

MPEG Interoperability Initiative: Delivery Media Representation and Segmentation

Application Specification for Digital Cinema Packaging (AS-DCP)

This document specifies a framework for mapping the AS-DCP D-Cinema Package (DCP) onto a wide variety of delivery media. In particular, it allows the segmentation of the DCP across multiple distinct physical or logical volumes. A mapping to UDF-formatted media is described.

NOTICE

This document is provided without warranty as to its fitness for a particular purpose.

Document type: Standard
Document subtype:
Document stage: Draft
Document language: English

Contents

1.	Introduction	2
2.	Normative References	3
3.	Overview	3
4.	Asset Map	4
4.1	AssetMap Structure	4
4.2	Asset Structure	5
4.3	Chunk Structure	6
4.4	Asset Map Sample [Informative]	6
4.5	XML Schema	7
5.	Media-Specific Constraints	8
5.1	Asset Map Location	8
5.2	VolumeIndex Location	8
5.3	Asset Path	8
6.	Annex – Mapping to UDF-Formatted Magnetic Media	8
6.1	File System Constraints	8
6.2	Asset Map Location	8
6.3	VolumeIndex	8
6.4	Chunk Path Format	9
6.5	Physical Delivery Media Specification	9
7.	Change History	9

1. Introduction

D-cinema content is composed of a number of distinct assets¹ such as Composition Lists and Track Files. For delivery, these assets are combined into logical D-Cinema Packages (DCP). Each DCP is meant to correspond to a single delivery event and contains a single Packing List. The Packing List, an asset itself, enumerates all the assets included in the DCP, and allows a traceable and error-free delivery. For convenience, multiple DCPs may be combined onto a single delivery medium.

The DCP is specified independently of the delivery media used for distribution. This layered approach has two distinct advantages. First it simplifies specification by removing dependence on past, current, or future media constraints. Second it allows the DCP and its underlying assets to be created once and distributed on multiple delivery media. Consequently the Packing List does not contain the location of each asset on the delivery medium, but rather the unique identifier, i.e. UUID, associated with each AS-DCP asset.

This document describes a framework and corresponding data structures enabling the representation of the DCP on a wide range of distribution media. In particular, it allows mapping of Packing List asset identifiers to actual asset location, e.g. file path, on the delivery medium. It also accommodates the segmentation of the DCP and its related assets across distinct volumes, e.g. discs. Such segmentation will be required for delivery on some media, e.g. DVD-ROM, due to the relatively large size of the DCP.

This document also specifies a mapping to UDF-formatted media using this generic framework.

¹The term “asset” is used throughout instead of “file”. Although assets will be represented as individual files in most circumstances, this document does not make this assumption. The idea is to accommodate schemes where assets are stored in a database structure, for instance.

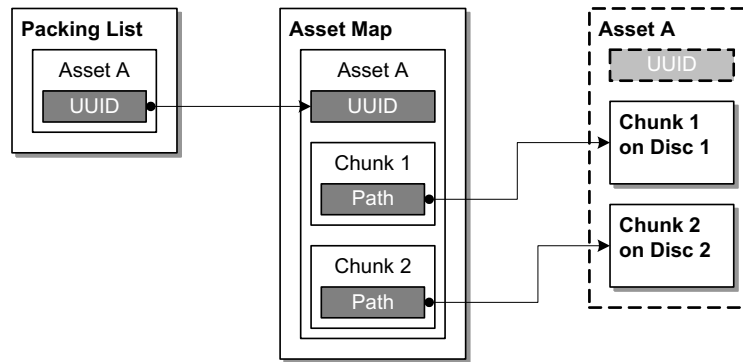


Figure 1. Relationship between the Packing List and Asset Map structures.

The Asset Map structure is used to map UUIDs contained in the Packing List to actual files on the delivery medium.

2. Normative References

The following standards contain provisions which, through reference in this text, constitute provisions of this standard. At the time of publication, the editions indicated were valid. All standards are subject to revision, and parties to agreements based on this standard are encouraged to investigate the possibility of applying the most recent edition of the standards indicated below.

[XSCH] XML Schema 1.0, W3C Recommendation, [2 May 2001].
<http://www.w3.org/TR/2001/REC-xmlschema-1-20010502/>

[XML] World Wide Web Consortium (W3C) Recommendation (06 October 2000).
Extensible Markup Language (XML) <http://www.w3.org/TR/2000/REC-xml-20001006>

[UUID] The Internet Engineering Task Force (IETF) . A UUID URN Namespace [WWW document]. URL <http://www.ietf.org/internet-drafts/draft-mealling-uuid-urn-03.txt> (update)

MPEG Interop: Packing List Specification

MPEG Interop: Composition Playlist Specification

[UDF] Universal Disk Format Specification, Revision 2.01, Optical Storage Technology Association.

3. Overview

The framework described in this document maps the assets belonging to n DCPs onto a delivery medium consisting of m distinct volumes. Each volume is uniquely identified by its VolumeIndex identifier and corresponds, for instance, to a distinct file system partition or physical disc. The mapping is represented by a single Asset Map structure, which is replicated on all volumes.

The AssetMap structure enumerates all assets included on the delivery medium. Each asset is uniquely identified by its UUID, as defined by the Packing List, and may be further divided into Chunks. Each Chunk links a particular segment of the asset to an actual location on the delivery medium.

The AssetMap structure does not contain any specific information on the nature of the assets themselves other than their UUID. This information is already contained in the Packing List. The AssetMap structure does however specifically identify Packing Lists assets as such. This enables receiving devices to rapidly identify the number of DCPs contained in the delivery medium and locate each Packing List.

The structures defined in this document are represented using the XML language [XML], and specified using the W3C schema language [XSCH]. This version of the specification is associated with a unique XML namespace, namely <http://www.digicine.com/PROTO-ASDCP-AM-20040311#>. This namespace conveys both structural and semantic version information, and serves the purpose of a traditional version number field. Table 1 lists the XML namespaces used in this specification [XNAM].

Table 1. XML Namespaces.

Qualifier	URI
cpl	http://www.digicine.com/PROTO-ASDCP-CPL-20040511#
xs	http://www.w3.org/2001/XMLSchema
ds	http://www.w3.org/2000/09/xmldsig#

The Asset Map shall be encoded using the UTF-8 character encoding scheme.

4. Asset Map

4.1 AssetMap Structure

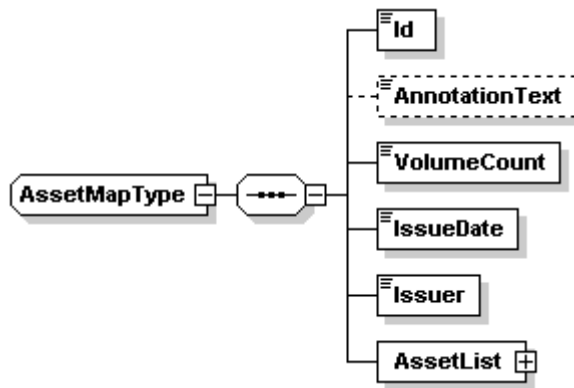


Figure 2. AssetMap structure. Dotted lines denote an optional element.

4.1.1 Id

The Id parameter uniquely identifies the Asset Map structure. It is encoded as a UUID [UUID].

4.1.2 AnnotationText [optional]

The AnnotationText parameter is a free-form, human-readable annotation describing the Asset Map. It is meant strictly as a display hint to the user.

4.1.3 VolumeCount

The VolumeCount parameter indicates the total number of volumes that are referenced by this Asset Map.

4.1.4 IssueDate

The IssueDate parameter indicates the time and date at which the Asset Map was issued. It may be displayed to the user.

4.1.5 Issuer

The Issuer parameter is a free-form, human-readable annotation describing the person or company who has created the Asset Map for distribution. It is meant strictly as a display hint to the user.

4.1.6 Creator

The Creator parameter is a free-form, human-readable annotation describing the system (hardware/software) that was used to create the Asset Map for distribution. It is meant strictly as a display hint to the user.

4.1.7 AssetList

The AssetList parameter contains a list of asset elements. The structure of the latter is described in Section 4.2.

4.2 Asset Structure

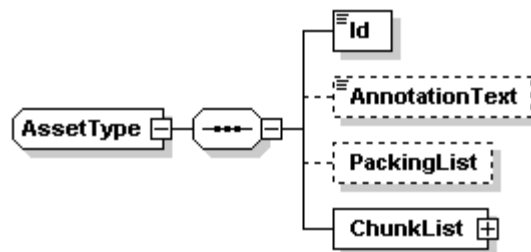


Figure 3. Asset Structure. Dotted lines denote an optional element.

4.2.1 Id

The Id parameter uniquely identifies the asset for management purposes. It is represented by a UUID.

4.2.2 AnnotationText [optional]

The AnnotationText parameter is a free-form, human-readable annotation describing the asset. It is meant strictly as a display hint to the user.

4.2.3 PackingList [optional]

The PackingList parameter indicates whether the asset is a Packing List. If present, the asset is a Packing List.

4.2.4 ChunkList

The ChunkList parameter contains a list of asset chunk elements. The structure of chunk elements can be found in section 4.3

4.3 Chunk Structure

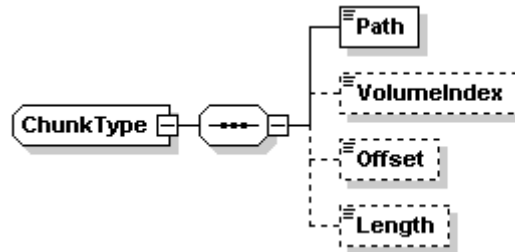


Figure 4. Chunk Structure. Dotted lines denote an optional element.

4.3.1 Path

The Path parameter indicates the complete path for the chunk. Its semantics and format are delivery-medium dependent.

4.3.2 VolumeIndex [optional]

The VolumeIndex parameter indicates the index of the volume that contains the chunk. The first volume shall be volume 1. If the VolumeIndex parameter is absent, the chunk belongs to volume 1.

4.3.3 Offset [optional]

The Offset parameter indicates the offset from the start of the asset to the first byte of the asset segment referenced by this chunk. If the Offset parameter is absent, the chunk is assumed to start at the beginning of the asset.

4.3.4 Length [optional]

The Length parameter identifies the length in bytes of the chunk. If the Length parameter is absent, the length of the chunk is assumed to be that of the asset.

4.4 Asset Map Sample [Informative]

The following Asset Map sample XML structure is a valid instance of the Asset Map schema.

```
<?xml version="1.0" encoding="UTF-8"?>
<AssetMap xmlns="http://www.digicine.com/PROTO-ASDCP-AM-20040311#"
          xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance">
  <Id>urn:uuid:00002000-0000-0000-0000-000000000000</Id>
  <AnnotationText>Magic Packager 3.2</AnnotationText>
  <VolumeCount>2</VolumeCount>
  <IssueDate>2001-12-17T09:30:47-05:00</IssueDate>
  <Issuer>Analog Labs</Issuer>
  <Creator>Asset Mapper 1.0</Creator>
  <AssetList>
    <Asset>
      <Id>urn:uuid:00000003-0000-0000-0000-000000000000</Id>
      <AnnotationText>Packing List for When Pigs May Fly II</AnnotationText>
      <PackingList/>
      <ChunkList>
```

```

    <Chunk>
      <Path>/00000003-0000-0000-0000-000000000000.pkl.xml</Path>
    </Chunk>
  </ChunkList>
</Asset>
<Asset>
  <Id>urn:uuid:00000000-0000-0000-0000-000000040000</Id>
  <AnnotationText>Picture Track File for Reel #1 for When Pigs May Fly
    II</AnnotationText>
  <ChunkList>
    <Chunk>
      <Path>/00000000-0000-0000-0000-000000040000.ptk.mxf</Path>
      <VolumeIndex>1</VolumeIndex>
      <Offset>0</Offset>
      <Length>8000000</Length>
    </Chunk>
    <Chunk>
      <Path>/00000000-0000-0000-0000-000000040000.ptk.mxf</Path>
      <VolumeIndex>2</VolumeIndex>
      <Offset>8000001</Offset>
      <Length>16000000</Length>
    </Chunk>
  </ChunkList>
</Asset>
</AssetList>
</AssetMap>

```

4.5 XML Schema

```

<xs:schema targetNamespace="http://www.digicine.com/PROTO-ASDCP-AM-20040311#"
  xmlns:xs="http://www.w3.org/2001/XMLSchema"
  xmlns:cpl="http://www.digicine.com/PROTO-ASDCP-CPL-20040511#"
  elementFormDefault="qualified"
  attributeFormDefault="unqualified">
  ...
</xs:schema>

```

4.5.1 Asset Map

```

<xs:element name="AssetMap" type="am:AssetMapType"/>
<xs:complexType name="AssetMapType">
  <xs:sequence>
    <xs:element name="Id" type="cpl:UUID"/>
    <xs:element name="AnnotationText" type="cpl:UserText" minOccurs="0"/>
    <xs:element name="VolumeCount" type="xs:positiveInteger"/>
    <xs:element name="IssueDate" type="xs:dateTime"/>
    <xs:element name="Issuer" type="cpl:UserText"/>
    <xs:element name="Creator" type="cpl:UserText"/>
    <xs:element name="AssetList">
      <xs:complexType>
        <xs:sequence>
          <xs:element ref="am:Asset" maxOccurs="unbounded"/>
        </xs:sequence>
      </xs:complexType>
    </xs:element>
  </xs:sequence>
</xs:complexType>

```

4.5.2 Asset

```

<xs:complexType name="AssetType">
  <xs:sequence>
    <xs:element name="Id" type="cpl:UUID"/>
    <xs:element name="AnnotationText" type="cpl:UserText" minOccurs="0"/>
    <xs:element name="PackingList" minOccurs="0"/>
    <xs:element name="ChunkList">
      <xs:complexType>
        <xs:sequence>
          <xs:element ref="am:Chunk" maxOccurs="unbounded"/>
        </xs:sequence>
      </xs:complexType>
    </xs:element>
  </xs:sequence>

```

```
</xs:complexType>
```

4.5.3 *Chunk*

```
<xs:element name="Chunk" type="am:ChunkType"/>
<xs:complexType name="ChunkType">
  <xs:sequence>
    <xs:element name="Path" type="xs:string"/>
    <xs:element name="VolumeIndex" type="xs:positiveInteger" minOccurs="0"/>
    <xs:element name="Offset" type="xs:nonNegativeInteger" minOccurs="0"/>
    <xs:element name="Length" type="xs:positiveInteger" minOccurs="0"/>
  </xs:sequence>
</xs:complexType>
```

5. Media-Specific Constraints

The AssetMap structure makes little assumption about the structure of the underlying delivery media. This section describes additional constraints that media-specific specifications that will need to be specified to ensure interoperability.

5.1 Asset Map Location

Any media mapping specification shall clearly specify the location of the AssetMap structure. Each volume shall contain exactly one Asset Map structure.

5.2 VolumeIndex Location

For the purpose of segmentation across distinct media units, this specification assumes that each such unit is identified with a VolumeIndex. The media mapping specification shall therefore specify the location of the VolumeIndex for individual media units.

5.3 Asset Path

Media mapping specifications shall specify the format and semantics of the path parameter contained in each Chunk.

6. Informative Annex – Mapping to UDF-Formatted Magnetic Media

6.1 File System Constraints

The UDF file system shall adhere to the UDF 2.01 specification.

The UDF file system shall be contained in the first primary partition of the DOS disk partition table.

The logical block size shall be 512 bytes.

6.2 Asset Map Location

The Asset Map structure shall be contained in a file named 'ASSETMAP' located in the root directory of the UDF partition.

6.3 VolumeIndex

6.3.1 *Location*

The VolumeIndex parameter shall be contained in a file named 'VOLINDEX' located in the root directory of the UDF partition.

6.3.2 Format

The VOLINDEX file shall be a valid, UTF-8 encoded, XML file containing three elements:

1. A required, base element named "VolumeIndex"
2. A required, non-zero, positive integer element named "Index".
3. An optional text string named "AnnotationText".

6.4 Chunk Path Format

The path and filename shall conform to the UDF specification.

6.5 Physical Delivery Media Specification

The delivery medium shall be a UDF-formatted hard drive designed for external use.

The drive shall support the USB 2.0 and Firewire data interfaces.

The associated power supply shall be shipped with the drive.

The power supply mains connections shall support a universal voltage range (from 100 to 240 VAC 50/60 Hz with automatic switching) and the IEC standard power inlet.

7. Change History

Ver	Date	By	Sect	Description
1.0	20 May 2004			Revised version of SMPTE dcp_representation_v6.doc
2.0	8 June 2004			Changed namespace to digicine.com. Added VOLINDEX format. Added physical media spec.
3.0	16 June 2004			Changes based on June 9 review.
3.2	18 June 2004			Changes based on review.
3.3	30 July 2004			Clarified range of Volume Index to start at 1.
3.4	24 August 2004-08-24			Clarified that Annex is informative.