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:
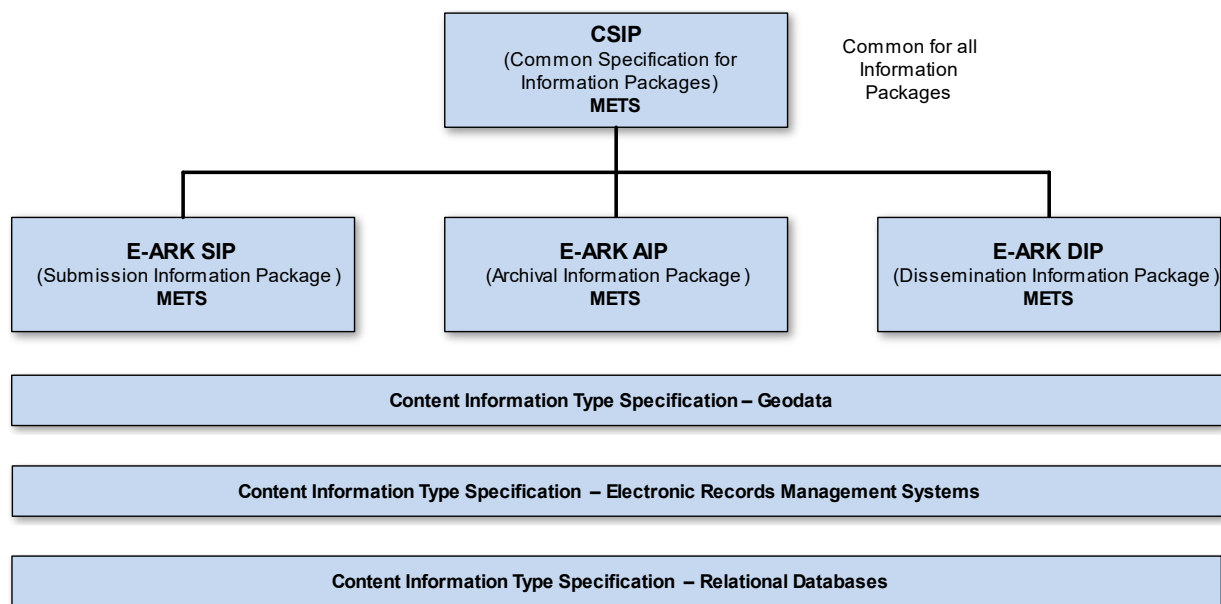

Figure 1: E-ARK specification dependency hierarchy

Table 1: Specification hierarchy aims and goals

Specification	Aim and Goals
Common Specification for Information Packages	This document introduces the concept of a Common Specification for Information Packages (CSIP). Its three main purposes are to: • 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
	• 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. 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.
E-ARK SIP	The main aims of this specification are to: • 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	The main aims of this specification are to: • 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	The main aims of this specification are to: • 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	The main aim and goal of a Content Information Type Specification is to: • Define, in technical terms, how data and metadata must be formatted and placed within a CSIP Information Package in 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.

TABLE OF CONTENT

LIST OF TABLES

LIST OF FIGURES

2 Introduction

2.1 Purpose

The purpose of this document is to describe the Content Information Type Specification for 3D Heritage Model data (CITS 3D HM). The specification is designed to be used for the transfer to archives as well as for records exchange between different organisations and repositories. This specification is supported by METS profiles for the Root and Representation METS files, an example package and a Guideline document.

2.2 Scope

Use of 3D data is widespread across many domains, with a plethora of applications and data formats. This 3D HM content specification limits its scope to the area of 3D models of cultural heritage artefacts, buildings and sites that have been produced as:

- Point cloud models (for example by: photogrammetry, laser scanning, structured light);

- CAD based models (including building information models, BIM amd heritage building information models, HBIM);

- Volumetric models (computer tomography);

- GIS models; and

- Procedural modelling (reconstructions).

Further background on this can be found in the accompanying Guideline.

The scope of the CITS may evolve in future to accommodate other production technologies. The 3D HM CITS has a related specification for 3D Product Model data, CITS 3DPM.

2.3 Layered Data Model

This section introduces the role of the CITS 3D HM 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 to the CSIP specification. The third layer of the model represents specific content information type specifications, such as this 3D Heritage Model specification. Additional layers for business-specific specifications and local variant implementations of any specification can be added to suit the needs of the organisation.
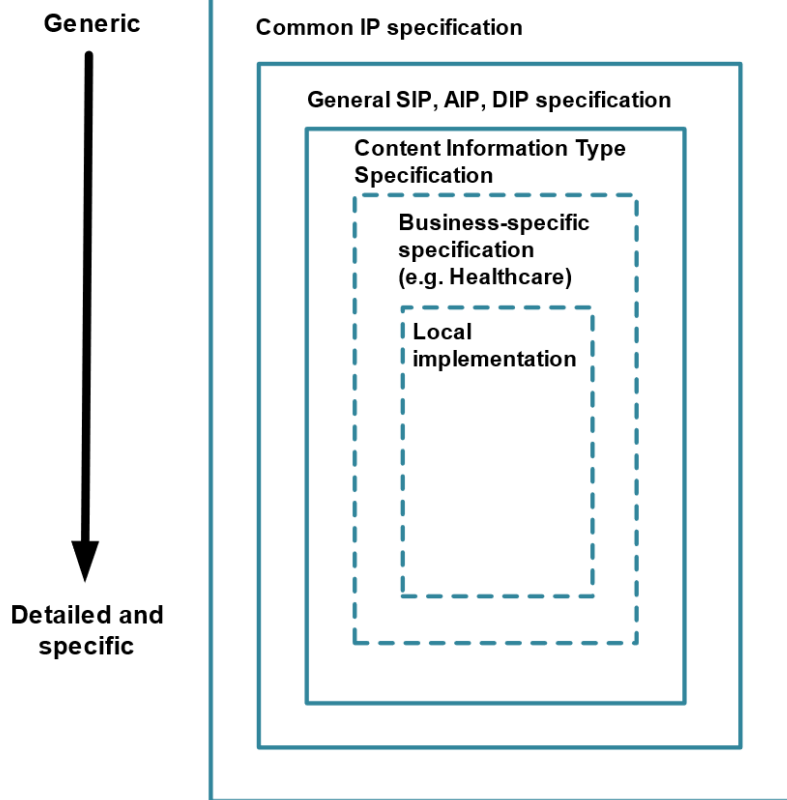
Figure 2: Data Model Structure

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.

3 Specification

3.1 Requirements Structure

The Content Information Type Specification for 3D Heritage Model data aims to define the necessary elements required to preserve the accessibility and authenticity of 3D Heritage Model data over time and across changing technical environments. 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. The specification sets out general principles that underpin the specific requirements and further context for the requirements and principles can be found in the accompanying Guideline to this document.

3.2 Principles

3.2.1 Principle– data formats and representations

The E-ARK 3D Heritage Model content specification should be data agnostic, i.e. any type of data or data format for 3D models can be packaged for long-term archiving and none is excluded; however the use of open-standards and the inclusion in packages of multiple representations is encouraged to reduce the risk of data format obsolescence and information loss. Where open 3D model data formats exist (e.g. STEP-IFC for BIM) their use alongside original, proprietary data formats is strongly encouraged.

3.2.2 Principle– use of PREMIS

From the CSIP and PREMIS specification:

- 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 should 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.

Use of PREMIS must conform to the requirements of the Common Specification for Preservation Metadata (CSPM).

3.3 Use Cases for Archiving of Heritage 3D Model Data

Further detail of the use cases for long-term archiving of 3D Heritage Model data are given in the accompanying Guideline. In summary, the use cases for archiving of 3D Heritage Model data are determined to be:

1. To enable long-term archiving of 3D Heritage Model data whilst preserving the usability, authenticity and accessibility of the data over time;

2. To enable inter-organisational exchange of 3D Heritage Model data whilst facilitating the understanding of the provenance, context and means to render;

3. To enable acceptance of 3D Heritage Model data submission packages (SIPs) at a central repository.

4 Implementation

4.1 Package Structure

The CITS 3D HM CITS inherits its package structure from the E-ARK Common Specification for Information Packages and is shown in Figure 3. It can be seen that additional folders have been added for Paradata, Other and optionally Authentication Documentation at root and Representation level but otherwise the structure is identical.
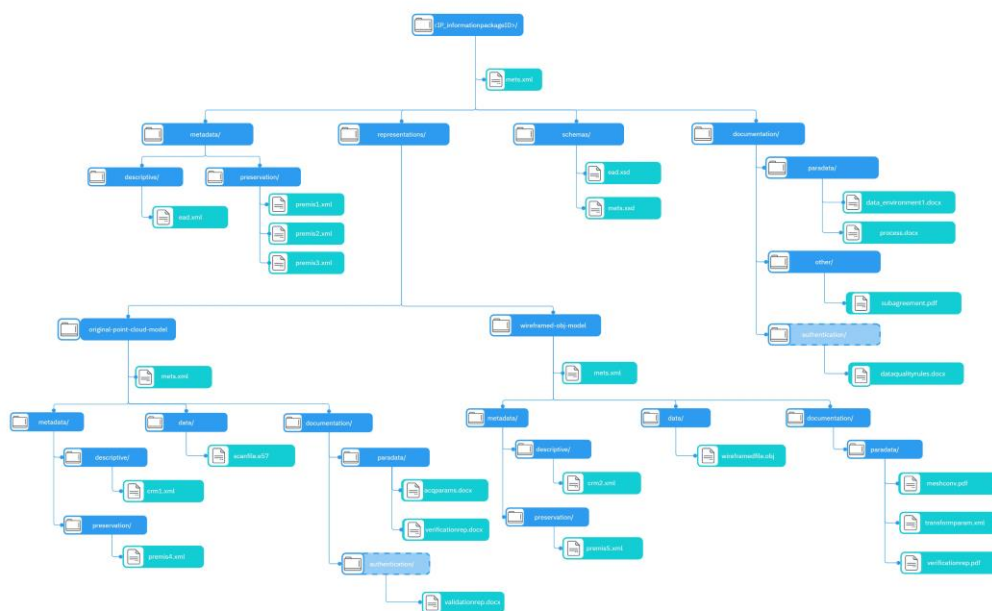
Figure 3: Example Information Package Folder Structure

Multiple formats of the same 3D model which have been created through transformation events may be included in a single package and held in individual Representations (for example proprietary BIM models and STEP-IFC derivations). Information related to a transformation event (software used, parameters etc) should be included in the relevant documentation/paradata folder and details of the event recorded in PREMIS.

3D models of the same physical object can be created via different means (e.g point cloud vs CAD based) and it is a matter for the repository to determine if it considers these models to be the same or a different intellectual entity and thus whether they should be in the same or different information packages. Should models created via different methods be included in

_____

the same package then Rights information and Paradata may differ for each model and should therefore be held at Representation level. Submission Agreements between Producer and Archive should detail whether different capture/creation versions of the same physical object are permitted in a single information package.

It is strongly recommended that as much documentation as possible related to the creation, context, provenance and terms of use of the model is included in the information package such as for example: licence terms, project overview, model creation and transformation information. The CITS 3D HM recommends the inclusion of such information related to the production of the model in a documentation/paradata sub-folder and related to archiving and use of the model in a documentation/other sub-folder. If model Authentication information (such as data quality rules) is included with the model then this can also be included in the optional documentation/authentication folder. Further information on model Authentication can be found in the CITS 3D PM at: https://github.com/DILCISBoard/CITS-3DPM/tree/rel/v1.0.0. The inclusion of a Submission Agreement in the information package is recommended and should be located in the documentation/other sub-folder.

Individual folder structures are recommended within each representation/data folder to provide structure appropriate to the model format used.

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

3D HM1: the package MUST have at least one Representation in the Representations folder

3D HM2: the Documentation folder at package and Representation level SHOULD have a sub-folder named Paradata. This is an extension of CSIPSTR16.

3D HM3: the Documentation folder at package and Representation level SHOULD include a sub-folder named Other.   This is an extension of CSIPSTR16.

3DPM4: the Documentation folder at package level and Representation level MAY include a sub-folder named Authentication.   This is an extension of CSIPSTR16.

4.2 Metadata and Supporting Information

4.2.1 Descriptive Metadata

The package should contain general Descriptive Metadata about the digitised object and may contain specific Descriptive Metadata about the individual 3D model Representations.

Further detail on Descriptive Metadata is provided in the Guideline.

3D HM5: the information package SHOULD contain descriptive metadata about the digitised object according to a current standard (such as MARC, MODS, Dublin Core, TEI Header, EAD, VRA, FGDC, DDI, CARARE, LIDO, CIDOC-CRM) or a locally produced, well formed schema located within the metadata/descriptive folder.

3D HM6: the information package MAY contain descriptive metadata about the representations of the digitised object according to a current standard (such as MARC, MODS, Dublin Core, TEI Header, EAD, VRA, FGDC, DDI, CARARE, LIDO, CIDOC-CRM) or a locally produced schema located in the representation/metadata/descriptive folders.

4.2.2 Preservation Metadata

Good practice in the management of 3D Heritage Model data requires that Information Packages include Preservation Metadata, specifically information related to:

- Provenance

- Reference

- Fixity

- Context

It is recommended that users review the CSPM.

CITS 3D HM recommends the inclusion of PREMIS files at Representation level to include provenance, rendering environment, origination information and if it exists Authentication information.

3D HM6: there SHOULD be (a) PREMIS file(s) produced according to the CSPM and the requirements of this CITS in the representation/metadata/preservation folder of each Representation of the Information Package containing preservation metadata.

4.2.3   Rights Metadata

From the Principle above, detailed Rights information should be recorded within PREMIS. As such a PREMIS file should be included at either package or in each Representation to contain this.

3D HM7: there SHOULD be (a) PREMIS file(s) produced according to CITS PREMIS and the requirements of this CITS in the metadata/preservation folder of the Information Package or within each representation in the metadata/preservation folders containing Rights information related to all models or to individual models.

4.2.4   Paradata

Paradata is defined as supporting textual material which concerns the conditions under which the model digitization (creation) took place, , the intended purpose of the model, the reasons of decisions taken in the digitization process leading to the final result, and for reconstructions, the references to the documentation supporting the reconstruction. Further information is included in the accompanying Guideline to this specification.

Within this 3D Heritage Model specification a specific folder for Paradata is defined as a sub-folder of the Documentation folder at root or Representation level. Within the CITS the concept of Paradata is extended to include any unstructured textual material related to the creation, processing, transformation, rendering or quality of the model(s).

4.2.5   Creating, Transforming and Rendering Hardware and Software

Details of the hardware and software used in the creation and transformation and required for the rendering of Heritage 3D Models can be captured in some specialised Descriptive Metadata schemas, described in event based ontologies such as the CRMdig extension of CIDOC-CRM, captured in PREMIS preservation metadata within object (creating application and extensions), environment function (rendering environment), event and agent entity semantic units or can be recorded as simple, unstructured text and held in the documentation/paradata folder.

4.2.6   Quality Information

Quality information may be included in some specialised metadata schemas or if unstructured can be included in the documentation/paradata folder of each representation.

4.2.7   Authentication Information

If Authentication documentation exists then the optional documentation/authentication subfolder can be used at both root and representation level. Authentication events can be recorded within PREMIS and examples are given in the CITS 3D PM specification and

Guideline as to how this can be done (see https://github.com/DILCISBoard/CITS-3DPM/tree/rel/v1.0.0).

4.2.8 Processing Information

Processing information unless specifically encoded according to specialised schemas or ontologies can be included in the documentation/paradata sub-folder either at root or Representation level.

4.2.9 Geometry Data

Geometry data is closely aligned with the data model itself and should be included in the data folder within each Representation alongside the model data. Specific folder structures can be defined within the data folder for a model types or derivations.

4.3 METS

4.3.1 Use of METS in CITS 3D HM

CSIP specifies that METS files should 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 HM has a requirement to contain at least one Representation and so will contain at minimum a root METS and a Representation METS file.

4.3.2 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 HM and in some cases, the level of the CSIP or package requirements have been increased (but never decreased).

4.3.2.1 Root METS root element

CITS 3D HM 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 HM.

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

ID	Name, Location and Description	Card & Level
3D HM8 **Ref CSIP6**	**METS profile** `mets/@PROFILE` The value is set to "https://CITS3D HM.dilcis.eu/profile/E-ARK-3D HM-ROOT-v1.0.0.xml"	**1..1** MUST
3D HM9 **Ref CSIP2**	**Content category** `mets/@TYPE` The `mets/@TYPE` attribute is set to the value "OTHER"	**1..1** MUST
3D HM10 **Ref CSIP3**	**Other content category** `mets/@csip:OTHERTYPE` The `mets/@csip:OTHERTYPE` attribute is set to the value "Heritage Model Data"	**1..1** MUST
3D HM11 **Ref CSIP4**	**Content information type specification** `mets/@csip:CONTENTINFORMATIONTYPE` The `mets/@csip:CONTENTINFORMATIONTYPE` attribute is set to the value "cits_3D HM_v1_0" **See also:** Vocabulary Content information type specification	**1..1** MUST

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://earksip.dilcis.eu/schema/DILCISExtensionSIPMETS.xsd" OBJID="Heritage
    Model Package" TYPE="OTHER" csip:OTHERTYPE="Heritage Model Data"
    csip:CONTENTINFORMATIONTYPE="cits3D HM_v1_0 " LABEL="Heritage 3D Data from
    Fonds Landernau" PROFILE="https://cits3D HM.dilcis.eu/profile/E-ARK-3D HM-
    ROOT-v1-0-0.xml" />
```

4.3.2.2   Root METS header element (element metsHdr)

There are no specific requirements in CITS 3D HM for the root METS header section.

Example 2 : Root METS header example (element metsHdr)

```
<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>3D 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>Fonds Landernau</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>Archive Bretagne</mets:name>
 <mets:note csip:NOTETYPE="IDENTIFICATIONCODE" >ID:1234567</mets:note>
    </mets:agent>
    </mets:metsHdr>
```

4.3.2.3   Root METS descriptive metadata section (element dmdSec)

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

Example 3 : Root METS descriptive metadata section example (element dmdSec)

```
<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>
```

4.3.2.4 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.

The CSIP (and METS) categorise preservation metadata as administrative metadata, specifically digital provenance metadata (following the available Guidelines published in the Guidelines for using PREMIS with METS for exchange: http://www.loc.gov/standards/premis/Guidelines2017-premismets.pdf) and hence all PREMIS metada should be referenced from a single or multiple digiprovMD elements within the amdSec.

Note that CITS PREMIS requires that all PREMIS is referenced from the digiprovMD element, including PREMIS Rights information and not via a separate rightsMD statement.

Example 4 : Root METS administrative metadata section (element amdSec)

```
<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:digiprovMD ID="rights-premis-file2" 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:digiprovMD>
<mets:digiprovMD ID="rights-premis-file3" 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:digiprovMD>
    </mets:amdSec>
```

4.3.2.5 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 CITS 3D HM the use of the METS fileSec element at the package level becomes mandatory, such as to reference the METS files within each representation and to reference the file groups containing Paradata Documentation, Authentication Documentation and Other Documentation.

Table 3: Root METS file metadata section (element fileSec)

ID	Name, Location and Description	Card & Level

3D HM12 ref CSIP58	**File section** `mets/fileSec` The transferred content is placed in representation folders described by representation METS documents referenced from the Root METS file section. Only a single root file section <fileSec> element MUST be present.	**1..1** MUST	
3D HM13	**Paradata Documentation file group** `Mets/fileSec/fileGrp[@USE='Paradata Documentation']` All Paradata Documentation located in the documentation/paradata folder is placed in one or more file group elements with `mets/fileSec/fileGrp/@USE` attribute value 'Paradata Documentation' taken from the vocabulary.	**1..n** MUST	
3D HM14	**Authentication Documentation file group** `Mets/fileSec/fileGrp[@USE='Authentication Documentation']` All Authentication Documentation located in the documentation/authentication folder is placed in one or more file group elements with `mets/fileSec/fileGrp/@USE` attribute value 'Authentication Documentation' taken from the vocabulary.	**1..n** MUST	
3D HM15	**Other Documentation file group** `Mets/fileSec/fileGrp[@USE='Other Documentation']` All Other Documentation located in the documentation/other folder is placed in one or more file group elements with `mets/fileSec/fileGrp/@USE` attribute value 'Other Documentation' taken from the vocabulary.	**1..n** MUST	
3D HM16 ref CSIP61	**Reference to administrative metadata** `mets/fileSec/filegrp/@ADMID` 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 are rights and/or digital provenance metadata that are general to the package.	**1..1** MUST	
3D HM17 ref CSIP62	**Content information type specification** `mets/fileSec/fileGrp/@csip:CONTENTINFORMATIONTYPE` The value of the attribute `mets/fileSec/fileGrp/@csip:CONTENTINFORMATIONTYPE` is set to "cits3D HMI_v1_0". See also: Vocabulary Content information type specification	**1..1** MUST	

Example 5 : Root METS file section (element fileSec)

```
<mets:fileSec ID="filesec-example" >
<mets:fileGrp ID="filegrp-documentation-paradata" USE="Paradata Docummentation"
    >
<mets:file ID="file-data-creation-environment"
    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/paradata/data_environment1.docx" />
```

```xml
        </mets:file>
<mets:file ID="file-documentation-scanning-process"
    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/paradata/process.docx" />
    </mets:file>
    </mets:fileGrp>
<mets:fileGrp ID="filegrp-documentation-other" USE="Other Documentation" >
<mets:file ID="file-ptr-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:fileGrp>
<mets:fileGrp ID="filegrp-documentation-authentication" USE="Authentication
    Documentation" >
<mets:file ID="file-ptr-data-quality-rules"
    MIMETYPE="application/vnd.openxmlformats-
    officedocument.wordprocessing.document" SIZE="43445212" CREATED="2012-08-
    15T12:08:15.432+01:00"
    CHECKSUM="160D71F56C2CE685CE7FBD679076FD76B3C67EE9AB5062F5EF5C99AE39C1F43B"
    CHECKSUMTYPE="SHA-256" >
 <mets:FLocat LOCTYPE="URL" xlink:type="simple"
    xlink:href="documentation/authentication/data-quality-rules.docx" />
    </mets:file>
    </mets:fileGrp>
<mets:fileGrp ID="filegrp-schemas" USE="Schemas" >
<mets:file ID="file-ptr-schema1" 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-point-cloud-model"
    USE="representations/original-point-cloud-model" ADMD="digiprov-pm-file1
    rights-pm-file1" DMDID="dmd-ead-file" csip:CONTENTINFORMATIONTYPE="cits3D
    HM_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-obj-model"
    USE="representations/wireframed-obj-model" ADMD="digiprov-pm-file1 rights-
    pm-file2" DMDID="dmd-ead-file" csip:CONTENTINFORMATIONTYPE="cits3D HM_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>
```

4.3.2.6   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 HM 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 Heritage Model representations in each package, the CITS 3D HM specification requires that each Heritage 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/paradata file group located in the documentation/paradata 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.

If present, the structural map should reference the documentation/authentication file group located in the documentation/authentication 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 CITS 3D HM, which differ from the CSIP, are listed in the following table.

Table 4: Root METS structural map (element structMap)

ID	Name, Location and Description	Card & Level
3D HM18	**Paradata documentation division** `mets/structMap[@LABEL='CSIP']div/div/div[@LABEL='Paradata Documentation']` Paradata documentation referenced in the file section is described in the structural map with three sub-divisions.	**0..1** SHOULD
3D HM19	**Paradata documentation division identifier** `mets/structMap[@LABEL='CSIP']/div/div/div@LABEL='Paradata Documentation'/@ID` Mandatory, xml:id identifier must be unique within the package.	**1..1** MUST
3D HM20	**Paradata documentation division label** `mets/structMap[@LABEL='CSIP']/div/div/div[@LABEL='Paradata Documentation']` The 'Paradata Documentation' division `<div>` element in the package uses the value 'Paradata Documentation' from the vocabulary as the value for the `@LABEL` attribute.	**1..1** MUST
3D HM21	**Paradata documentation file references**	**1..n**

	`mets/structMap[@LABEL='CSIP']/div/div/div[@LABEL='Pa radata Documentation']/fptr`	MUST
	File groups containing 'Paradata Documentation' are referenced via a relevant file group identifiers.	
3D HM22	**Paradata documentation file group reference pointer**	**1..1**
	`mets/structMap[@LABEL='CSIP']/div/div/div[@LABEL='Pa radata Documentation']/fptr/file@ID`	MUST
	A reference, by ID, to 'Paradata Documentation' file groups.	
3D HM23	**Authentication documentation division**	**0..1**
	`mets/structMap[@LABEL='CSIP']div/div/div[@LABEL=' Authentication Documentation']`	MAY
	Authentication documentation referenced in the file section is described in the structural map with three sub-divisions.	
3D HM24	**Authentication documentation division identifier**	**1..1**
	`mets/structMap[@LABEL='CSIP']/div/div/div@LABEL='Aut hentication Documentation'/@ID`	MUST
	Mandatory, xml:id identifier must be unique within the package.	
3D HM25	**Authentication documentation division label**	**1..1**
	`mets/structMap[@LABEL='CSIP']/div/div/div[@LABEL='Au thentication Documentation']`	MUST
	The 'Authentication Documentation' division `<div>` element in the package uses the value 'Authentication Documentation' from the vocabulary as the value for the `@LABEL` attribute.	
3D HM26	**Authentication documentation file references**	**1..n**
	`mets/structMap[@LABEL='CSIP']/div/div/div[@LABEL='Au thentication Documentation']/fptr`	MUST
	File groups containing 'Authentication Documentation' are referenced via a relevant file group identifiers.	
3D HM27	**Authentication documentation file group reference pointer**	**1..1**
	`mets/structMap[@LABEL='CSIP']/div/div/div[@LABEL='Au thentication Documentation']/fptr/file@ID`	MUST
	A reference, by ID, to 'Authentication Documentation' file groups.	
3D HM28	**Other documentation division**	**1..1**
	`mets/structMap[@LABEL='CSIP']div/div/div[@LABEL=' Other Documentation']`	SHOULD
	Other documentation referenced in the file section is described in the structural map with two sub-divisions.	
3D HM29	**Other documentation division identifier**	**1..1**
	`mets/structMap[@LABEL='CSIP']/div/div/div@LABEL='Oth er Documentation'/@ID`	SHOULD
	Mandatory, xml:id identifier must be unique within the package.	
3D HM30	**Other documentation division label**	**1..1**
	`mets/structMap[@LABEL='CSIP']/div/div/div[@LABEL='Ot her Documentation']`	MUST
	The 'Other Documentation' division `<div>` element in the package uses the value 'Other Documentation' from the vocabulary as the value for the `@LABEL` attribute.	
3D HM31	**Other documentation file references**	**1..n**
	`mets/structMap[@LABEL='CSIP']/div/div/div[@LABEL='Ot her Documentation']/fptr`	MUST
	File groups containing 'Other Documentation' are referenced via a relevant file group identifiers.	
3D HM32	**Other documentation file group reference pointer**	**1..1**
	`mets/structMap[@LABEL='CSIP']/div/div/div[@LABEL='Ot her Documentation']/fptr/file@ID`	MUST
	A reference, by ID, to 'Other Documentation' file groups.	
3D HM33	**Representation division**	**1..n**
	`mets/structMap[@LABEL='CSIP']div/div`	

Ref CSIP105	There must be a discrete `div` element for each representation of the Model.	MUST

Example 6: Root structural map (element structMap)

```xml
<mets:structMap ID="struct-map-example" TYPE="PHYSICAL" LABEL="CSIP" >
<mets:div ID="struct-map-example-div" LABEL="cits-3D HM-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-paradata-div" LABEL="Paradata
    Documentation" >
 <mets:fileptr FILEID="filegrp-documentation-paradata" />
    </mets:div>
<mets:div ID="structmap-documentation-other-div" LABEL="Other Documentation" >
 <mets:fileptr FILEID="filegrp-documentation-other" />
    </mets:div>
<mets:div ID="structmap-documentation-authentication-div" LABEL="Authentication
    Documentation" >
 <mets:fileptr FILEID="filegrp-documentation-authentication" />
    </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-point-
    cloud-model" >
 <mets:mptr LOCTYPE="URL" xlink:type="simple"
    xlink:href="representations/original-point-cloud-model/METS.xml"
    xlink:title="file-grp-rep-original-point-cloud-model" />
    </mets:div>
<mets:div ID="struct-map-reps-sub-div2" LABEL="Representations/derived-
    wireframed-model" >
 <mets:mptr LOCTYPE="URL" xlink:type="simple"
    xlink:href="representations/derived-wireframed-model/METS.xml"
    xlink:title="file-grp-rep-derived-wireframed-model" />
    </mets:div>
    </mets:div>
    </mets:structMap>
```

4.3.2.7   Whole root METS file example

Example 7: Root METS whole file example

```xml
<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://earkcsip.dilcis.eu/schema/DILCISExtensionMETS.xsd
    https://DILCIS.eu/XML/METS/SIPExtensionMETS
    https://earksip.dilcis.eu/schema/DILCISExtensionSIPMETS.xsd"
    OBJID="Product_Model_Package" TYPE="OTHER" csip:OTHERTYPE="Product Model
    Data" csip:CONTENTINFORMATIONTYPE="cits3D HM_v1_0" LABEL="Product Model Data
    from Landivisiau Engineering SARL" PROFILE="https://cits3D
    HM.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" >
```

```xml
    <mets:name>heritage 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>Fonds Landernau</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>Archive Bretagne</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:digiprovMD ID="rights-premis-file2" 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:digiprovMD>
<mets:digiprovMD ID="rights-premis-file3" 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:digiprovMD>
      </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/valpropsrulesdata1.docx" />
```

```xml
        </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-schema1" 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" ADMD="digiprov-pm-file1 rights-
    pm-file1" DMDID="dmd-ead-file" csip:CONTENTINFORMATIONTYPE="cits3D HM_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" ADMD="digiprov-pm-file1 rights-pm-file2" DMDID="dmd-ead-file"
    csip:CONTENTINFORMATIONTYPE="cits3D HM_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-3D HM-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-paradata-div" LABEL="Paradata
    Documentation" >
 <mets:fileptr FILEID="filegrp-documentation-paradata" />
    </mets:div>
<mets:div ID="structmap-documentation-other-div" LABEL="Other Documentation" >
```

```
<mets:fileptr FILEID="filegrp-documentation-other" />
    </mets:div>
<mets:div ID="structmap-documentation-authentication-div" LABEL="Authentication
    Documentation" >
<mets:fileptr FILEID="filegrp-documentation-authentication" />
    </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>
    </mets>
```

4.3.3   Representation METS Files

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

4.3.3.1   Representation METS root element

CITS 3D HM 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 HM.

Table 5: Representation METS root element (element METs root)

ID	Name, Location and Description	Card & Level
3D HM34	**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
3D HM35	**METS profile** `mets/@PROFILE` The value is set to "https://CITS3D HM.dilcis.eu/profile/E-ARK-3D HM-REP-v1-0-0.xml"	1..1 MUST
3D HM36 **Ref CSIP2**	**Content category** `mets/@TYPE` The `mets/@TYPE` attribute is set to the value "OTHER"	1..1 MUST
3D HM37 **Ref CSIP3**	**Other content category** `mets/@csip:OTHERTYPE` The `mets/@csip:OTHERTYPE` attribute is set to the value "Heritage Model Data"	1..1 MUST
3D HM38 **Ref CSIP 4**	**Content information type specification** `mets/@csip:CONTENTINFORMATIONTYPE` The `mets/@csip:CONTENTINFORMATIONTYPE` attribute is set to the value "cite3D HM_v1_0"	1..1 MUST

Example 8: Representation METS root element (element METS root)

```
<mets:mets OBJID="Product Model Representation" TYPE="OTHER"
csip:OTHERTYPE="Product Model Data" csip:CONTENTINFORMATIONTYPE="cits3D
HM_v1_0 " PROFILE="https://cits3D HM.dilcis.eu/profile/E-ARK-3dpm-REP-v1-0-
0.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/SIPExtensionMETS
https://earksip.dilcis.eu/schema/DILCISExtensionSIPMETS.xsd" />
```

4.3.3.2 Representation METS header element (element metsHdr)

There are no specific requirements for the header element in a CITS 3D HM Representation METS. The 3D HM 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 Heritage Model representation.

4.3.3.3 Representation METS descriptive metadata section (element dmdSec)

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

Example 9: Representation METS descriptive metadata (element dmdSec)

```
<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>
```

4.3.3.4 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 avaiable Guidelines published by the PREMIS EC Guidelines: http://www.loc.gov/standards/premis/Guidelines2017-premismets.pdf) and hence all preservation metadata should be referenced from single or multiple digiprovMD elements within the amdSec.

Note that CITS PREMIS requires that all PREMIS is referenced from the digiprovMD element, including PREMIS Rights information and not via a separate rightsMD statement.

There are no specific requirements in CITS 3D HM for the representation METS administrative metadata section.

```xml
<mets:amdSec>
<mets:digiprovMD ID="digiprov-premis-file4" CREATED="2024-04-
    24T15:27:45.702+01:00" STATUS="CURRENT" >
 <mets:mdRef LOCTYPE="URL" xlink:href="metadata/preservation/premis4.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>
```

4.3.4   Representation METS file metadata section (element fileSec)

The CSIP does not make use of the METS fileSec element mandatory, but it is strongly recommended. In CITS 3D HM the use of the METS fileSec element at the Representation level becomes mandatory, such as to reference the file groups containing data, Paradata Documentation, Authentication Documentation and Other Documentation.

Table 6: Representation METS fileSec element (element fileSec)

ID	Name, Location and Description	Card & Level
3D HM39 **ref CSIP58**	**File section** `mets/fileSec` 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.	**1..1** MUST
3D HM40	**Paradata Documentation file group** `Mets/fileSec/fileGrp[@USE='Paradata Documentation']` All Paradata Documentation located in the documentation/paradata folder is placed in one or more file group elements with `mets/fileSec/fileGrp/@USE` attribute value 'Paradata Documentation' taken from the vocabulary.	**1..n** MUST
3D HM41	**Authentication Documentation file group** `Mets/fileSec/fileGrp[@USE='Authentication Documentation']` All Authentication Documentation located in the documentation/authentication folder is placed in one or more file group elements with `mets/fileSec/fileGrp/@USE` attribute value 'Authentication Documentation' taken from the vocabulary.	**1..n** MUST
3D HM42	**Other Documentation file group** `Mets/fileSec/fileGrp[@USE='Other Documentation']` All Other Documentation located in the documentation/other folder is placed in one or more file group elements with `mets/fileSec/fileGrp/@USE` attribute value 'Other Documentation' taken from the vocabulary.	**1..n** MUST
3D HM43 **ref CSIP61**	**Reference to administrative metadata** `mets/fileSec/filegrp/@ADMID`	**1..1** MUST

	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 are rights and/or digital provenance metadata that are general to the package.	
3D HM44 **ref CSIP62**	**Content information type specification** `mets/fileSec/fileGrp/@csip:CONTENTINFORMATIONTYPE` The value of the attribute `mets/fileSec/fileGrp/@csip:CONTENTINFORMATIONTYPE` is set to "cits3D HMI_v1_0". See also: Vocabulary Content information type specification	1..1 MUST

Example 11: Representation METS file section (element fileSec)

```
<mets:fileSec ID="filesec-example" >
<mets:fileGrp ID="filegrp-documentation-paradata" USE="Documentation" >
<mets:file ID="file-documentation-acqparams-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/paradata/acqparams.docx" />
    </mets:file>
<mets:file ID="file-documentation-verificationrep-file1"
    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/paradata/verificationrep.docx" />
    </mets:file>
    </mets:fileGrp>
<mets:fileGrp ID="filegrp-original-point-cloud-model" USE="Representations"
    csip:CONTENTINFORMATIONTYPE="cits3D HM_v1_0" ADMD="digiprov-premis-file-4" >
<mets:file ID="file-original-point-cloud-model" MIMETYPE="e57" 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/scanfile.e57"
    />
    </mets:file>
    </mets:fileGrp>
    </mets:fileSec>
    </Example>
<Example ID="structMapExample" LABEL="METS representation example of the
    mandatory structural map including representations for eHealth1" >
<mets:structMap ID="struct-map-example" TYPE="PHYSICAL" LABEL="CSIP" >
<mets:div ID="struct-map-example-div" LABEL="cits-3D HM-example" >
 <mets:div ID="struct-map-metadata-div" LABEL="Metadata" ADMD="digiprovpremis-
    file-4" />
<mets:div ID="struct-map-documentation-div" LABEL="Documentation" >
<mets:div ID="structmap-documentation-paradata-div" LABEL="Paradata
    Documentation" >
 <mets:fileptr FILEID="filegrp-documentation-paradata" />
    </mets:div>
<mets:div ID="structmap-documentation-other-div" LABEL="Other Documentation" >
 <mets:fileptr FILEID="filegrp-documentation-other" />
```

```xml
      </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-data-div" LABEL="Representations" >
 <mets:fptr FILEID="filegrp-original-point-cloud-model" />
      </mets:div>
      </mets:div>
      </mets:structMap>
      </Example>
<Appendix NUMBER="1" LABEL="Example of a whole METS document describing a
    representation following CITS 3D HM (cits3D HM_v1_0)." >
 <mets:mets OBJID="Product Model Representation" TYPE="OTHER"
    csip:OTHERTYPE="Product Model Data" csip:CONTENTINFORMATIONTYPE="cits3D
    HM_v1_0 " PROFILE="https://cits3D HM.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/SIPExtensionMETS
    https://earksip.dilcis.eu/schema/DILCISExtensionSIPMETS.xsd" />
<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>heritage 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>Fonds Landernau</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>Archive Bretagne</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-file4" CREATED="2024-04-
    24T15:27:45.702+01:00" STATUS="CURRENT" >
 <mets:mdRef LOCTYPE="URL" xlink:href="metadata/preservation/premis4.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" >
<mets:fileGrp ID="filegrp-documentation-paradata" USE="Documentation" >
<mets:file ID="file-documentation-acqparams-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/paradata/acqparams.docx" />
    </mets:file>
<mets:file ID="file-documentation-verificationrep-file1"
          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/paradata/verificationrep.docx" />
    </mets:file>
    </mets:fileGrp>
<mets:fileGrp ID="filegrp-original-point-cloud-model" USE="Representations"
          csip:CONTENTINFORMATIONTYPE="cits3D HM_v1_0" ADMD="digiprov-premis-file-4" >
<mets:file ID="file-original-point-cloud-model" MIMETYPE="e57" 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/scanfile.e57"
          />
    </mets:file>
    </mets:fileGrp>
    </mets:fileSec>
```

4.3.4.1 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.

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

The structural map should reference the documentation/authentication file group located in the documentation/paradata 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 HM CITS, which differ from the CSIP, are listed in the following table.

Table 7: Representation METS structural map (element structMap)

ID	Name, Location and Description	Card & Level
3D HM45	**Paradata documentation division** `mets/structMap[@LABEL='CSIP']/div/div/div[@ LABEL='Paradata Documentation']` Paradata documentation referenced in the file section file groups is described in the structural map with two sub divisions.	**1..1** MUST
3D HM46	**Paradata documentation division identifier** `mets/structMap[@LABEL='CSIP']/div/div/div[@LABEL='Par adata Documentation']/@ID` Mandatory, xml:id identifier must be unique within the package.	**1..1** MUST

3D HM47	**Paradata documentation division label** `mets/structMap[@LABEL='CSIP']/div/div/div[@LABEL='Paradata Documentation']` The 'Paradata Documentation' division `<div>` element in the package uses the value 'Paradata Documentation' from the vocabulary as the value for the `@LABEL` attribute.	**1..1** MUST
3D HM48	**Paradata documentation file references** `mets/structMap[@LABEL='CSIP']/div/div/div[@LABEL='Paradata Documentation']/fptr` File groups containing 'Paradata Documentation' are referenced via a relevant file group identifiers.	**1..n** MUST
3D HM49	**Paradata documentation file group reference pointer** `mets/structMap[@LABEL='CSIP']/div/div/div[@LABEL='Paradata Documentation']/fptr/file@ID` A reference, by ID, to 'Verification Documentation' file groups.	**1..1** MUST
3D HM50	**Authentication documentation division** `mets/structMap[@LABEL='CSIP']/div/div/div[@LABEL='Authentication Documentation']` Authentication documentation referenced in the file section file groups is described in the structural map with two sub divisions.	**1..1** MUST
3D HM51	**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
3D HM52	**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 'Auethentication Documentation' from the vocabulary as the value for the `@LABEL` attribute.	**1..1** MUST
3D HM53	**Authentication documentation file references** `mets/structMap[@LABEL='CSIP']/div/div/div[@LABEL='Paradata Documentation']/fptr` File groups containing 'Authentication Documentation' are referenced via a relevant file group identifiers.	**1..n** MUST
3D HM54	**Authentication documentation file group reference pointer** `mets/structMap[@LABEL='CSIP']/div/div/div[@LABEL='Paradata Documentation']/fptr/file@ID` A reference, by ID, to 'Authentication Documentation' file groups.	**1..1** MUST
3D HM55	**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 two sub-divisions.	**1..1** SHOULD
3D HM56	**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** SHOULD
3D HM57	**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
3D HM58	**Other documentation file references** `mets/structMap[@LABEL='CSIP']/div/div/div[@LABEL='Other Documentation']/fptr`	**1..n** MUST

	File groups containing 'Other Documentation' are referenced via a relevant file group identifiers.		
3D HM59	**Other documentation file group reference pointer**	**1..1**	
	`mets/structMap[@LABEL='CSIP']/div/div/div[@LABEL='Other Documentation']/fptr/file@ID`	MUST	
	A reference, by ID, to 'Other Documentation' file groups.		
3D HM60	**Data division**	**1..n**	
ref CSIP105	`mets/structMap/div/div/` Within 3D PH CITS data MUST be held in a data folder within a minimum single representation and described in the structMap within a single sub-division.	MUST	
3D HM61	**Data division identifier**	**1..1**	
	`mets/structMap/div/div/@ID` Mandatory, xml:id identifier must be unique within the package.	MUST	
3D HM62	**Data division label**	**1..1**	
	`mets/structMap/div/div/@LABEL` The package's data division <div> element must have the `@LABEL` attribute value "DATA", taken from the vocabulary.	MUST	
3D HM63	**Data file references**	**1..n**	
	`mets/structMap[@LABEL='CSIP']/div/div/div[@LABEL='Other Documentation']/fptr` File groups containing 'Data' are referenced via a relevant file group identifiers.	MUST	
3D HM64	**Data file group reference pointer**	**1..1**	
	`mets/structMap[@LABEL='CSIP']/div/div/div[@LABEL='Authentication Documentation']/fptr/file@ID` A reference by ID, to 'Data' file groups.	MUST	

Example 12: Representation Structural Map (element structMap)

```
<mets:structMap ID="struct-map-example" TYPE="PHYSICAL" LABEL="CSIP" >
<mets:div ID="struct-map-example-div" LABEL="cits-3D HM-example" >
 <mets:div ID="struct-map-metadata-div" LABEL="Metadata" ADMD="digiprovpremis-
    file-4" />
<mets:div ID="struct-map-documentation-div" LABEL="Documentation" >
<mets:div ID="structmap-documentation-paradata-div" LABEL="Paradata
    Documentation" >
 <mets:fileptr FILEID="filegrp-documentation-paradata" />
    </mets:div>
<mets:div ID="structmap-documentation-other-div" LABEL="Other 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-data-div" LABEL="Representations" >
 <mets:fptr FILEID="filegrp-original-point-cloud-model" />
    </mets:div>
    </mets:div>
    </mets:structMap>
```

4.3.4.2   Whole representation METS file example

Example 13: Representation METS whole file example

```
<mets>
<mets:mets OBJID="Product Model Representation" TYPE="OTHER"
    csip:OTHERTYPE="Product Model Data" csip:CONTENTINFORMATIONTYPE="cits3D
    HM_v1_0 " PROFILE="https://cits3D HM.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
```

```xml
        https://DILCIS.eu/XML/METS/CSIPExtensionMETS
        https://earkcsip.dilcis.eu/schema/DILCISExtensionMETS.xsd
        https://DILCIS.eu/XML/METS/SIPExtensionMETS
        https://earksip.dilcis.eu/schema/DILCISExtensionSIPMETS.xsd" />
<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>heritage 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>Fonds Landernau</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>Archive Bretagne</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-file4" CREATED="2024-04-
    24T15:27:45.702+01:00" STATUS="CURRENT" >
 <mets:mdRef LOCTYPE="URL" xlink:href="metadata/preservation/premis4.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" >
<mets:fileGrp ID="filegrp-documentation-paradata" USE="Documentation" >
<mets:file ID="file-documentation-acqparams-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/paradata/acqparams.docx" />
    </mets:file>
<mets:file ID="file-documentation-verificationrep-file1"
    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/paradata/verificationrep.docx" />
    </mets:file>
    </mets:fileGrp>
<mets:fileGrp ID="filegrp-original-point-cloud-model" USE="Representations"
    csip:CONTENTINFORMATIONTYPE="cits3D HM_v1_0" ADMD="digiprov-premis-file-4" >
<mets:file ID="file-original-point-cloud-model" MIMETYPE="e57" SIZE="10338744"
    CREATED="2024-04-24T14:33:23.617+01:00"
```

```xml
          CHECKSUM="B1CF59678A21C2805370536AB1097735D7E9F3FDDDCAE3757426ED85F6350A48"
          CHECKSUMTYPE="SHA-256" >
   <mets:FLocat LOCTYPE="URL" xlink:type="simple" xlink:href="data/scanfile.e57"
          />
       </mets:file>
       </mets:fileGrp>
       </mets:fileSec>
   <mets:structMap ID="struct-map-example" TYPE="PHYSICAL" LABEL="CSIP" >
   <mets:div ID="struct-map-example-div" LABEL="cits-3D HM-example" >
     <mets:div ID="struct-map-metadata-div" LABEL="Metadata" ADMD="digiprovpremis-
          file-4" />
   <mets:div ID="struct-map-documentation-div" LABEL="Documentation" >
   <mets:div ID="structmap-documentation-paradata-div" LABEL="Paradata
          Documentation" >
     <mets:fileptr FILEID="filegrp-documentation-paradata" />
       </mets:div>
   <mets:div ID="structmap-documentation-other-div" LABEL="Other 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-data-div" LABEL="Representations" >
     <mets:fptr FILEID="filegrp-original-point-cloud-model" />
       </mets:div>
       </mets:div>
       </mets:structMap>
    </mets>
```

4.3.5   PREMIS

4.3.5.1   Use of PREMIS in CITS 3D PM

The use of PREMIS within the 3D HM 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). From the principles above:

3D HM6: there SHOULD be (a) PREMIS file(s) produced according to the CSPM and adjusted to the requirements of this CITS in the metadata/preservation folder of the Information Package.

3D HM7: there SHOULD be (a) PREMIS file(s) produced according to CSPM 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

4.3.5.2   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. If local vocabularies are used within the repository then these should be included within each package.

4.3.5.3   Use of PREMIS at package level

PREMIS can be used in addition METS at package level to record preservation and rights metadata. Note that if PREMIS is used then the requirements of the CITS Preservation apply and those provided by the CITS 3D HM are in addition to these.

3D HM65 Preservation information for the entire package (e.g. provenance, preservation actions) MAY be recorded within a PREMIS file located in the metadata/preservation folder and must follow Guidelines set out in CITS PREMIS.

3D HM66 Rights for the entire package (e.g. copyright, license, other, rights grants) MAY be recorded within a PREMIS file located in the metadata/preservation folder using the PREMIS Rights semantic unit and must follow the Guidelines set out in CITS PREMIS. Each individual rights statement (copyright, licence, other, rights granted) must be held in a separate rightsStatement. 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.

4.3.5.4   Use of PREMIS at Representation level

PREMIS can be used in addition METS at Representation level to record preservation and rights metadata. Preservation information can include details of the object creating application via the creatingApplication semantic container and the required rendering environment via the Environment entity. Note that if PREMIS is used then the requirements of the CITS Preservation apply and those provided by the CITS 3D HM are in addition to these.

3D HM67: Preservation information for each Representation (e.g. provenance, preservation actions, creating application, rendering environment) MAY be recorded within a PREMIS file located in the representation/metadata/preservation folder and must follow Guidelines set out in CITS PREMIS.

3D HM68 Rights information for specific represenattions of the 3D model (e.g. copyright, license, other, rights grants) MAY be recorded within a PREMIS file located in the metadata/preservation folder of each representation using the PREMIS Rights semantic unit and must follow the Guidelines set out in CITS PREMIS. Each individual rights statement (copyright, licence, other, rights granted) must be held in a separate rightsStatement. 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.

3D HM48: Heritage Model authentication events MAY be recorded within a PREMIS file located in each representation/metadata/preservation folder, using the PREMIS event semantic unit 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.

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).
Authentication	Process of establishing the authenticity or quality of a digital object either through tests against given rules or through validation of Digital Signatures.
Building Information Modeling (BIM)	A process involving the generation and management of digital representations of the physical and functional characteristics of buildings and other physical assets.
Cardinality	The term describes the possible number of occurrences for elements in a set. The numbers have the following meanings: (1..1) – in each set, there is exactly 1 such element present (0..1) – the set can contain from 0 to 1 of such elements (1..n) – the set contains at least one element (0..n) – the set can contain up to n of such elements, but it is not mandatory (0..0) – the element is prohibited to use
Computer Aided Design (CAD)	A way to digitally model 2D drawings and 3D models of real-world objects (mobile and immobile).
Content Data Object	The Data Object, that together with associated Representation Information comprises the Content Informartion (Source OAISA – 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 Object composed of its Content Data Object and its Representation Information. (Source 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 Model meets quality requirements within defined tolerances, i.e. that a specific representation represents the 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
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
Dissemenation 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.
Heritage Model	A 3D digital model produced by means of a cultural heritage asset such as an object, building, or archeological site.
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 **MUST –** this means that the definition is an absolute requirement

	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 **MUST NOT** – this means that the prohibition described in the requirement is an absolute prohibition of the use of the element. **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. **MAY** – means that a requirement is entirely optional.
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 Model or Native Representation	Used specially to keep the design intent for long term archiving in the contact of certification and legal requirements for proof. It can be stored in native or standardised formats.
Paradata	Documentation of the evaluative, analytical, deductive, interpretative and creative decisions made in the course of computer-based recorded in such a way that the relationship between research sources, implicit knowledge, explicit reasoning, and visualisation-based outcomes can be understood.
Preservation Description Information (PDI)	The information which is necessary for adequate preservation of the Content Information and which can be categorised as Provenance, Reference, Fixity and Access Rights Information.
Producer	The producer is an organisation, person, or client system, which provides the information to be preserved. This can include other archives or internal archive personnel or system components. Typical roles of type "producer" may be. System Designers, Design Engineers, Subcontractors, Manufactures or Test Engineers. (Source EN 9300)
RDBMS	Relational Database Management System

Representation	A Representation within an Infiormation 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 Representatiuon Information must enable or allow the re-creation of the significant properties of the original data 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. (Source EN9300)
Submission Agreement	The agreement reached between an archive and the submission producer that specifies a submission format (eHealth1 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.
Validation	Validation is applied to guarantee the integrity of the content of a Document throughout the entire process of long-term archiving. Validation is typically performed by calculation and comparison of Validation Properties which are like a fingerprint for the content of the Document. Each change of the content changes one or more attributes of the Validation Properties.
Verification	A process to ensure that data is correctly represented (e.g in a package representation). Verification rules ensure that a data representation meet he quality requirements within defined tolerances. Verification rules at domain specific

	(CAD, PDM, Electronic Assembly, Fluid Dynamics) and are defined within EN 9300. (Source EN 9300)

6 Vocabularies

6.1 Vocabulary3D HM

Value	Description
cits3D HM_v1_0	Content Information Type : `mets/@csip:CONTENTINFORMATIONTYPE`
Heritage Model Data	Other Content Category: `mets/@csip:OTHERTYPE`
Other Documentation	Other Documentation fileGrp and division label: `mets/structMap[@LABEL='CSIP']/div/div/div[@LABEL='Other Documentation']`
Paradata Documentation	Paradata documentation fileGrp and division label `mets/structMap[@LABEL='CSIP']/div/div/div[@LABEL=Paradata Documentation']`
Authentication Documentation	Authentication documentation fileGrp and division label `mets/structMap[@LABEL='CSIP']/div/div/div[@LABEL=Paradata Documentation']`

7 Postface

AUTHOR(S)	
Name(s)	Organisation(s)
Stephen Mackey	Penwern Limited, E-ARK Consortium

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

Project co-funded by the European Commission within the ICT Policy Support Programme Dissemination Level		
P	Public	x
C	Confidential, only for members of the Consortium and the Commission Services	

REVISION HISTORY AND STATEMENT OF ORIGINALITY

Submitted Revisions History

Revision No.	Date	Authors(s)	Organisation	Description
V1.0.0	30/08/2024	Stephen Mackey	Penwern Limited, E-ARK Consortium	Review version

Statement of originality:
This deliverable contains original unpublished work except where clearly indicated otherwise. Acknowledgement of previously published material and of the work of others has been made through appropriate citation, quotation or both.