
**Digital cinema (D-cinema) — XML data
types**

Cinéma numérique (cinéma D) — Types de données XML

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Case postale 56 • CH-1211 Geneva 20
Tel. + 41 22 749 01 11
Fax + 41 22 749 09 47
E-mail copyright@iso.org
Web www.iso.org

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Foreword

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The main task of technical committees is to prepare International Standards. Draft International Standards adopted by the technical committees are circulated to the member bodies for voting. Publication as an International Standard requires approval by at least 75 % of the member bodies casting a vote.

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. ISO shall not be held responsible for identifying any or all such patent rights.

ISO 26433 was prepared by the Society of Motion Picture and Television Engineers (as SMPTE 433-2008) and was adopted, under a special “fast-track procedure”, by Technical Committee ISO/TC 36, *Cinematography*, in parallel with its approval by the ISO member bodies.

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Introduction

This International Standard comprises SMPTE 433-2008 and Annex ZZ (which provides equivalences between ISO standards and SMPTE standards referenced in the text).

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SMPTE STANDARD

D-Cinema — XML Data Types



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Foreword

SMPTE (the Society of Motion Picture and Television Engineers) is an internationally-recognized standards developing organization. Headquartered and incorporated in the United States of America, SMPTE has members in over 80 countries on six continents. SMPTE's Engineering Documents, including Standards, Recommended Practices and Engineering Guidelines, are prepared by SMPTE's Technology Committees. Participation in these Committees is open to all with a bona fide interest in their work. SMPTE cooperates closely with other standards-developing organizations, including ISO, IEC and ITU.

SMPTE Engineering Documents are drafted in accordance with the rules given in Part XIII of its Administrative Practices.

SMPTE Standard 433 was prepared by Technology Committee DC28.

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Introduction

In the development of XML Schema for a number of D-Cinema artifacts, it was observed that a number of common data types were defined and redefined multiple times in application schemas. This document combines the definition of the most commonly duplicated data types in a single namespace, along with additional types that are most commonly defined in large XML projects, and which have general applicability to the field of Digital Cinema Systems. The intention is that this namespace can be included in other schema to easily use these types as needed. These data types are defined using W3C XML Schema Definition Language (XSDL) as defined in [XML-SCH-1].

1 Scope

The purpose of this document is to define and describe common data types used in D-Cinema metadata structures for applications using XML as a data description language. In addition, this document includes normative references for types and identifiers, defined elsewhere, which are necessary to use XML in standards documents. The structure and composition of the types defined in this document are simple yet general in order to promote reusability in other standards.

2 Conformance Notation

Normative text is text that describes elements of the design that are indispensable or contains the conformance language keywords: "shall", "should", or "may". Informative text is text that is potentially helpful to the user, but not indispensable, and can be removed, changed, or added editorially without affecting interoperability. Informative text does not contain any conformance keywords.

All text in this document is, by default, normative, except: the Introduction, any section explicitly labeled as "Informative" or individual paragraphs that start with "Note:"

The keywords "shall" and "shall not" indicate requirements strictly to be followed in order to conform to the document and from which no deviation is permitted.

The keywords, "should" and "should not" indicate that, among several possibilities, one is recommended as particularly suitable, without mentioning or excluding others; or that a certain course of action is preferred but not necessarily required; or that, (in the negative form) a certain possibility or course of action is deprecated but not prohibited.

The keywords "may" and "need not" indicate courses of action permissible within the limits of the document.

The keyword "reserved" indicates a provision that is not defined at this time, shall not be used, and may be defined in the future. The keyword "forbidden" indicates "reserved" and in addition indicates that the provision will never be defined in the future.

A conformant implementation according to this document is one that includes all mandatory provisions ("shall") and, if implemented, all recommended provisions ("should") as described. A conformant implementation need not implement optional provisions ("may") and need not implement them as described.

3 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.

[XML-SCH-1] XML Schema Part 1: Structures <http://www.w3.org/TR/xmlschema-1-20041028/>

[XML-SCH-2] XML Schema Part 2: Datatypes <http://www.w3.org/TR/xmlschema-2-20041028/>

[ISO-639-2] International Standards Organization (ISO) ISO-639-2 Codes for the representation of names of languages -- Part 2: Alpha-3 code.

Normative Text: <http://www.loc.gov/standards/iso639-2/normtext.html>

Registration Authority: US Library of Congress: <http://www.loc.gov/standards/iso639-2/>

[ISO-3166-1] International Standards Organization (ISO) ISO 3166-1 Codes for the representation of names of countries and their subdivisions - Part 1: Country codes

Official List: <http://www.iso.org/iso/en/prods-services/iso3166ma/02iso-3166-code-lists/list-en1.html>

Decoding Table: http://www.iso.ch/iso/en/prods-services/iso3166ma/02iso-3166-code-lists/iso_3166-1_decoding_table.html

[RFC-4122] Internet Engineering Task Force (IETF) RFC 4122 "A Universally Unique Identifier (UUID) URN Namespace" <http://www.ietf.org/rfc/rfc4122.txt>

[RFC-3066] Internet Engineering Task Force (IETF) RFC 3066 "Tags for Identification of Languages" (January 2001) <http://www.ietf.org/rfc/rfc3066.txt>

[RFC-3629] Internet Engineering Task Force (IETF) RFC 3629: "UTF-8, a transformation format of ISO 10646" <http://www.ietf.org/rfc/rfc3629.txt>

[D-Cert] SMPTE 430-2-2006, D-Cinema Operations – Digital Certificate

4 DCML Namespace

This document uses many of the basic datatypes specified in [XML-SCH-2] to define a number of derived types for D-Cinema applications. This collection of types shall be referred to as Digital Cinema Mark-up Language (DCML).

The types defined in this document shall be included in an XML namespace, whose Namespace Name (URI) shall be:

<http://www.smpte-ra.org/schemas/433/2008/dcmlTypes/>

When published, the version number of the informative XML Schema representation of the namespace shall be set to "1.0", where "1" is the major part of the version number and "0" is the minor part. If the namespace is subsequently revised to add new types not defined in this standard, but not to modify any of the existing types in a way that breaks reverse compatibility, the minor part of the version number shall be incremented by one. If the namespace is subsequently modified with result of changing any of the types defined in this document in a way that breaks reverse compatibility, the major part of the version number shall be incremented by one. The version number shall be specified by the version attribute the xs:schema element of the XML schema that this namespace represents.

5 Basic Data Types

This section describes a set of fundamental data types that are intended for use in the construction of more complex types in application schemas.

5.1 UUID Type

UUIDs are used as object identifiers in many places in schema for D-Cinema. The structure of a UUID is normatively defined in [RFC-4122]. In schemas, UUIDs shall be represented by the following data type:

```
<xs:simpleType name="UUIDType">
  <xs:restriction base="xs:anyURI">
    <xs:pattern value="urn:uuid:[0-9a-fA-F]{8}-[0-9a-fA-F]{4}-[0-9a-fA-F]{4}-[0-9a-fA-F]{4}-[0-9a-fA-F]{12}"/>
  </xs:restriction>
</xs:simpleType>
```


5.2 User Text Type

In various places in schemas, user text data is specified. In order to provide for language specification and a default language, the following User Text type is extended from a simple string type. Schemas shall use this type to represent stored text intended for viewing by users. Note that the language identifier attribute is optional, but defaults to English in the absence of the attribute. The language identifiers are defined in [RFC-3066]. In XSDL, the User Text Type shall be defined as follows:

```
<xs:complexType name="UserTextType">
  <xs:simpleContent>
    <xs:extension base="xs:string">
      <xs:attribute name="language" type="xs:language" use="optional"
default="en"/>
    </xs:extension>
  </xs:simpleContent>
</xs:complexType>
```

5.3 Rational Type

Many relationships in media are described in terms of ratios of integers. Image aspect ratios and edit rates are common examples of this. In order to provide a consistent representation of these ratios, the Rational data type is defined as an ordered list of two long integers. The first long integer in the list is the numerator, and the second is the denominator. In XSDL, the Rational Type shall be defined as follows:

```
<xs:simpleType name="RationalType">
  <xs:restriction>
    <xs:simpleType>
      <xs:list itemType="xs:long"/>
    </xs:simpleType>
    <xs:length value="2"/>
    <xs:pattern value="^[+-]?[0-9]+ 0*[1-9][0-9]*"/>
  </xs:restriction>
</xs:simpleType>
```

5.4 Units of Measure

The basic datatypes defined in [XML-SCH-2] do not address units of measure. In Digital Cinema systems, many specifications are expressed in units of measurement, and many quantities must be measured. While the units of measurement may be implicit in some cases, in other cases explicit units are required to clarify the meaning of the measurement. This section defines XML data types for common units of measure that are useful for digital cinema applications, such as system set-up and monitoring.

5.4.1 Units of Temperature

Temperatures are normally expressed on one of three scales. This type defines a set of tokens, which provide for the expression of temperature scale units. The set of temperature unit tokens shall be defined as follows:

```
<xs:simpleType name="temperatureUnitsToken">
  <xs:restriction base="xs:token">
    <xs:enumeration value="celsius"/>
    <xs:enumeration value="fahrenheit"/>
    <xs:enumeration value="kelvin"/>
  </xs:restriction>
</xs:simpleType>
```

5.4.2 Units of Voltage

Units of voltage are well understood, but are usually scaled in chunks of three orders of magnitude when expressed as measurements. This type defines tokens for the common scaling orders used in common electronic systems. The set of voltage unit tokens shall be defined as follows:

```
<xs:simpleType name="voltageUnitsToken">
  <xs:restriction base="xs:token">
    <xs:enumeration value="volts"/>
    <xs:enumeration value="millivolts"/>
    <xs:enumeration value="microvolts"/>
  </xs:restriction>
</xs:simpleType>
```

5.4.3 Units of Current

Units of current are expressed in amperes, and are usually scaled in chunks of three orders of magnitude when expressed as measurements. This type defines tokens for the common scaling orders used in common electronic systems. The set of current unit tokens shall be defined as follows:

```
<xs:simpleType name="currentUnitsToken">
  <xs:restriction base="xs:token">
    <xs:enumeration value="amps"/>
    <xs:enumeration value="milliamps"/>
  </xs:restriction>
</xs:simpleType>
```

Current is commonly understood to be measured in two modes: either alternating current (AC) or direct current (DC). The current mode shall be expressed with a token defined in the following type:

```
<xs:simpleType name="currentModeToken">
  <xs:restriction base="xs:token">
    <xs:enumeration value="AC"/>
    <xs:enumeration value="DC"/>
  </xs:restriction>
</xs:simpleType>
```

5.4.4 Units of Duration (Time)

Duration is defined in units of seconds, where sixty seconds is one minute, sixty minutes are one hour, twenty-four hours are one day, seven days are one week, and 365 days are one year. Standard engineering practice provides the three orders of magnitude decimal offsets for subdivisions of seconds. Durations of time shall be expressed using the following tokens to convey the unit period of time expressed.

```
<xs:simpleType name="timeUnitToken">
  <xs:restriction base="xs:token">
    <xs:enumeration value="week"/>
    <xs:enumeration value="day"/>
    <xs:enumeration value="hour"/>
    <xs:enumeration value="minute"/>
    <xs:enumeration value="second"/>
    <xs:enumeration value="millisecond"/>
    <xs:enumeration value="microsecond"/>
  </xs:restriction>
</xs:simpleType>
```

Note: Durations expressed in years do not account for leap year corrections – that work is left to the application.

5.5 Temperature Type

Quantities of temperature shall be expressed with the following data type:

```
<xs:complexType name="temperatureType">
  <xs:simpleContent>
    <xs:extension base="xs:decimal">
      <xs:attribute name="units" type="dcml:temperatureUnitsToken"
use="required"/>
    </xs:extension>
  </xs:simpleContent>
</xs:complexType>
```

5.6 Voltage Type

Quantities of voltage shall be expressed with the following data type:

```
<xs:complexType name="voltageType">
  <xs:simpleContent>
    <xs:extension base="xs:decimal">
      <xs:attribute name="units" type="dcml:voltageUnitsToken"
use="required"/>
      <xs:attribute name="mode" type="dcml:currentModeToken" use="required"/>
    </xs:extension>
  </xs:simpleContent>
</xs:complexType>
```

5.7 Current Type

Quantities of current shall be expressed with the following data type:

```
<xs:complexType name="currentType">
  <xs:simpleContent>
    <xs:extension base="xs:decimal">
      <xs:attribute name="units" type="dcml:currentUnitsToken"
use="required"/>
      <xs:attribute name="mode" type="dcml:currentModeToken" use="required"/>
    </xs:extension>
  </xs:simpleContent>
</xs:complexType>
```

5.8 Duration Type

Durations (quantities of time) shall be expressed with the following data type:

```
<xs:complexType name="durationType">
  <xs:simpleContent>
    <xs:extension base="xs:decimal">
      <xs:attribute name="units" type="dcml:timeUnitToken"
use="required"/>
    </xs:extension>
  </xs:simpleContent>
</xs:complexType>
```