, standards which are widely used in international digital preservation. <p>Ultimately the goal of the Common Specification is to reach a level of interoperability between all Information Packages so that tools implementing the Common Specification can be adopted by institutions without the need for further modifications or adaptations.</p>
E-ARK SIP	<p>The main aims of this specification are to:</p> <ul style="list-style-type: none"> Define a general structure for a Submission Information Package format suitable for a wide variety of archival scenarios, e.g. document and image collections, databases or geographical data. Enhance interoperability between Producers and Archives. Recommend best practices regarding metadata, content and structure of Submission Information Packages.
E-ARK AIP	<p>The main aims of this specification are to:</p> <ul style="list-style-type: none"> Define a generic structure of the AIP format suitable for a wide variety of data types, such as document and image collections, archival records, databases or geographical data. Recommend a set of metadata related to the structural and the preservation aspects of the AIP as implemented by the reference implementation eArchiving ToolBox (formerly earkweb). Ensure the format is suitable to store large quantities of data.
E-ARK DIP	<p>The main aims of this specification are to:</p> <ul style="list-style-type: none"> Define a generic structure of the DIP format suitable for a wide variety of archival records, such as document and image collections, databases or geographical data. Recommend a set of metadata related to the structural and access aspects of the DIP.
Content Information Type Specifications	<p>The main aim and goal of a Content Information Type Specification is to:</p> <ul style="list-style-type: none"> Define, in technical terms, how data and metadata must be formatted and placed within a CSIP Information Package in

Specification	Aim and Goals
	order to achieve interoperability in exchanging specific Content Information. The number of possible Content Information Type Specifications is unlimited.

1.2 Organisational support

This specification is maintained by the Digital Information LifeCycle Interoperability Standards Board (DILCIS Board). The DILCIS Board (<http://dilcis.eu/>) was created to enhance and maintain the draft specifications developed in the European Archival Records and Knowledge Preservation Project (E-ARK project) which concluded in January 2017 (<http://eark-project.com/>). The Board consists of eight members, but there is no restriction on the number of participants in the work. All Board documents and specifications are stored in GitHub (<https://github.com/DILCISBoard>) while published versions are made available on the Board webpage. Since 2018 the DILCIS Board has been responsible for the core specifications in the Connecting Europe Facility eArchiving Building Block (<https://ec.europa.eu/cefdigital/wiki/display/CEFDIGITAL/eArchiving>).

1.3 Authors

A full list of contributors to this specification, as well as the revision history can be found in Appendix 1.

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2 Introduction

2.1 Purpose

The purpose of this document is to describe the Content Information Type Specification (CITS) for 3D Product Models (3D PM). The specification is designed to be used for the transfer to archives as well as for records exchange between different 3D Product Model systems. This specification is supported by METS profiles for the Root and Representation METS files and accompanying Guideline document.

2.2 Scope

Use of 3D data is widespread across many domains, with a plethora of applications and data formats. This 3D Product Model content specification limits its scope to the area of 3D digital product data such as computer aided design (CAD) or product data model (PDM) data. There is a international standard for the long term archiving of this class of data in the LOTAR “Long Term Archiving and Retrieval of digital technical product information”¹, which is published as the EN and NAS 9300 series. However although LOTAR extensively references and extends ISO 14721 the “Open reference model for Archiving Information System”, (OAIS) it does not extend into areas detailed in the E-ARK common specification for information packages (CSIP). LOTAR also references and builds on ISO 10303, the Standard for the Exchange of Product model data (STEP) and so with this E-ARK 3D PM CITS we have the opportunity to add to a layered standards model as seen below in section 2.3.

2.3 Layered Data Model

This section introduces the role of the CITS 3D PM and its dependencies on the basic structures of the Information Package.

This specification is created based on the requirements of the Common Specification for Information Packages (CSIP), the specification for Submission Information Packages (E-ARK SIP) and the specification for Archival Information Packages (E-ARK AIP). To fully understand its requirements, we highly recommend that users review the requirements and the terminology of the source documents, before using this specification.

The data model structure is based on a layered approach for information package definitions (Figure 2). The Common Specification for Information Packages (CSIP) forms the outermost layer. The general SIP, AIP and DIP specifications add respectively, submission, archiving and dissemination information

¹ <https://lotar-international.org/lotar-standard/>

to the CSIP specification. The third layer of the model represents specific content information type specifications, such as this 3D PM specification. Additional layers for business-specific specifications and local variant implementations of any specification can be added to suit the needs of the organisation.

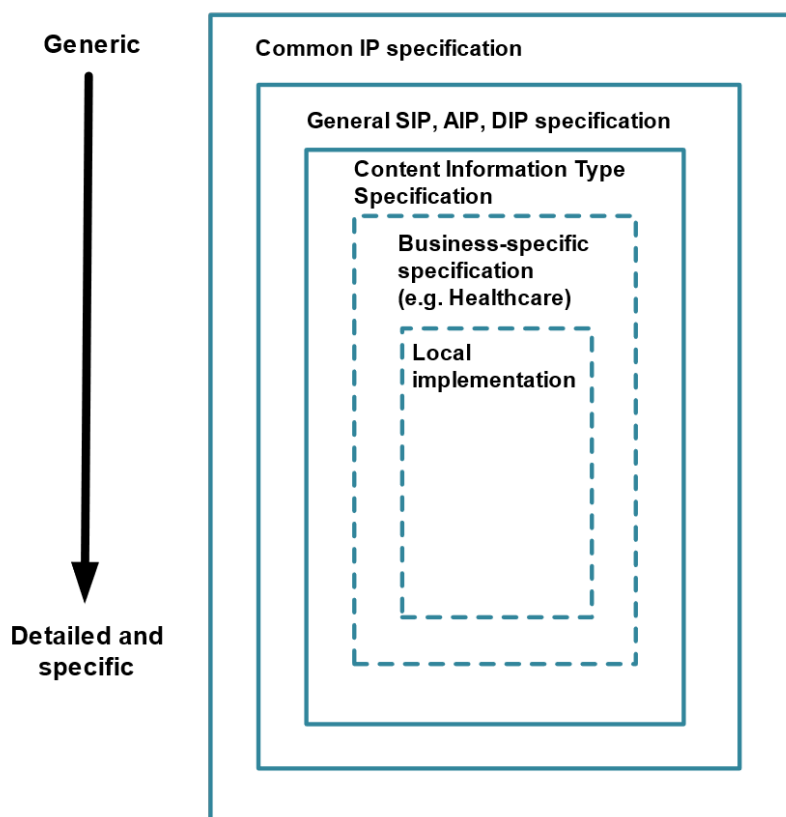


Figure 2: Data Model Structure

Every level in the data model structure inherits metadata entities and elements from the higher levels. In order to increase adoption, a flexible schema has been developed. This will allow for extension points where the schema in each layer can be extended to accommodate additional information on the next specific layer until, finally, the local implementation can add specific entities or metadata elements to satisfy specific local needs. Extension points can be implemented by:

- Embedding foreign extension schemas (in the same way as supported by METS [<http://www.loc.gov/standards/mets/>] and PREMIS [<http://www.loc.gov/standards/premis/>]). These both support increasing the granularity of existing metadata elements by using more detailed data structures as well as adding new types of metadata.
- Substituting metadata schemas for standards more appropriate for the local implementation.

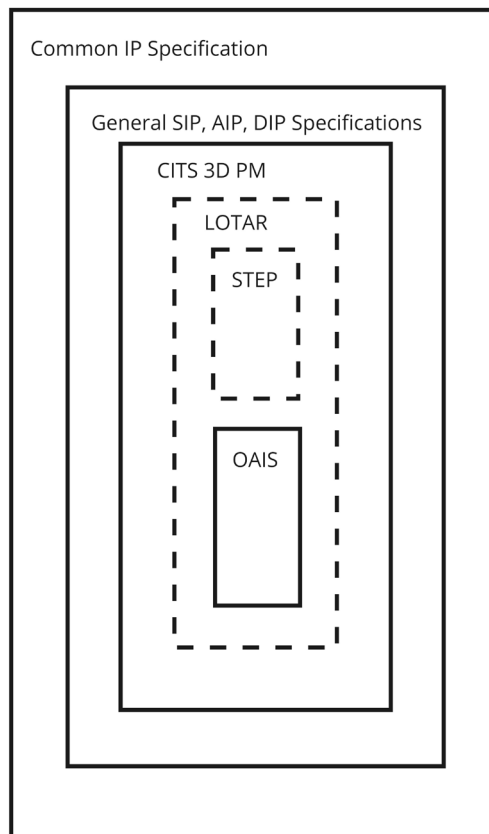
The structure allows the addition of more detailed requirements for metadata entities, for example, by:

- Increasing the granularity of metadata elements by using more detailed data structures, or
- Adding local controlled vocabularies.

For consistency, design principles are reused between layers as much as possible.

The CITS 3D PM builds on the existing LOTAR standard for “long-term archiving of digital technical product information” which in itself builds on the standard for an Open Archival Information System (OAIS, ISO 14721) and the Standard for the Exchange of Product Model Data (STEP, ISO 1303). So for CITS 3D PM in particular we have a layered data model as seen in Figure 3. Note however that compliance with LOTAR or STEP is not mandatory within 3D PM but is recommended. Individual organisational archiving strategies for 3D Product Model data may or may not include STEP representations of model data and may include all or some of the elements of the LOTAR standard. The 3D PM CITS provides for accommodation of these standards but makes compliance an organisational choice.

Figure 3: CITS 3D PM Layered Data Model



3 Specification

3.1 Requirements Structure

The Content Information Type Specification for 3D Product Model data aims to define the necessary elements required to preserve the accessibility and authenticity of 3D Product Model data over time and across changing technical environments. The specification builds on the international standard for long-term archiving of Product Model data (LOTAR) and facilitates conformance to the standard within an E-ARK packaging framework. In order to achieve this the specification elevates the level (and

adjusts the cardinality) of some of the requirements set out in the Common Specification (CSIP) and package specifications (namely SIP and AIP) and adds new requirements for the package structure, descriptive metadata, preservation metadata and accompanying METS files. It also introduces new requirements for authentication. The specification sets out general principals that underpin the specific requirements and further context for the requirements and principals can be found in the accompanying guideline to this document.

3.2 Principals

3.2.1 Principal – support for LOTAR conformance

The LOTAR “Long Term Archiving of digital technical product information” series is an international standard for the long term archiving of Product Model data (such as computer aided design CAD or product data model PDM data). LOTAR extensively references and extends ISO 14721 the “Open reference model for Archiving Information System”, (OAIS) but does not extend into areas detailed in the E-ARK common specification for information packages (CSIP). LOTAR also references and builds on ISO 10303, the Standard for the Exchange of Product Model data (STEP). This eArchiving 3D Product Model CITS creates a layered model for creating archival packages for Product Models that allows conformance to LOTAR and STEP whilst maintaining conformance with the CSIP and with the individual eArchiving package specifications (SIP, AIP and DIP). Specifically:

- no requirements in this specification should conflict with mandatory requirements of LOTAR;
- requirements of LOTAR with regard to essential data or metadata elements in Information Packages become optional should requirements in the 3D PM CITS;
- the scope of the E-ARK specifications are not altered to encompass areas covered by LOTAR but not covered by E-ARK, for example process requirements and management procedures.

A conformant E-ARK 3D PM Information Package will not imply conformance or validation against LOTAR, but an archive will be able to use the E-ARK 3D PM CITS together with the other E-ARK package specifications to produce Information Packages that support LOTAR compliance.

3.2.2 Principal – use of PREMIS

PREMIS can be usefully used to meet the requirements in LOTAR for the recording of Validation and Verification events, Digital Signatures, Rights and Digital Provenance Information). Neither CSIP or 3D PM CITS makes the use of PREMIS mandatory but guidance as to how it can be used to provide LOTAR conformance is provided by this CITS.

From the CSIP and PREMIS CITS:

- PREMIS should be used to record detailed technical metadata;
- Technical information should be included in PREMIS metadata by using extension schemas;
- Information about agents carrying out preservation actions must be recorded in the PREMIS metadata (this is because METS agents describe agents relevant for generic IP level events, such as the creation or submission of the package, not the preservation of the data);
- Event descriptions should be included in PREMIS metadata. Use of the official PREMIS event vocabulary (<https://id.loc.gov/vocabulary/preservation/eventType.html>) is recommended;

- Detailed rights information should be included in PREMIS. High-level rights information in METS indicates restrictions. Detailed, object-specific rights information will be included in the PREMIS metadata;
- File format information for all files should be included as Persistent Unique Identifier (PUID) values in the appropriate PREMIS semantic units.

Technical and preservation metadata in the context of the 3D PM CITS can include:

- Creating agent;
- Reference to the content information standard (e.g. STEP);
- Reference to the LOTAR standard part for the content information type;
- Information about the generating system.

Event descriptions in the context of 3D PM CITS can include:

- Creation events;
- Conversion or change events;
- Electronic Signature events;
- Verification events and results;
- Validation events and results.

Detailed technical metadata in the context of the 3D PM CITS include:

- File format, characterisation, checksums;
- Detailed part number, version, product model and issue information;
- Relationships for the digital object (is part of, contains parts).

Rights information in the context of 3D PM CITS can include:

- Access rights;
- Export controls;
- License restrictions;
- Copyright owner;
- Security classification;
- Personal identifiable information restrictions;
- Company specific classifications.

Use of PREMIS must conform to the requirements of the CITS Preservation Metadata.

3.3 Use Cases for Archiving of Product Model Data

Further detail of the use cases for long-term archiving of data in general and the rationales given in LOTAR specifically for Product Model data are given in the accompanying guideline. In summary, the use cases for archiving of Product Model data are determined to be:

1. To enable the submission of 3D Product Model data from engineering departments in an organisation to a centralised or distributed archive, in a common format;
2. To store archival 3D Product Model data in a manner that will allow consolidation of archives intra-organisationally or with sources added through mergers or acquisitions;
3. To allow dissemination of Preoduct Model archival data within the organisation or to external regulatory bodies preserving both the integrity of the data objects and the information packages.

4 Implementation

4.1 Package Structure

The CITS 3D Product Model information structure inherits its package structure from the E-ARK Common Specification for Information Packages and is shown in Figure 4. It can be seen that additional folders have been added for authentication documentation at root and representation level but otherwise the structure is identical.

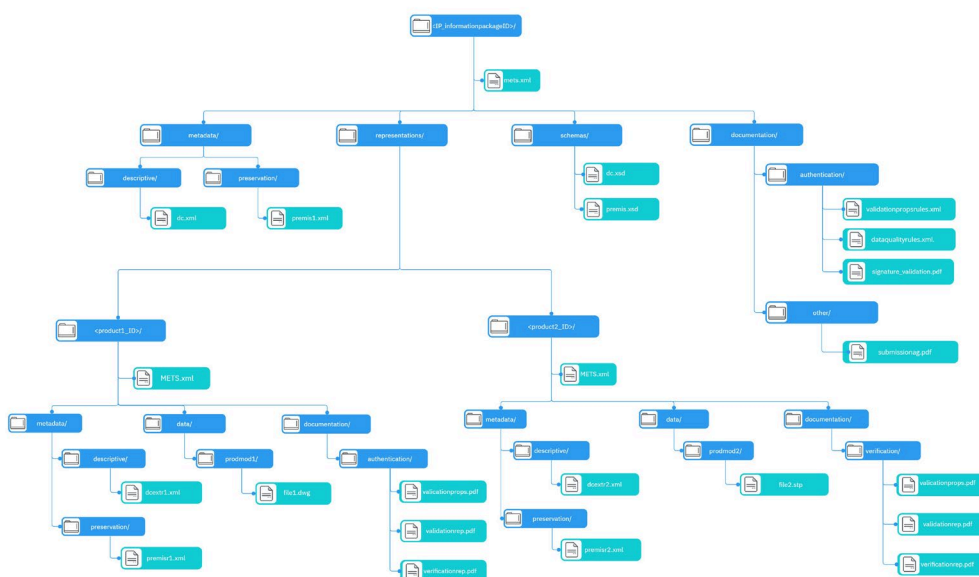


Figure 4: Example Information Package Folder Structure

A 3D Product Model Information package can consist of one to many representations comprising Product Information Models of the same product. It is likely for example that a Product Model archival package will at minimum contain a representation in Native Format and one in Standardised Open

Format (e.g. STEP). As described in LOTAR, long-term usability of proprietary Native Format data is a risk and conversely open derivations such as STEP are at risk of losing some properties from the original.

LOTAR requires the inclusion of information to support Validation and Verification of the data and representations, including:

- Validation Properties Rules Data
- Validation Properties
- Validation reports
- Data Quality Rules (Verification)
- Verification reports

Validation and Verification rules information relate to the package and their outputs (properties, reports) relate to each individual representation. Within CITS 3D PM, a sub-folder named Authentication is included at root and representation levels within the Documentation folders to store the respective information related to Validation and Verification.

It is strongly recommended that as much documentation as possible related to the production, context, provenance and terms of use of the Product Model is included in the information package such as for example: images, licence terms, project overviews, model creation information. 3D PM CITS recommends the inclusion of such information related to the Product Model in a documentation/other sub-folder and related to specific Product Information Models in representation/documentation/other sub-folders. LOTAR also requires the inclusion of a Submission Agreement in the information package that references the location of the references for Validation Properties Rules Data and Data Quality Rules (Verification) within Descriptive Information (metadata). The Submission Agreement should be located in the documentation/other sub-folder.

Specific requirements for the CITS 3D Product Model folder structure are as follows:

3DPM1: the package MUST have at least one representation in the Representations folder

3DPM2: the Documentation folder at package level and representation level SHOULD include a sub-folder named Authentication. This is an extension of CSIPSTR16.

3DPM3: the Documentation folder at package and representation level SHOULD include a sub-folder named Other. This is an extension of CSIPSTR16.

4.2 Metadata and Supporting Information

4.2.1 General Requirements

4.2.1.1 Descriptive Metadata

According to LOTAR:² “The producer creates a set of Descriptive Information (DI), which includes archive metadata meeting the archives requirements (according to ISO 14721:2003 – OAIS).”

² Val

Neither CSIP or LOTAR prescribe specific schemas for descriptive information and so this is left to be determined by the user organisation. According to CSIP this should be according to a standardised schema such as for example EAD, Dublin Core, MODS or a locally defined schema that must be included in the package.

LOTAR does require that Verification information (Quality Rules Data) is referenced from the DI. It is assumed that it would also be desirable that Validation information, i.e. Validation Properties rules data is also referenced. This specification does not specify where this information should be located in any respective standardised descriptive metadata schema and this will be an organisational decision. LOTAR does prescribe that the location of the information references is agreed in the Submission Agreement and for that to be true, a submission agreement should be present in the package. It also recommends that Verification and Validation supporting documentation as described below is included in the package and that Verification and Validation events are recorded within PREMIS.

4.2.1.2 Authentication

Validation

LOTAR requires that data selected for archiving undergoes Validation checks involving the generation of Validation properties from the archival data and checks that the data representations meet with the recommended data quality criteria (Validation Rules Properties Rules Data). Good archival practice dictates that we should not only include the results of those Validation checks but that Validation Properties Rules Data and Validation Properties should be included in the package. This specification also recommends that Validation events and results are recorded within preservation metadata (PREMIS).

3D PM4: the package Authentication sub-folder SHOULD contain Validation Rules Data files or documents.

3D PM5: each representation Authentication sub-folder SHOULD contain Validation results report files or documents.

Verification

LOTAR requires that each representation of the Product Model be verified using Data Quality Rules and that these documents are referenced from Descriptive Information (DI). The data Verification process is supported by the following documents:

- Data Quality Rules (Verification)
- Data Verification results report

Good archival practice states that we should not only include the reference to Verification results in Descriptive Metadata but should include the Data Quality Rules and the Verification reports within each Representation. This specification also recommends that Verification events and results are recorded with Preservation Metadata (PREMIS).

3DPM5: the package Authentication sub-folder SHOULD Data Quality Rules files or documents.

3DPM6: each Representation Authentication sub-folder SHOULD contain files or documents containing Verification results reports.

This specification does not detail the content or format of Validation and Verification information which may be specified within other standards such as LOTAR.

Digital Signatures

A Digital Signature is a defined method to sign an object in electronic environments; it provides means to authenticate the signatory and the signed object in an unambiguous and safe way by attaching to or logically associating data in digital form to other digital objects. In LOTAR it is defined by an encrypted hash code with additional information such as time of creation and owner of the signature.

LOTAR requires that a Digital Signature is provided on Ingest, i.e. production of AIPs from SIPs. Note that LOTAR also requires that signatures are ‘created using means that the signatory can maintain’, which may exclude the use of 3rd party certificate and time stamp providers.

3DPM7: Information Packages MAY contain Digital Signatures associated with Product Model Representations that are encoded within a Representation PREMIS file.

This specification recommends that any Digital Signature information be recorded within PREMIS (see Principle 5.2). PREMIS also requires that the operations to be performed for validating a Digital Signature are known. This can be by means of a canonicalized method, or if by a local method either documentation or a persistent link to archived documentation or a resource must be provided.

3DPM8: If Digital Signatures are provided then documentation MUST be included in the documentation/authentication folder or a persistent link provided to a resource.

4.2.1.3 Preservation Metadata

LOTAR requires that Information Packages include Preservation Description Information (PDI) which in turn comprises information related to:

- Provenance
- Reference
- Fixity
- Context

According to the CITS PREMIS: “When using preservation metadata together with the Common Specification for Information Packages (CSIP) (<http://earkcsip.dilcis.eu>), it is recommended that these are included in the information package in PREMIS format. Although this is not mandatory, all tools claiming to be able to validate CSIP compliant Information Packages may validate PREMIS metadata once it exists within the package. The two high-level requirements for the use of PREMIS in Common Specification IPs are that:

- All preservation metadata is created according to official PREMIS guidelines;
- All PREMIS metadata is referenced from the amdSec/digiprovMD element of the appropriate METS file.

It is recommended that users review the CITS PREMIS specification.

3D PM recommends the inclusion of PREMIS files at Representation level to include Authentication events, Provenance and Digital Signature information for Product Information Models and Content Objects respectively.

3DPM9: there SHOULD be a PREMIS file produced according to CITS PREMIS and the requirements of this CITS in the representation/metadata/preservation folder of each Representation of the Information Package.

4.2.1.4 Rights Metadata

From Principle 6.2 above detailed Rights information should be recorded within PREMIS and as such a PREMIS file should be included at package level to contain this.

3D PM10: there SHOULD be a PREMIS file produced according to CITS PREMIS and the requirements of this CITS in the metadata/preservation folder of the Information Package containing package rights information.

4.2.2 METS

4.2.2.1 Use of METS in CITS 3D PM

CSIP specifies that METS files be located at the root of the package folder structure (Root METS) and optionally in each of the Representations within its respective root folder (Representation METS). CITS 3D PM has a requirement to contain at least one Representation and so will contain at minimum a root METS and a Representation METS file.

4.2.2.2 Root METS File

The root METS file must adhere to the requirements of the CSIP and Information Package specifications. In addition, there are specific requirements for CITS 3D PM and in some cases, the level of the CSIP or package requirements have been increased (but never decreased).

Root METS root element

CITS 3D PM does not change or extend any of the requirements for the Root METS root element. Information is given below regarding the specific content type attributes to be used in CITS 3D PM.

Table 2: Root METS root element (element METS root)

ID	Name, Location and Description	Card & Level
3DPM11 Ref CSIP6	METS profile mets/@PROFILE The value is set to "https://cits3dpm.dilcis.eu/profile/E-ARK-3dpm-ROOT.xml"	1..1 MUST
3DPM12 Ref CSIP2	Content category mets/@TYPE The `mets/@TYPE` attribute is set to the value "OTHER"	1..1 MUST
3DPM13 Ref CSIP3	Other content category mets/@csip:OTHERTYPE The `mets/@csip:OTHERTYPE` attribute is set to the value "Product Model Data"	1..1 MUST
3DPM14 Ref CSIP4	Content information type specification mets/@csip:CONTENTINFORMATIONTYPE	1..1 MUST

The `mets/@csip:CONTENTINFORMATIONTYPE` attribute is set to the value "cits3dpm_v1_0"

See also: Vocabulary [Content information type specification](#)

Example 1 : Root METS Element Example (element METS root)

```
<mets:mets xsi:schemaLocation="http://www.loc.gov/METS/
http://www.loc.gov/standards/mets/mets.xsd http://www.w3.org/1999/xlink
http://www.loc.gov/standards/mets/xlink.xsd
https://DILCIS.eu/XML/METS/CSIPExtensionMETS
https://earkcsip.dilcis.eu/schema/DILCISExtensionMETS.xsd
https://DILCIS.eu/XML/METS/SIPExtensionMETS
https://earkcsip.dilcis.eu/schema/DILCISExtensionSIPMETS.xsd" OBJID="3dpm-
root-mets-example" TYPE="OTHER" csip:OTHERTYPE="Product Model Data"
csip:CONTENTINFORMATIONTYPE="cits3dpm_v1_0" LABEL="Product Model Data from
Landivisiau Engineering SARL" PROFILE="https://cits3dpm.dilcis.eu/profile/E-
ARK-3dpm-ROOT.xml" />
```

4.2.2.3 Root METS header element (element metsHdr)

The following describes the differences in the package metsHdr element between CSIP, IP and the CITS 3D PM specification.

Table 3: Root METS header section (element METS Header)

ID	Name, Location and Description	Card & Level
3DPM15	Submission Agreement mets/metsHdr/altRecordID	0..1
ref SIP5	There SHOULD be a reference to a Submission Agreement associated with the package. @TYPE is used with the value "SUBMISSIONAGREEMENT". Note: A machine-readable format is recommended for a better description of a submission agreement. For example, the submission agreement developed by Docuteam GmbH at: http://www.loc.gov/standards/mets/profiles/00000041.xml A reference code for the Submission Agreement MAY be included with @TYPE used with the value "REFERENCECODE" The Submission Agreement SHOULD contain information related to the location in representation descriptive metadata of references to Verification reports.	SHOULD

Example 2 : Root METS Header with Submission Agreements (element METS Header)

```
<mets:metsHdr CREATEDATE="2018-04-24T14:37:49.602+01:00" LASTMODDATE="2018-
04-24T14:37:49.602+01:00" RECORDSTATUS="NEW" csip:OAISPACKAGETYPE="SIP" >
<mets:agent ROLE="CREATOR" TYPE="OTHER" OTHERTYPE="SOFTWARE" >
<mets:name>product model sip software</mets:name>
<mets:note csip:NOTETYPE="SOFTWARE VERSION" >version 1.1</mets:note>
</mets:agent>
<mets:agent ROLE="CREATOR" TYPE="ORGANIZATION" >
<mets:name>Lanivisiau Engineering</mets:name>
<mets:note csip:NOTETYPE="IDENTIFICATIONCODE" >ID:89101112 </mets:note>
</mets:agent>
```



```

<mets:agent ROLE="OTHER" TYPE="INDIVIDUAL" OTHERROLE="SUBMITTER" >
<mets:name>Tanguy Mesguen</mets:name>
<mets:note>Phone: 33 6 12 34 56, Email:
tanguy.mesguen@landi.mail</mets:note>
</mets:agent>
<mets:agent ROLE="ARCHIVIST" TYPE="ORGANIZATION" >
<mets:name>Landivisiau Engineering</mets:name>
<mets:note csip:NOTETYPE="IDENTIFICATIONCODE" >ID:1234567</mets:note>
</mets:agent>
<mets:agent ROLE="PRESERVATION" TYPE="ORGANIZATION" >
<mets:name>Landivisiau Engineering</mets:name>
<mets:note csip:NOTETYPE="IDENTIFICATIONCODE" >ID:1234567</mets:note>
</mets:agent>
<mets:altRecordID TYPE="SUBMISSIONAGREEMENT"
>http://submissionagreement.le.fr/dnr331-1144-
2011/20120711/</mets:altRecordID>
<mets:altRecordID TYPE="PREVIOUSSUBMISSIONAGREEMENT" >FM 12-2387/12726,
2007-09-19</mets:altRecordID>
<mets:altRecordID TYPE="REFERENCECODE" >SE/RA/123456/24/P</mets:altRecordID>
<mets:altRecordID TYPE="PREVIOUSREFERENCECODE"
>SE/FM/123/123.1/123.1.3</mets:altRecordID>
</mets:metsHdr>

```

4.2.2.4 Root METS descriptive metadata section (element dmdSec)

According to LOTAR³: “the producer creates a set of Descriptive Information (DI), which includes archive metadata meeting the archives requirements (according to ISO 14721:2003 – OAIS).” Neither CSIP or LOTAR make any assumptions regarding the use of specific descriptive metadata schemas and so this is left to the user organisation with a recommendation to use standardised or defined schemas.

There are no specific requirements in CITS 3D PM for the root METS descriptive metadata section.

Example 3 : Root METS Descriptive Metadata section (element dmdSec)

```

<mets:dmdSec ID="dmd-ead-file" CREATED="2024-04-24T15:27:45.702+01:00"
STATUS="CURRENT" >
<mets:mdRef LOCTYPE="URL" xlink:href="metadata/descriptive/ead.xml"
xlink:type="simple" MDTYPE="EAD" MIMETYPE="application/xml" SIZE="643"
CREATED="2024-04-24T14:11:29.309+01:00"
CHECKSUM="66EEDDF0A22EF57078694B67CA45DF301034556D6CB493531356C4FFE92AB6B1"
CHECKSUMTYPE="SHA-256" />
</mets:dmdSec>

```

4.2.2.5 Root METS administrative metadata section (element amdSec)

The administrative metadata section contains four sub-sections each used to record different types of metadata for package content: technical metadata (element techMD) records technical metadata; rights metadata (element rightsMD) records intellectual property rights information; source metadata (element sourceMD) records descriptive technical or rights metadata for an analogue source for a digital object; and digital provenance metadata (element digiprovMD) records digital preservation information, e.g. audit information for an object’s lifecycle.

³ EN 9300 Part 0011, 6.8

The CSIP (and METS) categorise preservation metadata as administrative metadata, specifically digital provenance metadata (following the available guidelines published by the Library of Congress): <http://www.loc.gov/standards/premis/guidelines2017-premismets.pdf>) and hence all preservation metadata should be referenced from a digiprovMD element within the amdSec.

As detailed Rights information is required by LOTAR for the package then CITS 3D PM recommends the inclusion of a PREMIS file in the metadata/preservation folder containing detailed Rights information as described in 10.3.2 and any digital provenance metadata as described in the CITS Preservation Metadata.

Example 4 : Root METS Administrative Metadata section (element dmdSec)

```
<mets:amdSec>
<mets:digiprovMD ID="digiprov-premis-file1" CREATED="2018-04-
24T15:27:45.702+01:00" STATUS="CURRENT" >
<mets:mdRef LOCTYPE="URL" xlink:href="metadata/preservation/premis1.xml"
xlink:type="simple" MDTYPE="PREMIS" MIMETYPE="application/xml" SIZE="1211"
CREATED="2024-04-24T14:11:29.309+01:00"
CHECKSUM="8aa278038dbad54bbf142e7d72b493e2598a94946ea1304dc82a79c6b4bac3d5 "
CHECKSUMTYPE="SHA-256" />
</mets:digiprovMD>
<mets:rightsMD ID="rights-premis-file1" STATUS="CURRENT" >
<mets:mdRef LOCTYPE="URL" xlink:href="metadata/preservation/premis2.xml"
xlink:type="simple" MDTYPE="PREMIS" MIMETYPE="application/xml" SIZE="563"
CREATED="2024-04-24T14:11:29.309+01:00"
CHECKSUM="66EEDDF0A22EF57078694B67CA45DF301034556D6CB493531356C4FFE92AB6B1"
CHECKSUMTYPE="SHA-256" />
</mets:rightsMD>
<mets:rightsMD ID="rights-premis-file2" STATUS="CURRENT" >
<mets:mdRef LOCTYPE="URL" xlink:href="metadata/preservation/premis3.xml"
xlink:type="simple" MDTYPE="PREMIS" MIMETYPE="application/xml" SIZE="645"
CREATED="2024-04-24T14:11:29.309+01:00"
CHECKSUM="66EEDDF0A22EF57078694B67CA45DF301034556D6CB493531356C4FFE92AB6B1"
CHECKSUMTYPE="SHA-256" />
</mets:rightsMD>
</mets:amdSec>
```

4.2.2.6 Root METS file metadata section (element fileSec)

The CSIP does not make use of the METS fileSec element mandatory, but it is strongly recommended. In the 3D PM CITS the use of the METS fileSec element at the package level becomes mandatory, such as to reference the METS files within each representation.

Table 4: Root METS file metadata section (element fileSec)

ID	Name, Location and Description	Card & Level
3DPM16	File section	1..1
ref CSIP58	mets/fileSec The transferred content is placed in representation folders and described by representation METS documents referenced from the	MUST

	Root METS file section. Only a single root file section <fileSec> element MUST be present.	
3DPM17	Reference to administrative metadata	1..1
ref CSIP61	<p>mets/fileSec/fileGrp/@ADMID</p> <p>If administrative metadata has been provided at file group level this attribute MUST refer to its administrative metadata section by ID.</p> <p>For example, if there are rights and/or digital provenance metadata that are general to the package.</p>	MUST
3DPM18	Content information type specification	1..1
ref CSIP62	<p>mets/fileSec/fileGrp/@csip:CONTENTINFORMATIONTYPE</p> <p>The value of the attribute `mets/fileSec/fileGrp/@csip:CONTENTINFORMATIONTYPE` is set to "cits3dpm_v1_0".</p> <p>See also: Vocabulary Content information type specification</p>	MUST

Example 5 : Root METS File Section (element fileSec)

```

<mets:fileSec ID="filesec-example" >
<mets:fileGrp ID="filegrp-documentation-authentication" USE="Documentation"
>
<mets:file ID="file-data-quality-rules"
MIMETYPE="application/vnd.openxmlformats-
officedocument.wordprocessing.document" SIZE="43445212" CREATED="2023-08-
15T12:08:15.432+01:00"
CHECKSUM="160D71F56C2CE685CE7FBD679076FD76B3C67EE9AB5062F5EF5C99AE39C1F43B"
CHECKSUMTYPE="SHA-256" ADMID="digiprov-premis-file1" >
<mets:FLocat LOCTYPE="URL" xlink:type="simple"
xlink:href="documentation/authentication/dataquality1.docx" />
</mets:file>
<mets:file ID="file-documentation-validation-properties-rules-data"
MIMETYPE="application/vnd.openxmlformats-
officedocument.wordprocessingml.document" SIZE="31462826" CREATED="2023-08-
15T14:44:45.432+01:00"
CHECKSUM="0FE9683451D0390BCDEF19CE10CFD287A2D944B6A33D246681FEF27F44FFAF1D"
CHECKSUMTYPE="SHA-256" ADMID="digiprov-premis-file1" >
<mets:FLocat LOCTYPE="URL" xlink:type="simple"
xlink:href="documentation/authentication/valpropsrulesdata1.docx" />
</mets:file>
</mets:fileGrp>
<mets:fileGrp ID="filegrp-documentation-other" USE="Documentation" >
<mets:file ID="file-submission-agreement" MIMETYPE="application/pdf"
SIZE="21464778" CREATED="2024-08-15T12:08:15.432+01:00"
CHECKSUM="0FE9683451D0390BCDEF19CE10CFD287A2D944B6A33D246681FEF27F44FFAF1D"
CHECKSUMTYPE="SHA-256" ADMID="digiprov-premis-file1" >
<mets:FLocat LOCTYPE="URL" xlink:type="simple"
xlink:href="documentation/other/subagreement.pdf" />
</mets:file>
<mets:file ID="file-electronic-signature-validation"
MIMETYPE="application/pdf" SIZE="3162826" CREATED="2024-08-
15T14:44:45.432+01:00"

```

```

CHECKSUM="160D71F56C2CE685CE7FBD679076FD76B3C67EE9AB5062F5EF5C99AE39C1F43B"
CHECKSUMTYPE="SHA-256" ADMID="digiprov-premis-file1" >
<mets:FLocat LOCTYPE="URL" xlink:type="simple"
xlink:href="documentation/other/signaturevalidation.pdf" />
</mets:file>
</mets:fileGrp>
<mets:fileGrp ID="filegrp-schemas" USE="Schemas" >
<mets:file ID="file-ptr-schemal" MIMETYPE="text/xsd" SIZE="123917"
CREATED="2021-04-24T14:37:49.617+01:00"
CHECKSUM="4073D09CA1BAE023D5A7E2010819BF0E8A8EB3C015444D0673733630DE08461C"
CHECKSUMTYPE="SHA-256" ADMID="digiprov-premis-file1" >
<mets:FLocat LOCTYPE="URL" xlink:type="simple" xlink:href="schemas/ead.xsd"
/>
</mets:file>
<mets:file ID="file-ptr-schema2" MIMETYPE="application/xml" SIZE="6814"
CREATED="2015-12-04T09:59:45"
CHECKSUM="B565CA93CD86950503F233A7906E4DB709088BA42B9D109D4A8D6F183799603F"
CHECKSUMTYPE="SHA-256" ADMID="digiprov-premis-file1" >
<mets:FLocat xlink:href="schemas/METS.xsd" xlink:type="simple" LOCTYPE="URL"
/>
</mets:file>
</mets:fileGrp>
<mets:fileGrp ID="filegrp-representation-original-product-model"
USE="representations/original-product-model" ADMID="digiprov-pm-file1 rights-
pm-file1" DMDID="dmd-ead-file" csip:CONTENTINFORMATIONTYPE="cits3dpm_v1_0" >
<mets:file ID="file-ptr-repmets1" MIMETYPE="xml" SIZE="1338744"
CREATED="2024-04-24T14:33:23.617+01:00"
CHECKSUM="B1CF59678A21C2805370536AB1097735D7E9F3FDDDCAE3757426ED85F6350A48"
CHECKSUMTYPE="SHA-256" >
<mets:FLocat LOCTYPE="URL" xlink:type="simple"
xlink:href="representations/original-product-model/mets.xml" />
</mets:file>
</mets:fileGrp>
<mets:fileGrp ID="filegrp-representation-step-model"
USE="representations/step-product-model" ADMID="digiprov-pm-file1 rights-pm-
file2" DMDID="dmd-ead-file" csip:CONTENTINFORMATIONTYPE="cits3dpm_v1_0" >
<mets:file ID="file-ptr-repmets2" MIMETYPE="xml" SIZE="1338744"
CREATED="2018-04-24T14:33:23.617+01:00"
CHECKSUM="B1CF59678A21C2805370536AB1097735D7E9F3FDDDCAE3757426ED85F6350A48"
CHECKSUMTYPE="SHA-256" >
<mets:FLocat LOCTYPE="URL" xlink:type="simple"
xlink:href="representations/step-product-model/mets.xml" />
</mets:file>
</mets:fileGrp>
</mets:fileSec>

```

4.2.2.7 Root METS structural map (element structMap)

The METS structural map element is the only mandatory element in the METS specification. It provides an overview of the components described in the METS document. It can also link the elements in the structure to associated content files and metadata. In CITS 3D PM the package structMap describes the high-level structure of all the content in the package and links to at least one Representation. To allow for the inclusion of multiple Product Model Representations in each package, the CITS 3D PM specification requires that each Product Model has a discrete div element.

The Representation METS.xml is referenced from the package METS.xml via the <mptr> element, and hence the requirements for the structMap element within the package METS.xml (CSIP requirements

CSIP80 to CSIP118) are unchanged. Because a Representation is present, the need for a Content Division in the package METS.xml structMap is not required (CSIP101 to CSIP105).

The structural map should reference the documentation/authentication file group located in the documentation/authentication sub-folder by means of a separate div element.

The structural map should reference the documentation/other file group located in the documentation/other sub-folder by means of a separate div element.

Implementers are welcome to define additional structural maps for their internal purposes by repeating the structMap element. The specific requirements for elements, sub-elements and attributes for 3D PM CITS, which differ from the CSIP, are listed in the following table.

Table 5: Root METS structural map (element structMap)

ID	Name, Location and Description	Card & Level
3DPM19	Authentication documentation division mets/structMap[@LABEL='CSIP']/div/div/div[@LABEL='Authentication Documentation'] Authentication documentation referenced in the file section is described in the structural map with three sub-divisions.	1..1 SHOULD
3DPM20	Authentication documentation division identifier mets/structMap[@LABEL='CSIP']/div/div/div@LABEL='Authentication Documentation'/@ID Mandatory, xml:id identifier must be unique within the package.	1..1 MUST
3DPM21	Authentication documentation division label mets/structMap[@LABEL='CSIP']/div/div/div@LABEL='Authentication Documentation' The 'Authentication Documentation' division <div> element in the package uses the value 'Authentication Documentation' from the vocabulary as the value for the @LABEL attribute.	1..1 MUST
3DPM22	Authentication documentation file references mets/structMap[@LABEL='CSIP']/div/div/div[@LABEL='Authentication Documentation']/fptr File groups containing 'Authentication Documentation' are referenced via relevant file group identifiers.	1..n MUST
3DPM23	Authentication documentation file group reference pointer mets/structMap[@LABEL='CSIP']/div/div/div[@LABEL='Authentication Documentation']/fptr/file@ID A reference by ID, to 'Authentication Documentation' file groups.	1..1 MUST
3DPM24	Other documentation division mets/structMap[@LABEL='CSIP']/div/div/div[@LABEL='Other Documentation'] Other documentation referenced in the file section is described in the structural map with three sub-divisions.	1..1 SHOULD
3DPM25	Other documentation division identifier mets/structMap[@LABEL='CSIP']/div/div/div@LABEL='Other Documentation'/@ID Mandatory, xml:id identifier must be unique within the package.	1..1 MUST
3DPM26	Other documentation division label	1..1

	<p>mets/structMap[@LABEL='CSIP']/div/div/div[@LABEL='Other Documentation']</p> <p>The 'Other Documentation' division <div> element in the package uses the value 'Other Documentation' from the vocabulary as the value for the @LABEL attribute.</p>	MUST
3DPM27	<p>Other documentation file references</p> <p>mets/structMap[@LABEL='CSIP']/div/div/div[@LABEL='Other Documentation']/fptr</p> <p>File groups containing 'Other Documentation' are referenced via a relevant file group identifiers.</p>	<p>1..n</p> <p>MUST</p>
3DPM28	<p>Other documentation file group reference pointer</p> <p>mets/structMap[@LABEL='CSIP']/div/div/div[@LABEL='Other Documentation']/fptr/file@ID</p> <p>A reference, by ID, to 'Other Documentation' file groups.</p>	<p>1..1</p> <p>MUST</p>
3DPM29	<p>Representation division</p> <p>mets/structMap[@LABEL='CSIP']/div/div</p>	1..n
Ref CSIP105	<p>There must be a discrete `div` element for each representation of the Product Model.</p>	MUST

Example 6: Root Structural Map (element structMap)

4.2.2.8 Root METS file example

Example 7 shows an example of a whole METS document describing a submission information package following CITS 3D PM.

```
<mets:structMap ID="struct-map-example" TYPE="PHYSICAL" LABEL="CSIP" >
<mets:div ID="struct-map-example-div" LABEL="cits-3dpm-example" >
<mets:div ID="struct-map-metadata-div" LABEL="Metadata" DMDID="dmd-ead-file"
ADMD="digiprov-premis-file1 rights-premis-file1 rights-premis-file1" />
<mets:div ID="struct-map-documentation-div" LABEL="Documentation" >
<mets:div ID="structmap-documentation-authentication-div"
LABEL="Documentation" >
<mets:fileptr FILEID="filegrp-documentation-authentication" />
</mets:div>
<mets:div ID="structmap-documentation-other-div" LABEL="Documentation" >
<mets:fileptr FILEID="filegrp-documentation-other" />
</mets:div>
</mets:div>
<mets:div ID="struct-map-schemas-div" LABEL="Schemas" >
<mets:fptr FILEID="filegrp-schemas" />
</mets:div>
<mets:div ID="struct-map-reps-sub-div1" LABEL="Representations/original-
product-model" >
<mets:mptr LOCTYPE="URL" xlink:type="simple"
xlink:href="representations/original-product-model/METS.xml"
xlink:title="file-grp-rep-original-product-model" />
</mets:div>
<mets:div ID="struct-map-reps-sub-div2" LABEL="Representations/derived-
product-model" >
<mets:mptr LOCTYPE="URL" xlink:type="simple"
xlink:href="representations/derived-product-model/METS.xml"
xlink:title="file-grp-rep-derived-product-model" />
</mets:div>
</mets:div>
</mets:structMap>
```

Example 7 : Whole root METS

```

<mets:mets xsi:schemaLocation="http://www.loc.gov/METS/
http://www.loc.gov/standards/mets/mets.xsd http://www.w3.org/1999/xlink
http://www.loc.gov/standards/mets/xlink.xsd
https://DILCIS.eu/XML/METS/CSIPEExtensionMETS
https://earksip.dilcis.eu/schema/DILCISEExtensionMETS.xsd
https://DILCIS.eu/XML/METS/SIPEExtensionMETS
https://earksip.dilcis.eu/schema/DILCISEExtensionSIPMETS.xsd"
OBJID="Product_Model_Package" TYPE="OTHER" csip:OTHERTYPE="Product Model
Data" csip:CONTENTINFORMATIONTYPE="cits3dpm_v1_0" LABEL="Product Model Data
from Landivisiau Engineering SARL"
PROFILE="https://cits3dpm.dilcis.eu/profile/E-ARK-eHealth1-ROOT.xml" />
<mets:metsHdr CREATEDATE="2024-04-24T14:37:49.602+01:00" LASTMODDATE="2024-
04-24T14:37:49.602+01:00" RECORDSTATUS="NEW" csip:OAISPACKAGETYPE="SIP" >
<mets:altRecordID TYPE="SUBMISSIONAGREEMENT"
>http://submissionagreement.le.fr/dnr331-1144-
2011/20120711/</mets:altRecordID>
<mets:altRecordID TYPE="PREVIOUSSUBMISSIONAGREEMENT"
>http://submissionagreement.le.fr/dnr330-1122-
2009/20110613/</mets:altRecordID>
<mets:altRecordID TYPE="REFERENCECODE" >SE/RA/123456/24/P</mets:altRecordID>
<mets:altRecordID TYPE="PREVIOUSREFERENCECODE"
>SE/FM/123/123.1/123.1.3</mets:altRecordID>
<mets:agent ROLE="CREATOR" TYPE="OTHER" OTHERTYPE="SOFTWARE" >
<mets:name>product model sip software</mets:name>
<mets:note csip:NOTETYPE="SOFTWARE VERSION" >version 1.1</mets:note>
</mets:agent>
<mets:agent ROLE="CREATOR" TYPE="ORGANIZATION" >
<mets:name>Lanivisiau Engineering</mets:name>
<mets:note csip:NOTETYPE="IDENTIFICATIONCODE" >ID:89101112 </mets:note>
</mets:agent>
<mets:agent ROLE="CREATOR" TYPE="INDIVIDUAL" >
<mets:name>Tanguy Mesguen</mets:name>
<mets:note>Phone: 33 6 12 34 56, Email:
tanguy.mesguen@landi.mail</mets:note>
</mets:agent>
<mets:agent ROLE="PRESERVATION" TYPE="ORGANIZATION" >
<mets:name>Landivisiau Engineering</mets:name>
<mets:note csip:NOTETYPE="IDENTIFICATIONCODE" >ID:1234567</mets:note>
</mets:agent>
</mets:metsHdr>
<mets:dmdSec ID="dmd-ead-file1" CREATED="2024-04-24T15:27:45.702+01:00"
STATUS="CURRENT" >
<mets:mdRef LOCTYPE="URL" xlink:href="metadata/descriptive/ead1.xml"
xlink:type="simple" MDTYPE="EAD" MIMETYPE="application/xml" SIZE="643"
CREATED="2024-04-24T14:11:29.309+01:00"
CHECKSUM="66EEDDF0A22EF57078694B67CA45DF301034556D6CB493531356C4FFE92AB6B1"
CHECKSUMTYPE="SHA-256" />
</mets:dmdSec>
<mets:amdSec>
<mets:digiprovMD ID="digiprov-premis-file1" CREATED="2024-04-
24T15:27:45.702+01:00" STATUS="CURRENT" >
<mets:mdRef LOCTYPE="URL" xlink:href="metadata/preservation/premis1.xml"
xlink:type="simple" MDTYPE="PREMIS" MIMETYPE="application/xml" SIZE="1211"
CREATED="2024-04-24T14:11:29.309+01:00"
CHECKSUM="8aa278038dbad54bbf142e7d72b493e2598a94946ea1304dc82a79c6b4bac3d5"
CHECKSUMTYPE="SHA-256" />
</mets:digiprovMD>
<mets:rightsMD ID="rights-premis-file1" STATUS="CURRENT" >

```



```
<mets:mdRef LOCTYPE="URL" xlink:href="metadata/preservation/premis2.xml"
xlink:type="simple" MDTYPE="PREMIS" MIMETYPE="application/xml" SIZE="563"
CREATED="2024-04-24T14:11:29.309+01:00"
CHECKSUM="66EEDDF0A22EF57078694B67CA45DF301034556D6CB493531356C4FFE92AB6B1"
CHECKSUMTYPE="SHA-256" />
</mets:rightsMD>
<mets:rightsMD ID="rights-premis-file2" STATUS="CURRENT" >
<mets:mdRef LOCTYPE="URL" xlink:href="metadata/preservation/premis3.xml"
xlink:type="simple" MDTYPE="PREMIS" MIMETYPE="application/xml" SIZE="645"
CREATED="2024-04-24T14:11:29.309+01:00"
CHECKSUM="66EEDDF0A22EF57078694B67CA45DF301034556D6CB493531356C4FFE92AB6B1"
CHECKSUMTYPE="SHA-256" />
</mets:rightsMD>
</mets:amdSec>
<mets:fileSec ID="filesec-example" >
<mets:fileGrp ID="filegrp-documentation-authentication" USE="Documentation"
>
<mets:file ID="file-data-quality-rules"
MIMETYPE="application/vnd.openxmlformats-
officedocument.wordprocessing.document" SIZE="43445212" CREATED="2023-08-
15T12:08:15.432+01:00"
CHECKSUM="160D71F56C2CE685CE7FBD679076FD76B3C67EE9AB5062F5EF5C99AE39C1F43B"
CHECKSUMTYPE="SHA-256" ADMID="digiprov-premis-file1" >
<mets:FLocat LOCTYPE="URL" xlink:type="simple"
xlink:href="documentation/authentication/dataquality1.docx" />
</mets:file>
<mets:file ID="file-documentation-validation-properties-rules-data"
MIMETYPE="application/vnd.openxmlformats-
officedocument.wordprocessingml.document" SIZE="31462826" CREATED="2023-08-
15T14:44:45.432+01:00"
CHECKSUM="0FE9683451D0390BCDEF19CE10CFD287A2D944B6A33D246681FEF27F44FFAF1D"
CHECKSUMTYPE="SHA-256" ADMID="digiprov-premis-file1" >
<mets:FLocat LOCTYPE="URL" xlink:type="simple"
xlink:href="documentation/authentication/valproprulesdata1.docx" />
</mets:file>
</mets:fileGrp>
<mets:fileGrp ID="filegrp-documentation-other" USE="Documentation" >
<mets:file ID="file-submission-agreement" MIMETYPE="application/pdf"
SIZE="21464778" CREATED="2024-08-15T12:08:15.432+01:00"
CHECKSUM="0FE9683451D0390BCDEF19CE10CFD287A2D944B6A33D246681FEF27F44FFAF1D"
CHECKSUMTYPE="SHA-256" ADMID="digiprov-premis-file1" >
<mets:FLocat LOCTYPE="URL" xlink:type="simple"
xlink:href="documentation/other/subagreement.pdf" />
</mets:file>
<mets:file ID="file-electronic-signature-validation"
MIMETYPE="application/pdf" SIZE="3162826" CREATED="2024-08-
15T14:44:45.432+01:00"
CHECKSUM="160D71F56C2CE685CE7FBD679076FD76B3C67EE9AB5062F5EF5C99AE39C1F43B"
CHECKSUMTYPE="SHA-256" ADMID="digiprov-premis-file1" >
<mets:FLocat LOCTYPE="URL" xlink:type="simple"
xlink:href="documentation/other/signaturevalidation.pdf" />
</mets:file>
</mets:fileGrp>
<mets:fileGrp ID="filegrp-schemas" USE="Schemas" >
<mets:file ID="file-ptr-schemal" MIMETYPE="text/xsd" SIZE="123917"
CREATED="2021-04-24T14:37:49.617+01:00"
CHECKSUM="4073D09CA1BAE023D5A7E2010819BF0E8A8EB3C015444D0673733630DE08461C"
CHECKSUMTYPE="SHA-256" ADMID="digiprov-premis-file1" >
<mets:FLocat LOCTYPE="URL" xlink:type="simple" xlink:href="schemas/ead.xsd"
/>
</mets:file>
```



```
<mets:file ID="file-ptr-schema2" MIMETYPE="application/xml" SIZE="6814"
CREATED="2015-12-04T09:59:45"
CHECKSUM="B565CA93CD86950503F233A7906E4DB709088BA42B9D109D4A8D6F183799603F"
CHECKSUMTYPE="SHA-256" ADMID="digiprov-premis-file1" >
<mets:FLocat xlink:href="schemas/METS.xsd" xlink:type="simple" LOCTYPE="URL"
/>
</mets:file>
</mets:fileGrp>
<mets:fileGrp ID="filegrp-representation-original-product-model"
USE="representations/original-product-model" ADMID="digiprov-pm-file1 rights-
pm-file1" DMDID="dmd-ead-file" csip:CONTENTINFORMATIONTYPE="cits3dpm_v1_0" >
<mets:file ID="file-ptr-repmets1" MIMETYPE="xml" SIZE="1338744"
CREATED="2024-04-24T14:33:23.617+01:00"
CHECKSUM="B1CF59678A21C2805370536AB1097735D7E9F3FDDDCAE3757426ED85F6350A48"
CHECKSUMTYPE="SHA-256" >
<mets:FLocat LOCTYPE="URL" xlink:type="simple"
xlink:href="representations/original-product-model/mets.xml" />
</mets:file>
</mets:fileGrp>
<mets:fileGrp ID="filegrp-representation-step-model"
USE="representations/step-product-model" ADMID="digiprov-pm-file1 rights-pm-
file2" DMDID="dmd-ead-file" csip:CONTENTINFORMATIONTYPE="cits3dpm_v1_0" >
<mets:file ID="file-ptr-repmets2" MIMETYPE="xml" SIZE="1338744"
CREATED="2018-04-24T14:33:23.617+01:00"
CHECKSUM="B1CF59678A21C2805370536AB1097735D7E9F3FDDDCAE3757426ED85F6350A48"
CHECKSUMTYPE="SHA-256" >
<mets:FLocat LOCTYPE="URL" xlink:type="simple"
xlink:href="representations/step-product-model/mets.xml" />
</mets:file>
</mets:fileGrp>
</mets:fileSec>
<mets:structMap ID="struct-map-product-model-root" TYPE="PHYSICAL"
LABEL="CSIP" >
<mets:div ID="struct-map-example-div" LABEL="cits-3dpm-example" >
<mets:div ID="struct-map-metadata-div" LABEL="Metadata" DMDID="dmd-ead-file"
ADMID="digiprov-premis-file1 rights-premis-file1 rights-premis-file1" />
<mets:div ID="struct-map-documentation-div" LABEL="Documentation" >
<mets:div ID="structmap-documentation-authentication-div"
LABEL="Documentation" >
<mets:fileptr FILEID="filegrp-documentation-authentication" />
</mets:div>
<mets:div ID="structmap-documentation-other-div" LABEL="Documentation" >
<mets:fileptr FILEID="filegrp-documentation-other" />
</mets:div>
</mets:div>
<mets:div ID="struct-map-schemas-div" LABEL="Schemas" >
<mets:fptra FILEID="filegrp-schemas" />
</mets:div>
<mets:div ID="struct-map-reps-sub-div1" LABEL="Representations/original-
product-model" >
<mets:mpttra LOCTYPE="URL" xlink:type="simple"
xlink:href="representations/original-product-model/METS.xml"
xlink:title="file-grp-rep-original-product-model" />
</mets:div>
<mets:div ID="struct-map-reps-sub-div2" LABEL="Representations/derived-
product-model" >
<mets:mpttra LOCTYPE="URL" xlink:type="simple"
xlink:href="representations/derived-product-model/METS.xml"
xlink:title="file-grp-rep-derived-product-model" />
</mets:div>
</mets:div>
```

```
</mets:structMap>
</mets:mets>
```

4.2.2.9 Representation METS Files

The Representation METS files are used to describe the data structure as included in the data folder of each Representation (Product Model representations) via the structMap element and to reference additional descriptive and preservation metadata.

4.2.2.10 Representation METS root element

CITS 3D PM does not change or extend any of the requirements for the Representation root element but particular notice is drawn to the specific requirements of a Representation METS root element and the specific content type attributes to be used in CITS 3D PM.

Table 6: Representation METS root element (element METs root)

ID	Name, Location and Description	Card & Level
3DPM30	Representation identifier mets/@OBJID The mets/@OBJID attribute is mandatory. Its value is a string identifier for the METS document. For a representation level METS document, this value records the name of the representation (i.e. the name of the top level representation folder)	1..1 MUST
3DPM31 Ref CSIP2	Content category mets/@TYPE The `mets/@TYPE` attribute is set to the value "OTHER"	1..1 MUST
3DPM32 Ref CSIP3	Other content category mets/@csip:OTHERTYPE The `mets/@csip:OTHERTYPE` attribute is set to the value "Product Model Data"	1..1 MUST
3DPM33 Ref CSIP 4	Content information type specification mets/@csip:CONTENTINFORMATIONTYPE The `mets/@csip:CONTENTINFORMATIONTYPE` attribute is set to the value "cits3dpm_v1_0" See also: Vocabulary Content information type specification	1..1 MUST
3DPM34 Ref CSIP6	METS profile mets/@PROFILE The value is set to "https://cits3dpm.dilcis.eu/profile/E-ARK-3D PM-REP.xml"	1..1 MUST

Example 7: Representation METS Root Element (element METS root)

```
<mets:mets OBJID="Product Model Representation" TYPE="OTHER"
csip:OTHERTYPE="Product Model Data"
csip:CONTENTINFORMATIONTYPE="cits3dpm_v1_0 "
PROFILE="https://cits3dpm.dilcis.eu/profile/E-ARK-3dpm-REP.xml"
xsi:schemaLocation="http://www.loc.gov/METS/
http://www.loc.gov/standards/mets/mets.xsd http://www.w3.org/1999/xlink
http://www.loc.gov/standards/mets/xlink.xsd
https://DILCIS.eu/XML/METS/CSIPExtensionMETS
https://earkcsip.dilcis.eu/schema/DILCISExtensionMETS.xsd
https://DILCIS.eu/XML/METS/SIPEExtensionMETS
https://earkcsip.dilcis.eu/schema/DILCISExtensionSIPMETS.xsd" />
```

4.2.2.11 Representation METS header element (element metsHdr)

There are no specific requirements for the header element in a CITS 3D PM Representation METS. The 3D PM Representation metsHdr element should comply with the metsHdr requirements in the appropriate Information Package profile and can be used to identify specific agents related to a Product Model Representation.

Representation METS descriptive metadata section (element dmdSec)

There are no specific requirements in CITS 3D PM for the Representation METS Descriptive Metadata section.

Representation METS administrative metadata section (element amdSec)

The Administrative Metadata section contains four sub-sections each used to record different types of metadata for package content: technical metadata (element techMD) records technical metadata; rights metadata (element rightsMD) records intellectual property rights information; source metadata (element sourceMD) records descriptive technical or rights metadata for an analogue source for a digital object; and digital provenance metadata (element digiprovMD) records digital preservation information, e.g. audit information for an object's lifecycle.

The CSIP (and METS) categorise preservation metadata as Administrative Metadata, specifically digital provenance metadata (following the available guidelines published by the Library of Congress): <http://www.loc.gov/standards/premis/guidelines2017-premismets.pdf> and hence all preservation metadata should be referenced from a digiprovMD element within the amdSec.

As detailed provenance, authentication and technical metadata is required by LOTAR for each Product Information Model then CITS 3D PM strongly recommends the inclusion of a PREMIS file in the representation/metadata/preservation folder containing detailed metadata for: Verification events, Validation events, Digital Signatures and digital provenance information.

Table 7: Representation METS administrative metadata (element amdSec)

ID	Name, Location and Description	Card & Level
3DPM35 Ref CSIP31	Administrative metadata mets/amdSec Preservation, Authentication event and Electronic Signature metadata SHOULD be described using the administrative metadata section (<amdSec>) element. All administrative metadata is presented in a single <amdSec> element.	0..1 SHOULD
3DPM36 Ref CSIP32	Digital provenance metadata mets/amdSec/digiprovMD PREMIS MUST be used to record information about preservation (specifically including recording of data Validation events, Verification events and Electronic Signatures). The use of PREMIS SHOULD follow recommendations in the CITS PREMIS.	1..1 MUST
3DPM37 Ref CSIP35	Reference to the document with the digital provenance metadata mets/amdSec/digiprovMD/mdRef Reference to the digital provenance file stored in the 'metadata/preservation' folder of the representation.	1..1 MUST

Example 8: Representation METS Administrative Metadata (element amdSec)

```

<mets:amdSec>
<mets:digiprovMD ID="digiprov-premis-file-1" CREATED="2024-04-
24T15:27:45.702+01:00" STATUS="CURRENT" >
<mets:mdRef LOCTYPE="URL" xlink:href="metadata/preservation/premis1.xml"
xlink:type="simple" MDTYPE="PREMIS" MIMETYPE="application/xml" SIZE="1211"
CREATED="2024-04-24T14:11:29.309+01:00"
CHECKSUM="8aa278038dbad54bbf142e7d72b493e2598a94946ea1304dc82a79c6b4bac3d5 "
CHECKSUMTYPE="SHA-256" />
</mets:digiprovMD>
</mets:amdSec>

```

4.2.2.12 Representation METS file metadata section (element fileSec)

The CSIP does not make the use of the METS fileSec element mandatory, but it is strongly recommended. In the 3D Product Model CITS, the use of the METS fileSec element at the Representation level becomes mandatory, such as to reference the Content Data Objects within each Representation and link to preservation information held within mandatory PREMIS files.

Table 8: Representation METS file metadata (element fileSec)

ID	Name, Location and Description	Card & Level
3DPM38	File section mets/fileSec	1..1
ref CSIP58	The transferred content within a representation is referenced from the file section in different file group elements. Only a single representation file section <fileSec> element MUST be present. Simple or complex Product Information Model structures and hierarchies can be represented in METS if the <fileSec> element is present.	MUST
3DPM39	Reference to administrative metadata mets/fileSec/filegrp/@ADMID	1..1
ref CSIP61	If administrative metadata has been provided at file group `mets/fileSec/fileGrp/` level this attribute MUST refer to its administrative metadata section by ID. For example, if there is digital preservation metadata that is general to a group of files forming a Product Model.	MUST
3DPM40	Content information type specification mets/fileSec/fileGrp/@csip:CONTENTINFORMATIONTYPE	1..1
ref CSIP62	The value of the attribute `mets/fileSec/fileGrp/@csip:CONTENTINFORMATIONTYPE` is set to "cits3dpm_v1_0". See also: Vocabulary Content information type specification	MUST

3D PM41 ref CSIP74	File reference to administrative metadata mets/fileSec/fileGrp/file/@ADMID If administrative metadata has been provided at file level then this attribute MUST refer to the file's administrative metadata by ID.	1..1 MUST
---	--	--------------------------------

Example 9: Representation METS File Section (element fileSec) with administrative metadata at file group level

```
<mets:fileSec ID="filesec-example" >
<mets:fileGrp ID="filegrp-documentation-authentication" USE="Documentation"
>
<mets:file ID="file-validation-properties-file1"
MIMETYPE="application/vnd.openxmlformats-
officedocument.wordprocessing.document" SIZE="43445212" CREATED="2023-08-
15T12:08:15.432+01:00"
CHECKSUM="160D71F56C2CE685CE7FBD679076FD76B3C67EE9AB5062F5EF5C99AE39C1F43B"
CHECKSUMTYPE="SHA-256" >
<mets:FLocat LOCTYPE="URL" xlink:type="simple"
xlink:href="documentation/authentication/validationprops1.docx" />
</mets:file>
<mets:file ID="file-documentation-verification-report1"
MIMETYPE="application/vnd.openxmlformats-
officedocument.wordprocessingml.document" SIZE="31462826" CREATED="2023-08-
15T14:44:45.432+01:00"
CHECKSUM="0FE9683451D0390BCDEF19CE10CFD287A2D944B6A33D246681FEF27F44FFAF1D"
CHECKSUMTYPE="SHA-256" >
<mets:FLocat LOCTYPE="URL" xlink:type="simple"
xlink:href="documentation/authentication/verificationrep1.docx" />
</mets:file>
</mets:fileGrp>
<mets:fileGrp ID="filegrp-original-product-model" USE="Representations"
csip:CONTENTINFORMATIONTYPE="cits3dpm_v1_0" ADMID="digiprov-premis-file-1" >
<mets:file ID="file-original-product-model" MIMETYPE="dwg" SIZE="10338744"
CREATED="2024-04-24T14:33:23.617+01:00"
CHECKSUM="B1CF59678A21C2805370536AB1097735D7E9F3FDDDCAE3757426ED85F6350A48"
CHECKSUMTYPE="SHA-256" >
<mets:FLocat LOCTYPE="URL" xlink:type="simple"
xlink:href="data/product1.dwg" />
</mets:file>
</mets:fileGrp>
</mets:fileSec>
```

4.2.2.13 Representation METS structural map (element structMap)

The METS structural map element is the only mandatory element in the METS specification and is hence mandatory within the Representation METS. There must be one structural map present in each Representation METS file following the requirements of the CSIP. As Authentication documentation SHOULD be included in each Representation within 3D PM CITS, there is also a mandatory requirement for a structMap division for the documentation/authentication folder. The specific requirements for elements, sub-elements and attributes for 3D PM CITS, which differ from the CSIP, are listed in the following table.

Table 9: Representation METS structural map (element structMap)

ID	Name, Location and Description	Card & Level
3DPM42	Authentication Documentation division mets/structMap[@LABEL='CSIP']/div/div/div	0..1
Ref CSIP 93	Authentication documentation referenced in the file section file groups is described in the structural map with one sub division.	SHOULD
3D PM43	Authentication documentation division identifier mets/structMap[@LABEL='CSIP']/div/div/div/@ID Mandatory, xml:id identifier MUST be unique within the package.	1..1 MUST
3D PM44	Authentication documentation division label mets/structMap[@LABEL='CSIP']/div/div/div[@LABEL='Authentication Documentation'] The 'Authentication Documentation' division <div> element in the package uses the value 'Verification Documentation' from the vocabulary as the value for the @LABEL attribute.	1..1 MUST
3DPM45	Authentication documentation file references mets/structMap[@LABEL='CSIP']/div/div/div[@LABEL='Authentication Documentation']/fptr File groups containing 'Authentication Documentation' are referenced via relevant file group identifiers.	1..n MUST
3D PM46	Other Documentation division mets/structMap[@LABEL='CSIP']/div/div/div[@LABEL='Documentation'] Other documentation referenced in the file section file groups is described in the structural map with one sub division.	0..1 SHOULD
3D PM47	Other documentation division identifier mets/structMap[@LABEL='CSIP']/div/div/div[@LABEL='Other Documentation']/@ID Mandatory, xml:id identifier MUST be unique within the package.	1..1 MUST
3D PM48	Other documentation division label mets/structMap[@LABEL='CSIP']/div/div/div[@LABEL='Other Documentation'] The 'Other Documentation' division <div> element in the package uses the value 'Other Documentation' from the vocabulary as the value for the @LABEL attribute.	1..1 MUST
3DPM49	Other documentation file references mets/structMap[@LABEL='CSIP']/div/div/div[@LABEL='Other Documentation']/fptr File groups containing 'Other Documentation' are referenced via a relevant file group identifiers.	1..n MUST
3D PM50	Data division mets/structMap/div/div/ Within 3D PM CITS data MUST be held in a data folder within a minimum single representation and described in the structMap within a single sub-division.	1..n MUST
ref CSIP101		
3D PM51	Data division identifier mets/structMap/div/div/@ID Mandatory, xml:id identifier MUST be unique within the package.	1..1 MUST

Ref
CSIP102

3D PM52	Data division label	1..1
Ref CSIP103	The package's data division <div> element MUST have the `@LABEL` attribute value "DATA", taken from the vocabulary.	MUST

Example 10: Representation Structural Map

```
<mets:structMap ID="struct-map-example" TYPE="PHYSICAL" LABEL="CSIP" >
<mets:div ID="struct-map-example-div" LABEL="cits-3dpm-example" >
<mets:div ID="struct-map-metadata-div" LABEL="Metadata"
ADMD="digiprovpremis-file-1 digiprov-premis-file-2" />
<mets:div ID="struct-map-documentation-div" LABEL="Documentation" >
<mets:div ID="structmap-documentation-authentication-div"
LABEL="Documentation" >
<mets:fileptr FILEID="filegrp-documentation-authentication" />
</mets:div>
<mets:div ID="structmap-documentation-other-div" LABEL="Documentation" >
<mets:fileptr FILEID="filegrp-documentation-other" />
</mets:div>
</mets:div>
<mets:div ID="struct-map-schemas-div" LABEL="Schemas" >
<mets:fptr FILEID="filegrp-schemas" />
</mets:div>
<mets:div ID="struct-map-reps-sub-div1" LABEL="Representations/original-
product-model" >
<mets:mptr LOCTYPE="URL" xlink:type="simple"
xlink:href="representations/original-product-model/METS.xml"
xlink:title="file-grp-rep-original-product-model" />
</mets:div>
<mets:div ID="struct-map-reps-sub-div2" LABEL="Representations/derived-
product-model" >
<mets:mptr LOCTYPE="URL" xlink:type="simple"
xlink:href="representations/derived-product-model/METS.xml"
xlink:title="file-grp-rep-derived-product-model" />
</mets:div>
</mets:div>
</mets:structMap>
```

4.2.1 Representation METS file example

Example 11 shows an example of a whole representation METS document following CITS 3D PM.

Example 11 : Whole representation METS

```
<mets:mets xsi:schemaLocation="http://www.loc.gov/METS/
http://www.loc.gov/standards/mets/mets.xsd http://www.w3.org/1999/xlink
http://www.loc.gov/standards/mets/xlink.xsd
https://DILCIS.eu/XML/METS/CSIPExtensionMETS
https://earksip.dilcis.eu/schema/DILCISExtensionMETS.xsd
https://DILCIS.eu/XML/METS/SIPExtensionMETS
https://earksip.dilcis.eu/schema/DILCISExtensionSIPMETS.xsd"
OBJID="Product Model Submission" TYPE="OTHER" csip:OTHERTYPE="Product Model
Data" csip:CONTENTINFORMATIONTYPE="cits3dpm_v1_0"
PROFILE="https://cits3dpm.dilcis.eu/profile/E-ARK-eHealth1-ROOT.xml" />
```



```
<mets:metsHdr CREATEDATE="2024-04-24T14:37:49.602+01:00" LASTMODDATE="2024-04-24T14:37:49.602+01:00" RECORDSTATUS="NEW" csip:OAISPACKAGETYPE="SIP" >
<mets:agent ROLE="CREATOR" TYPE="OTHER" OTHERTYPE="SOFTWARE" >
<mets:name>product model sip software</mets:name>
<mets:note csip:NOTETYPE="SOFTWARE VERSION" >version 1.1</mets:note>
</mets:agent>
<mets:agent ROLE="CREATOR" TYPE="ORGANIZATION" >
<mets:name>Lanivisiau Engineering</mets:name>
<mets:note csip:NOTETYPE="IDENTIFICATIONCODE" >ID:89101112 </mets:note>
</mets:agent>
<mets:agent ROLE="INDIVIDUAL" TYPE="SUBMITTER" >
<mets:name>Tanguy Mesguen</mets:name>
<mets:note>Phone: 33 6 12 34 56, Email:
tanguy.mesguen@landi.mail</mets:note>
</mets:agent>
<mets:agent ROLE="PRESERVATION" TYPE="ORGANIZATION" >
<mets:name>Landivisiau Engineering</mets:name>
<mets:note csip:NOTETYPE="IDENTIFICATIONCODE" >ID:1234567</mets:note>
</mets:agent>
</mets:metsHdr>
<mets:dmdSec ID="dmd-ead-file2" CREATED="2024-04-24T15:27:45.702+01:00"
STATUS="CURRENT" >
<mets:mdRef LOCTYPE="URL" xlink:href="metadata/descriptive/ead2.xml"
xlink:type="simple" MDTYPE="EAD" MIMETYPE="application/xml" SIZE="643"
CREATED="2024-04-24T14:11:29.309+01:00"
CHECKSUM="66EEDDF0A22EF57078694B67CA45DF301034556D6CB493531356C4FFE92AB6B1"
CHECKSUMTYPE="SHA-256" />
</mets:dmdSec>
<mets:amdSec>
<mets:digiprovMD ID="digiprov-premis-file2" CREATED="2024-04-24T15:27:45.702+01:00" STATUS="CURRENT" >
<mets:mdRef LOCTYPE="URL" xlink:href="metadata/preservation/premis2.xml"
xlink:type="simple" MDTYPE="PREMIS" MIMETYPE="application/xml" SIZE="1211"
CREATED="2024-04-24T14:11:29.309+01:00"
CHECKSUM="8aa278038dbad54bbf142e7d72b493e2598a94946ea1304dc82a79c6b4bac3d5"
CHECKSUMTYPE="SHA-256" />
</mets:digiprovMD>
</mets:amdSec>
<mets:fileSec ID="filesec-example-1" >
<mets:fileGrp ID="filegrp-documentation-authentication" USE="Documentation"
>
<mets:file ID="file-validation-properties-file1"
MIMETYPE="application/vnd.openxmlformats-officedocument.wordprocessing.document" SIZE="43445212" CREATED="2023-08-15T12:08:15.432+01:00"
CHECKSUM="160D71F56C2CE685CE7FBD679076FD76B3C67EE9AB5062F5EF5C99AE39C1F43B"
CHECKSUMTYPE="SHA-256" >
<mets:FLocat LOCTYPE="URL" xlink:type="simple"
xlink:href="documentation/authentication/validationprops1.docx" />
</mets:file>
<mets:file ID="file-documentation-verification-report1"
MIMETYPE="application/vnd.openxmlformats-officedocument.wordprocessingml.document" SIZE="31462826" CREATED="2023-08-15T14:44:45.432+01:00"
CHECKSUM="0FE9683451D0390BCDEF19CE10CFD287A2D944B6A33D246681FEF27F44FFAF1D"
CHECKSUMTYPE="SHA-256" >
<mets:FLocat LOCTYPE="URL" xlink:type="simple"
xlink:href="documentation/authentication/verificationrep1.docx" />
</mets:file>
</mets:fileGrp>
```



```

<mets:fileGrp ID="filegrp-original-product-model" USE="Representations"
csip:CONTENTINFORMATIONTYPE="cits3dpm_v1_0" ADMID="digiprov-premis-file-2"
DMDID="dmd-ead-file2" >
<mets:file ID="file-original-product-model" MIMETYPE="dwg" SIZE="10338744"
CREATED="2018-04-24T14:33:23.617+01:00"
CHECKSUM="B1CF59678A21C2805370536AB1097735D7E9F3FDDCAE3757426ED85F6350A48"
CHECKSUMTYPE="SHA-256" >
<mets:FLocat LOCTYPE="URL" xlink:type="simple"
xlink:href="data/product1.dwg" />
</mets:file>
</mets:fileGrp>
</mets:fileSec>
<mets:structMap ID="struct-map-product-model-rep" TYPE="PHYSICAL"
LABEL="CSIP" >
<mets:div ID="struct-map-example-div" LABEL="CITS-3dpm-example" >
<mets:div ID="struct-map-metadata-div" LABEL="Metadata" DMDID="dmd-ead-
file2" ADMID="digiprov-premis-file2" />
<mets:div ID="struct-map-documentation-div" LABEL="Documentation" >
<mets:div ID="structmap-documentation-authentication-div"
LABEL="Documentation" >
<mets:fileptr FILEID="filegrp-documentation-authentication" />
</mets:div>
<mets:div ID="structmap-documentation-other-div" LABEL="Documentation" >
<mets:fileptr FILEID="filegrp-documentation-other" />
</mets:div>
</mets:div>
<mets:div ID="struct-map-data" LABEL="Data" >
<mets:mptr LOCTYPE="URL" xlink:type="simple" xlink:href="representations"
xlink:title="file-grp-rep-original-product-model" />
</mets:div>
</mets:div>
</mets:structMap>

```

4.2.2 PREMIS

4.2.2.1 Use of PREMIS in CITS 3D PM

The use of PREMIS within the 3D PM CITS must follow the requirements of the CITS PREMIS which can be found at: <https://dilcis.eu/content-types/cits-premis>.

Some PREMIS semantic units take the form of containers which comprise multiple sub (or even sub-sub) semantic units. Sub or sub-sub semantic units are not detailed in this specification if the container above has a level of MAY. Use of semantic units not listed should follow the requirements of the PREMIS data dictionary including the level (obligation).

For 3D PM CITS the use of PREMIS follows an interpretation of LOTAR as described in **3D PM10** and **3D PM11** above as follows:

3D PM10: there SHOULD be a PREMIS file produced according to CITS PREMIS and adjusted to the requirements of this CITS in the metadata/preservation folder of the Information Package.

3D PM11: there SHOULD be a PREMIS file produced according to CITS PREMIS and conforming to the adjusted requirements of this CITS in each Representation of the Information Package in the representation/metadata/preservation folder.

Following CITS PREMIS the CITS 3D PM follows the requirements and recommendation of the PREMIS Data Dictionary which can be found at: <https://www.loc.gov/standards/premis/v3/premis-3-0-final.pdf>

4.2.2.2 *Attribute values and controlled vocabularies*

Use of controlled vocabularies for the values of semantic units is encouraged within the PREMIS Data Dictionary and through best practice. Specific controlled vocabularies for semantic units are not provided by the CITS but their use is encouraged, particularly the use of any vocabularies provided by the LOTAR standard. If local vocabularies are used within the repository then these should be included within each package.

4.2.2.3 *Use of PREMIS at package level*

PREMIS can be used in addition to METS to support compliance with LOTAR in recording specific rights information at package level. Note that if PREMIS is used then the requirements of the CITS Preservation apply and those provided by the CITS 3D PM are in addition to these.

Preservation information

3D PM52 Preservation information for the entire package (e.g. provenance, preservation actions) MAY be recorded within the PREMIS file located in the metadata/preservation folder and must follow guidelines set out in CITS PREMIS.

Rights Information

3D PM53 Rights for the entire package (e.g. copyright, license, statute, other, rights grants) MAY be recorded within the PREMIS file located in the metadata/preservation folder using the PREMIS Rights entity and must follow the guidelines set out in CITS PREMIS. Each individual rights statement (copyright, licence, statute, other, rights granted) must be held in a separate rightsStatement semantic unit. Designation of the basis for the right or permission can be taken from the vocabulary available at: <http://id.loc.gov/vocabulary/preservation/rightsBasis.html> which are: license, copyright, statute, other. Information on rights associated with the rights basis can be included within the otherRightsInformation PREMIS semantic unit container using values from available controlled vocabularies.

Example 10: Package level PREMIS with license, copyright, statute and other rights statements

```
<premis:premis>
<premis:rightsStatement>
  <premis:rightsStatementIdentifier>
    <premis:rightsStatementIdentifierType>uuid</premis:
rightsStatementIdentifierType>
    <premis:rightsStatementIdentifierValue>0301dc6e-351d-11ee-be56-
0242ac120002</premis:rightsStatementIdentifierValue>
  </premis:rightsStatementIdentifier>
  <premis:rightsBasis>license</premis:rightsBasis>
  <premis:licenseInformation>
    <premis:licenseDocumentationIdentifier>

<premis:licenseDocumentationIdentifierType>URL</premis:licenseDocumentationI
dentifierType>

<premis:licenseDocumentationIdentifierValue>documentation/licenses/prostep-
ivip-MR-LICENSE-2019.pdf</premis:licenseDocumentationIdentifierValue>
```

```

    <premis:licenseDocumentationRole>collaborator
usage</premis:licenseDocumentationRole>
  </premis:licenseDocumentationIdentifier>
  <premis:licenseTerms>Apache v2.0, January 2004</premis:licenseTerms>
  <premis:licenseNote>License notes</premis:licenseNote>
  <premis:licenseApplicableDates>perpetual</premis:licenseApplicableDates>
</premis:licenseInformation>
</premis:rightsStatement>
<premis:rightsStatement>
  <premis:rightsStatementIdentifier>

<premis:rightsStatementIdentifierType>UUID</premis:rightsStatementIdentifier
Type>
  <premis:rightsStatementIdentifierValue>0301de76-351d-11ee-be56-
0242ac120002</premis:rightsStatementIdentifierValue>
</premis:rightsStatementIdentifier>
<premis:rightsBasis>copyright</rightsBasis>
<premis:copyrightInformation>
  <premis:copyrightStatus>copyrighted</premis:copyrightStatus>
  <premis:copyrightJurisdiction>US</premis:copyrightJurisdiction>

<premis:copyrightStatusDeterminationDate>20230809</premis:copyrightStatusDet
erminationDate>
  <premis:copyrightDocumentationIdentifier>

<premis:copyrightDocumentationIdentifierType>url</premis:copyrightDocumentat
ionIdentifierType>

<premis:copyrightDocumentationIdentifierValue>documentation/licenses/prostep
-ivip-MR- LICENSE-2019.pdf</premis:copyrightDocumentationIdentifierValue>
  </premis:copyrightDocumentationIdentifier>
  <premis:copyrightApplicableDates>
  <premis:startDate>2012-08-15T00:00:00</premis:startDate>
  <premis:endDate/>2052-08-14T00:00:00</premis:endDate>
  </premis:copyrightApplicableDates>
</premis:copyrightInformation>
</premis:rightsStatement>
<premis:rightsStatement>
  <premis:rightsStatementIdentifier>
  <premis:rightsStatementType>UUID</premis:rightsStatementType>
  <premis:premis:rightsStatementIdentifierValue>0301e010-351d-11ee-be56-
0242ac120002</premis:premis:rightsStatementIdentifierValue>
  </premis:rightsStatementIdentifier>
  <premis:rightsBasis>statute</premis:rightsBasis>
  <premis:statuteInformation>
  <pre, is:statuteJurisdiction>FR</premis:statuteJurisdiction>
  <premis:statuteCitation>EAR</premis:statuteCitation>
  <premis:statuteInformationDeterminationDate>20080814
</premis:statuteInformationDeterminationDate>
  <premis:statuteNote>French export restriction for defense
technology</premis:statuteNote>
  <premis:statuteDocumentationIdentifier>

<premis:statuteDocumentationIdentifierType>uuid</premis:statuteDocumentation
IdentifierType>
  <premis:statuteDocumentationIdentifierValue/>8a242c42-6754-11ee-8c99-
0242ac120002</premis:statuteDocumentationIdentifierValue>
  <premis:statuteDocumentationRole/>law</premis:statuteDocumentationRole>
  </premis:statuteDocumentationIdentifier>
  <premis:statuteApplicableDates>
  <premis:startDate>1976-06-12T00:00:00</premis:startDate>

```

```

    <premis:endDate>2053-06-12T00:00:00</premis:endDate>
  </premis:statuteApplicableDates>
</premis:statuteInformation>
</premis:rightsStatement>
<premis:rightsStatement>
  <premis:rightsStatementIdentifier>
    <premis:rightsStatementIdentifierType>uuid</rightsStatementIdentifierType>
    <premis:premis:rightsStatementIdentifierValue>0301e38a-351d-11ee-be56-
0242ac120002</premis:rightsStatementIdentifierValue>
  </premis:rightsStatementIdentifier>
  <premis:rightsBasis>other</premis:rightsBasis>
  <premis:otherRightsInformation>
    <premis:otherRightsDocumentationIdentifier>
      <premis:otherRightsDocumentationIdentifierType>uuid
</premis:otherRightsDocumentationIdentifierType>
      <premis:otherRightsDocumentationIdentifierValue>0e962862-6756-11ee-8c99-
0242ac120002</premis:otherRightsDocumentationIdentifierValue>
    </premis:otherRightsDocumentationIdentifier>
    <otherPremis:rightsBasis>security
classification</other<premis:rightsBasis>
    <premis:otherRightsApplicableDates>
      <premis:startDate>2007-06-12T00:00:00</premis:startDate>
      <premis:endDate/>2083-06-12T00:00:00</premis:endDate>
    </premis:otherRightsApplicableDates>
    <premis:otherRightsNote>EU Restricted</premis:otherRightsNote>
  <premis:otherRightsInformation>
</premis:rightsStatement>
<premis:rightsStatement>
  <premis:rightsStatementIdentifier>

<premis:rightsStatementIdentifierType>uuid</premis:rightsStatementIdentifier
Type>
  <premis:rightsStatementIdentifierValue>0301e6dc-351d-11ee-be56-
0242ac120002</premis:rightsStatementIdentifierValue>
</premis:rightsStatementIdentifier>
  <premis:rightsBasis>other</premis:rightsBasis>
  <premis:otherRightsInformation>
    <premis:otherRightsDocumentationIdentifier>

<premis:otherRightsDocumentationIdentifierType>uuid</premis:otherRightsDocum
entationIdentifierType>
    <premis:otherRightsDocumentationValue>cd87c450-6757-11ee-8c99-
0242ac120002    </premis:otherRightsDocumentationValue>
  </premis:otherRightsDocumentationIdentifier>
  <premis:rightsBasis>company specific</premis:rightsBasis>
  <premis:otherRightsApplicableDates>
    <premis:startDate>2012-11-05T00:00:00</premis:startDate>
    <premis:endDate>2060-11-04T00:00:00</premis:endDate>
  </premis:otherRightsApplicableDates>
  <premis:otherRightsNote>EU Restricted</premis:otherRightsNote>
</premis:otherRightsInformation>
</premis:rightsStatement>
</premis:premis>

```

4.2.2.4 Use of PREMIS at Representation level

PREMIS can be used in addition to METS to support compliance with LOTAR in recording specific Validation, Verification and Digital Signature events information at Representation level. Note that if

PREMIS is used then the requirements of the CITS Preservation apply and those provided by the CITS 3D PM are in addition to these.

Preservation information

3D PM54: Preservation information for each Representation (e.g. provenance, preservation actions) MAY be recorded within the PREMIS file located in the representation/metadata/preservation folder and must follow guidelines set out in CITS PREMIS.

Validation and Verification information

3D PM55: Product Data Model Validation and Verification events MAY be recorded within the PREMIS file located in each representation/metadata/preservation folder, using the PREMIS Event entity and should follow guidelines set out in CITS PREMIS. Values for eventTypes, eventDetailInformation and eventOutcomeInformation should take values from a controlled vocabulary and events should be linked to their respective objects using a linking object identifier.

Digital Signatures for Product Information Models

From 3D PM7: AIPs MAY contain Digital Signatures associated with Product Model Representations that are encoded within a Representation PREMIS file at object level using the signatureInformation semantic unit and signature events recorded as PREMIS Event entities.

3D PM56: If a Digital Signature is provided for an object then the operations to be performed to validate the object SHOULD be detailed. This could be a canonicalized method used before calculating the message digest or a pointer to a document in the representation/documentation/authentication folder.

3D PM57: If a Digital Signature is provided then further properties of the signature SHOULD be provided within the signatureProperties element to at least include a date and time of the signature. The granular structure of signatureProperties is not defined by PREMIS but an example of a possible date record within the signatureProperties element is shown below.

3D PM58: If a Digital Signature is provided, then information about the signer's public key SHOULD be provided within the keyInformation element. Different types of keys have different structures and parameters and so PREMIS does not define the structure of this container element and recommends practice from "KeyInfo" in the W3C's XML-Signature Syntax and Processing (<http://www.w3.org/TR/2002/REC-xmlsig-core-20020212/>) to represent key values.

Example 11: Representation level PREMIS with (RSA) Digital Signature Object property

```
<premis:premis>
<premis:object>
  <premis:objectIdentifier>
    <premis:objectIdentifierType>uuid</premis:objectIdentifierType>
    <premis:objectIdentifierValue>62d2c332-68e5-11ee-8c99-
0242ac120002</premis:objectIdentifierValue>
  </premis:objectIdentifier>
  <premis:objectCategory>file</premis:objectCategory>
  <premis:objectCharacteristics>
    <premis:fixity>
```

```
<premis:premis:messageDigestAlgorithm>SHA256</premis:premis:messageDigestAlgorithm>
  <premis:messageDigest>
506823058942ac69b5e677a333eb9c494cd854da38cf86f11a72f501a68faeb8
</premis:messageDigest>
  </premis:fixity>
  <size>208655915</size>
  <premis:format>
    <premis:formatDesignation>
      <premis:formatName>step</premis:formatName>
    <premis:formatRegistry>
      <premis:formatRegistryName>pronom</premis:formatRegistryName>
      <premis:formatRegistryKey>fmt/698</premis:formatRegistryKey>
    </premis:formatRegistry>
  </premis:format>
  <premis:signatureInformation>
    <premis:signature>
      <premis:signatureEncoding>Base64</premis:signatureEncoding>
      <premis:signer>prosstep ivip associates</premis:signer>
      <premis:signatureMethod>RSA-SHA1</premis:signatureMethod>
      <premis:signatureValue>juS5RhJ884qoFR
8f1VXd/rbrSDVGn40CapgB7qeQiT+rr0NekEQ6BHhUA8dT3+BCTBUQI0dBjlm19lwzENXvS83zRE
CjzXbMRTUUtVZiPZG2pqKPnL2YU3A9645UCjTXU+jgFumv7k78hieAGDzNci+PQ9KRmm//icT7JaY
ztgt4=</premis :signatureValue>

<premis :signatureValidationRules>documentation/authentication/signaturevalidation.pdf
</premis:signatureValidationRules>
  <premis:signatureProperties>2021-10-
07T00:00:00</premis :signatureProperties>
  <premis:keyInformation>
    <premis:keyName>Mars Rover STEP Key Body Assembly</keyName>
    <premis:keyValue>
      <premis:RSAKeyValue>

<premis:modulus>xA7SEU+e0yQH5rm9kbCDN9o3aPIo7HbP7tX6WOocLZAtNfyxSZDU16ksL6W
jubafOqNEpcwR3RdFsT7bCqnXPBe5ELh5u4VEy19MzxkXRgrMvavzyBpVRgBUwUlV
5foK5hhmbktQhyNdy/6LpQRhDUDsTvK+g9Ucj47es9AQJ3U=</premis:modulus>
  <premis:exponent>AQAB</premis:exponent>
M  </premis:RSAKeyValue>
  </premis:keyValue>
  </premis:keyInformation>
  </premis:signature>
  </premis:signatureInformation>
  </premis:object>
</premis:premis>
```

5 Glossary

Term	Description
Archival Creator	Organisation unit or individual that creates records and/or manages records during their active use.

Archival Information Package (AIP)	An information package, consisting of the Content Information and the associated Preservation Description Information (PDI), which is preserved within an Open Archival Information System (OAIS).
Asymmetric Keys	Asymmetric keys are pairs of keys, created in one step; they can be used in both directions. Encryption with the public key can only be decrypted with the private key; if the encryption is done with the private key, the decryption can only be done with the public key; such a key pair can be used for encryption and for signing
Authentication	Term needs verifying by DILCIS
Cardinality	<p>The term describes the possible number of occurrences for elements in a set. The numbers have the following meanings:</p> <p>(1..1) – in each set, there is exactly 1 such element present</p> <p>(0..1) – the set can contain from 0 to 1 of such elements</p> <p>(1..n) – the set contains at least one element</p> <p>(0..n) – the set can contain up to n of such elements, but it is not mandatory</p> <p>(0..0) – the element is prohibited to use</p>
Content Data Premis:object	The Data Premis:object, that together with associated Representation Information comprises the Content Information (OAIS – ISO 14721:2012).
Content Information	A set of information that is the original target of preservation or includes part or all of that information. It is an Information Premis:object composed of its Content Data Premis:object and its Representation Information (OAIS – ISO 14721:2012).
Data File	A component which contains data and has an associated MIME file type. A Data File can encapsulate multiple bit streams and metadata according to a standard such as a DICOM but must have a recognised MIME file type. A Data File may comprise one or more subsidiary Byte Streams; for example, an MP4 file might contain separate audio and video streams, each of which has its own associated metadata.

Data Quality Rules	Data Quality or Verification rules ensure that a representation of a product model meets quality requirements within defined tolerances, i.e. that a specific representation represents the Product Model with sufficient accuracy.
Derived Representation	A transformation of the native data, which may be based on a Native Format or a Standardised Format, e.g. an html version may be derived from a text document as an alternative representation.
Descriptive Information	Descriptive metadata described by LOTAR as including archive metadata meeting the archive's requirements (according to ISO 14721:2003 – OAIS).
Digital Signature	An Digital Signature is a defined method to sign an premis:object in electronic environments; it provides means to authenticate the signatory and the signed premis:object in an unambiguous and safe way by attaching to or logically associating data in electronic form to other electronic premis:objects
Dissemination Information Package (DIP)	An Information Package, derived from one or more AIPs and sent by Archives to the Consumer in response to a request to the OAIS.
Document	A single or group of related Data Files with common metadata. For example, a Document may consist of a PDF file together with associated attachments or a word file with a separate image signature sheet. A document can be considered to be an entity that is approved/signed as a whole by a practitioner.
Information Package	A logical container composed of optional Content Information and optional associated Preservation Description Information used to delimit and identify the Content Information and Package Description information used to facilitate searches for the Content Information.
Internal Archival Long Term Preservation guidelines	This type of guideline can have different names depending on the creator. Generally, archives specify technical guidelines and/or regulations for formats, specifying what they will accept and maintain for the long term/ Depending on the archive and available technical resources, the criteria for the selected formats can differ from archive to archive.
Level	The level of requirements of the element following RFC 2119 http://www.ietf.org/rfc/rfc2119.txt

	<p>MUST – this means that the definition is an absolute requirement</p> <p>SHOULD – this means that in particular circumstances, valid reasons may exist to ignore the requirement, but the full implications must be understood and carefully weighed before choosing a different course. http://www.ietf.org/rfc/rfc2119.txt</p> <p>MUST NOT – this means that the prohibition described in the requirement is an absolute prohibition of the use of the element.</p> <p>SHOULD NOT – this means that in particular circumstances, violating the prohibition described in the requirement is acceptable or even useful, but the full implications should be understood and the case carefully weighed before doing so. The requirement text should clarify such circumstances.</p> <p>MAY – means that a requirement is entirely optional.</p>
Open Archival Information System (OAIS)	An Archive consisting of an organisation, which may be part of a larger organisation, of people and systems, that has accepted the responsibility to preserve information and make it available for a Designated Community. It meets a set of responsibilities that allows an OAIS Archive to be distinguished from other uses of the term 'Archive'.
Original Product Model or Native Representation	Used specially to keep the design intent for long term archiving in the context of certification and legal requirements for proof. It can be stored in native or standardised formats. (LOTAR)
Preservation Description Information (PDI)	The information which is necessary for adequate preservation of the Content Information and which can be categorised as Provenance, Reference, Premis:fixity and Access Rights Information. (LOTAR).
Product Information Model	A Product Information Model represents an information model which provides an abstract description of facts, concepts and instructions about a product e.g. STEP (ISO 10303-1:1994) Application reference model or STEP Application interpreted model.
Product Model	A Product Model represents an occurrence of a product information model for a particular product, e.g. the geometric model of a part 123. Companies will create Product Models of different types, depending on the life

	cycle stages or disciplines, e.g. there are Product Models of type 'space allocation mock up'. Product Models are independent from their presentation.
Public Key	A public key is the part of the asymmetric key pair that is known to everyone
Private Key	A private key is the part of the asymmetric key pair that is only known by the owner of the asymmetric key pair
RDBMS	Relational Database Management System
Representation	A Representation within an Information Package contains archival data. If an Information Package contains the same data in two or more different formats (i.e. an original and a long term preservation format) or in different types of organisations (arrangements), the are placed within two or more separate Representations within the Representations folder of the Information Package of the Information Package.
Representation Information	The Representation Information must enable or allow the re-creation of the significant properties of the original data premis:object.
Standardised Machine-readable Documentation	A standardised machine-readable document is a document whose content can be readily processed by computers and is based on a commonly accepted standard. Such documents are distinguished from machine-readable data by virtue of having sufficient structure to provide the necessary context to support the business processes for which they are created.
Standardised Open Format	A format of data in a syntax which is derived by as broad community, such as ISO and which is independent of a specific system or interface. "Open" means completely and precisely documented in syntax and semantics and is applicable for free. In addition, standardisation processes regulate the change process for the standard. (LOTAR)
Submission Agreement	The agreement reached between an archive and the submission producer that specifies a submission format (e.g. 3D PM CITS) and any other arrangements needed, for the data submission session. Any special conditions on patient confidentiality could be specified in the submission agreement.
Submission Information Package (SIP)	An Information Package that is delivered by the Producer to the OAIS for use in the construction or update of one or more AIPs and/or the associated Descriptive Information.

Submitting Organisation	Name of the organisation submitting the package to the archive.
Time Stamp/Signature	A time signature is created automatically as part of a certified process and requires certified hardware; it provides a legal guarantee for time and owner of the data. (LOTAR).
Validation	Validation is applied to guarantee the integrity of the content of a Document throughout the entire process of long-term archiving. In the context of LOTAR the validation will be done by calculation and comparison of Validation Properties. A set of Validation Properties is like a fingerprint for the content of the document. Each change of the content changes one or more attributes of the Validation Properties. Validation properties should be independent from the system and representation within given deviations (LOTAR).
Validation Properties	Validation properties are measurable characteristics of a given Product Model that can demonstrate the veracity of a representation of the model. E.g. weight, center of gravity. Validation properties are calculated during the process of Validation for each representation of the model, e.g. STEP (LOTAR).
Validation Properties Rules Data	Validation Properties Rules Data is the original Validation Properties derived from the source Product Model (LOTAR).
Verification	A process to ensure that data is correctly represented (e.g in a package representation). Verification rules ensure that a data representation meet the quality requirements within defined tolerances. Verification rules are domain specific (CAD, PDM, Electronic Assembly, Fluid Dynamics) and are defined within LOTAR (LOTAR).

Table 10: Glossary

6 Vocabularies

Value	Vocabulary and Context
cits3dpm_v1_0	CSIPVocabularyContentInformationType Value for content information type : @csip:CONTENTINFORMATIONTYPE
Product Model Data	Vocabulary3DPM Other Content Category: @csip:OTHERTYPE
Other Documentation	Vocabulary3DPM Other Documentation fileGrp and division label: @LABEL='Other Documentation'
Authentication Documentation	Vocabulary 3DPM Authentication documentation fileGrp and division label @LABEL='Authentication Documentation'

Table 11: Vocabularies

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7 Postface

AUTHOR(S)	
Name(s)	Organisation(s)
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[Name]	[Affiliation]

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