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Information technology — High efficiency coding and media delivery in heterogeneous environments —

Part 11: MPEG Media Transport Composition Information

Technologies de l'information — Codage à haute efficacité et livraison des medias dans des environnements hétérogènes —

Partie 11: Informations de composition pour le transport des medias MPEG

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Foreword

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The procedures used to develop this document and those intended for its further maintenance are described in the ISO/IEC Directives, Part 1. In particular the different approval criteria needed for the different types of document should be noted. This document was drafted in accordance with the editorial rules of the ISO/IEC Directives, Part 2 (see www.iso.org/directives).

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For an explanation on the meaning of ISO specific terms and expressions related to conformity assessment, as well as information about ISO's adherence to the WTO principles in the Technical Barriers to Trade (TBT), see the following URL: Foreword — Supplementary information.

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The committee responsible for this document is ISO/IEC JTC 1, *Information technology*, Subcommittee SC 29, *Coding of audio, picture, multimedia and hypermedia information*.

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ISO/IEC 23008 consists of the following parts, under the general title *Information technology — High efficiency coding and media delivery in heterogeneous environments*:

— *Part 1: MPEG media transport (MMT)*

— *Part 2: High efficiency video coding (HEVC)*

— *Part 3: 3D Audio*

— *Part 5: HEVC Conformance testing and reference software*

— *Part 8: Confomance Specification for HEVC*

— *Part 10: MPEG Media Transport Forward Error Correction (FEC) codes*

— *Part 11: MPEG Media Transport Composition Information*

— *Part 12: Image file format*

— *Part 13: MMT Implementation guidelines*

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Introduction

This part of ISO/IEC 23008 specifies technologies for the delivery of coded media data for multimedia services over concatenation of heterogeneous packet-based network segments, including bidirectional IP networks and unidirectional digital broadcasting networks. In this part of ISO/IEC 23008, "coded media data" includes both timed audiovisual media data requiring synchronized decoding and presentation of each specific unit of data at a designated time and non-timed data that could be decoded and presented at an arbitrary time based on the context of the service or the user interaction.

MMT is designed under the assumption that the coded media data will be delivered through a packet-based delivery network. Several characteristics of such delivery environments have been taken into consideration, such as non-constant end-to-end delivery delay of each packet from the sending entity to the receiving entity and means to distinguish signaling messages from the media data provided by the underlying network.

For efficient and effective delivery of coded media data over heterogeneous packet-based delivery networks, this part of ISO/IEC 23008 provides the following elements:

— logical model to construct content composed of components from various sources (e.g. content for mash-up applications);

— structure of data conveying information about the coded media data for processing by the delivery layer (e.g. packetization and adaptation);

— packetization method and the structure of the packet to deliver media content over packet-based delivery networks supporting hybrid multichannel delivery that is agnostic to the specific type of media or coding method;

— format of signaling messages to manage the presentation and delivery of media content;

— format of information to be exchanged across layers of the delivery network to facilitate cross layer communication.

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Information technology — High efficiency coding and media delivery in heterogeneous environments —

Part 11: MPEG Media Transport Composition Information

1 Scope

This part of ISO/IEC 23008 specifies MPEG Composition Information (CI), a method describing composition information of media for delivery of multimedia services over packet-based heterogeneous networks.

The technologies for composition function specify the method associating content delivered in the format defined in this part of ISO/IEC 23008 to the presentation and the method representing synchronization between timed and non-timed content.

2 Normative references

The following documents, in whole or in part, are normatively referenced in this document and are indispensable for its application. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

W3C HTML5, A vocabulary and associated APIs for HTML and XHTML, W3C Candidate Recommendation 17 December 2012

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3 Symbols and abbreviated terms

AU access unit

CI composition information

MMT MPEG media transport

MPU media processing unit

SVC scalable video coding

URL uniform resource locator

URN uniform resource name

XML extensible mark-up language

4 Overview

This part of ISO/IEC 23008 defines a Composition Information (CI) layer that controls the temporal and spatial layout of media. The composition layer is currently specified using HTML5 and XML technologies.

The composition layer defines the presentation aspects of a multimedia presentation such as an MMT Package. The composition layer in this part of ISO/IEC 23008 addresses delivery of synchronization information of content that is composed of various content components and where multiple device screens may be used to present the content. Some parts of the content component may be replaced by others based on the context of the user, such as location or personal preferences. Presentation time of

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some components may not be assigned when the content is encapsulated but needs only to be decided when the content is acutally consumed.

A multimedia service may use any subset of the tools defined in this part of ISO/IEC 23008 according to their specific needs. Interfaces to other protocols and standards are either defined by this part of ISO/IEC 23008 or may be defined elsewhere.

5 Composition Information

5.1 Introduction

The Composition layer provides information on temporal relationships among the media content of a presentation to complement the associated HTML5 document, since the associated HTML5 document only provides initial information on spatial relationships among media elements. The composition layer also provides information on relationships between the media data (e.g. the MMT Assets) and possibly on how to optimally consume them on multiple screens. The Composition Information (CI) is represented as an XML document (CI document) providing descriptive representation of such temporal relationship information, thus enabling various ways to implement the composition layer (including implementations that do not use any scripts processing engine.)

To support descriptive representation of temporal relationships among media data (such as MMT assets or MPUs) and mapping of media data to be consumed on multiple devices, the composition layer defines several elements and attributes as follows:

— Association of HTML5 media elements and media data as resources.

— Temporal information to presentation time of the media data.

— Designation of certain parts of the presentation to be presented on a particular screen in a multi-screen environment.

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A CI processing engine is responsible for fetching the CI file and the HTML5 file (and any other referenced files) and processing the CI information to control the presentation accordingly.

The HTML5 file is typically parsed into a Document Object Model (DOM) tree and stored in memory. The CI processing engine applies changes to the DOM at specified time according to the information contained in the CI file. The DOM nodes/elements are referenced using their identifiers or possibly using a certain pattern (e.g. provided through jQuery selectors).

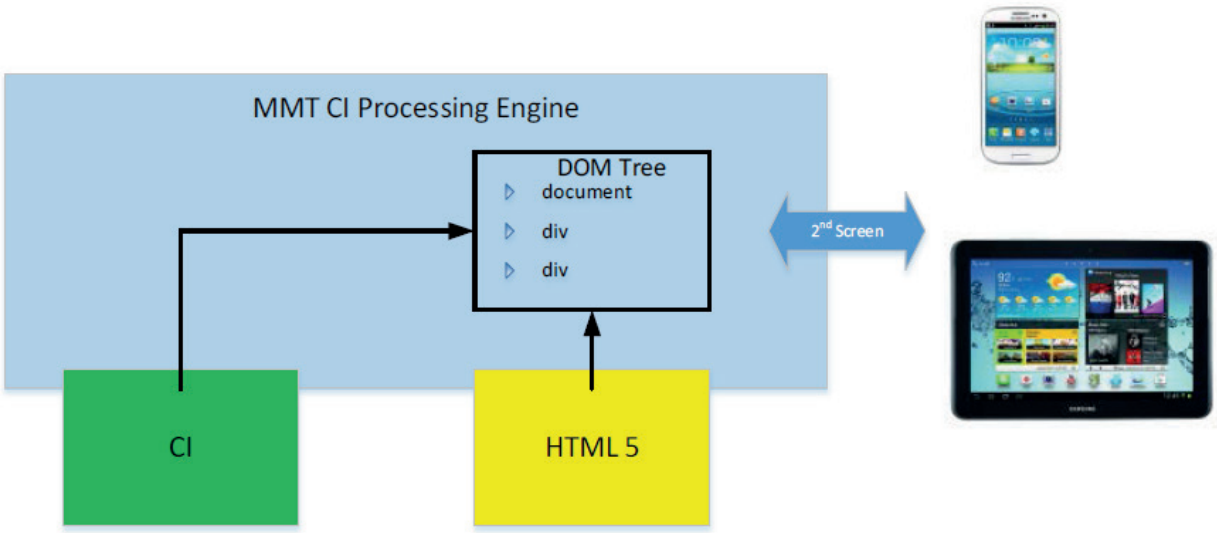

Figure 1 — CI Layer

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5.2 Structure of the CI document

5.2.1 Overview

The CI document is defined as an XML document with the XML schema provided in Annex A. The CI document is defined with several elements referring the elements defined in the HTML5 document by their IDs as shown in Figure 2.

The HTML5 document shall include HTML5 media elements, which maybe any of **video**, **audio**, **img**, or **track elements** together with their associated spatial information. A reference to the CI document may be included in the HTML5 document, typically as part of the Javascript that launches the CI parser. Spatial information of the media elements shall be used to present the corresponding media data (such as the MMT Assets). The **body** element of the HTML5 document shall include more than one spatial area (i.e. **div** element), if partial consumption of the presentation on multiple screens is to be allowed.

To efficiently represent temporal relationships among media data to be synchronously consumed on multiple screens that are independently processing a presentation, the CI document defines in a hierarchical structure the concepts of Area and View. An Area in the CI document represents a spatial region defined by a **div** element in the HTML5 document, which may include one or more HTML5 media elements. A View represents a set of Areas to be consumed on a single screen.

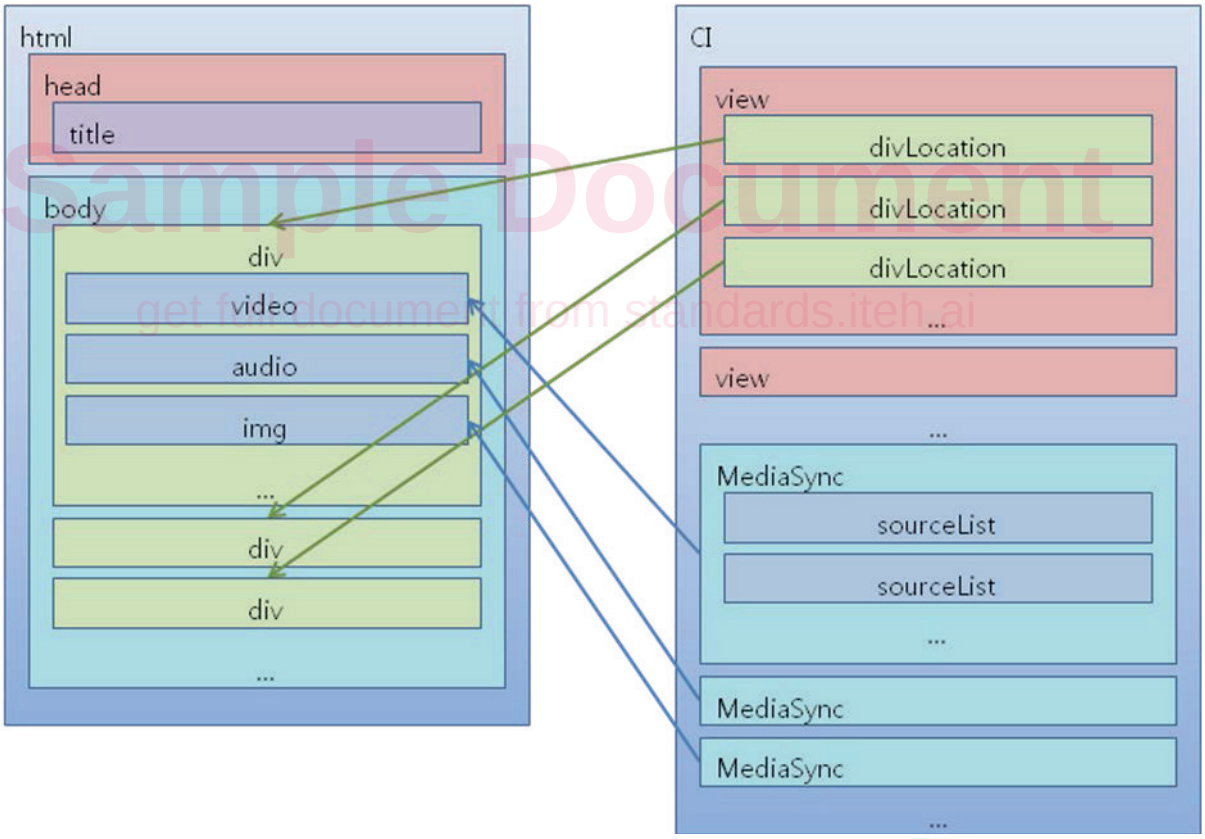

Figure 2 — Structure of CI document and its relationship with HTML5 document

The CI document provides temporal information about Views, Areas and media data. The root element of CI document is the **CI** element, which may contain elements such as **view** and **MediaSync** element. The roles of these elements are as follows:

— **view**: provides temporal information about the spatial changes of a View and its Areas.

— **MediaSync**: provides temporal information about the presentation of media data (e.g. MMT assets).

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The initial Areas in a View are generated by the **div** element in the HTML5 document, and the spatial changes of the initial Areas in the View are provided by the **area** elements of the CI document**.** These two elements allow the spatial location of Areas to be dynamically changed and updated without reloading the HTML5 document.

In MMT delivery, the CI data may be partitioned into multiple subsets that reference each other using the XLink framework and where each subset of the CI may be delivered separately for example by using the MPI signaling message (see ISO/IEC 23008-1 sub-clause 5.3.8 and 5.3.9).

Figure 3 shows an example representing the relationship among media data (MMT assets), Areas and View.

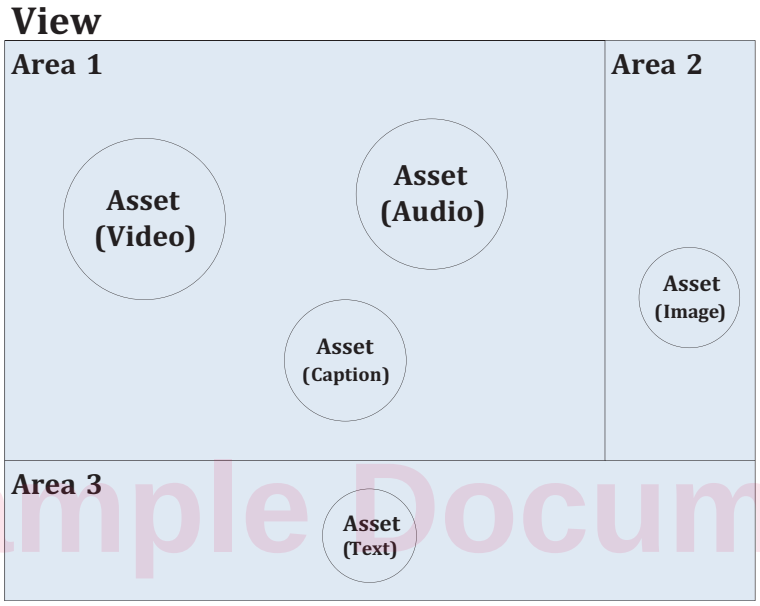

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Figure 3 — Example of Asset/Area/View

CI uses the timing and synchronization module of SMIL [W3C SMIL 3.0]. For CI consumption the timing and synchronization module shall be supported.

5.3 The attributes of a CI document

5.3.1 The *begin* attribute

The *begin* attribute indicates when the corresponding command has to be performed by the user agent, e.g. when particular media data needs to be rendered by an HTML5 media element or when a change to the spatial layout of the presentation has to be performed. The *begin* attribute is defined in section 5.4.3 of [W3C SMIL3.0]. All defined syncbases defined by [W3C SMIL 3.0] shall be supported.

5.3.2 The *end* attribute

The *end* attribute indicates when the corresponding CI action shall end. For media data it indicates when the media data playback stops. When the parent element is a view element, the agent shall completely remove the referenced ***div*** element from the DOM at the indicated end time. When not present for media data, the end time shall be the time when the playback of the media data ends. The *end* attribute is defined in section 5.4.3 of [W3C SMIL3.0].

5.3.3 The *dur* attribute

The *dur* attribute indicates the duration of the corresponding action, which is equivalent to the end time – the begin time. The dur attribute shall not be present when the corresponding action is about spatial layout. The *dur* attribute is defined in section 5.4.3 of [W3C SMIL3.0].

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5.3.4 The *clipBegin* attribute

The *clipBegin* attribute indicates the beginning of a time interval of a continuous media element by offset from the start of the media resource. The *clipBegin* attribute is defined in section 4.8.1 of [W3C SMIL3.0]. For example, a clipBegin="10s" attribute would indicate that the first 10 seconds of the media resource will not be played back.

5.3.5 The *clipEnd* attribute

The *clipEnd* attribute indicates the end of a time interval of a continuous media element by offset from the start of the media. The *clipEnd* attribute is defined in section 4.8.1 of [W3C SMIL3.0].

5.3.6 The *refDiv* attribute

The *refDiv* attribute describes an ID of **div** element, which is used for linking to its **area** element. If the referenced **div** element is not present in the HTML5, then a new div element is created and added to the DOM at the indicated **begin** time.

5.3.7 The *style* attribute

The *style* attribute shall be used to indicate any spatial layout or style modifications to the referenced **div** element. The style attribute shall conform to the CSS Style Attributes.

5.3.8 The *xlink:href* attributes

The *xlink:href* attribute provides the data that allows an XLink application to find a subset of CI data. The value of the href attribute shall be an URI reference as defined in [RFC 2396] and shall be provided.

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5.3.9 The *xlink:actuate* attributes

The *xlink:actuate* attribute defines the desired timing of traversal linked resources. If a value is supplied for an actuate attribute, it must be one of following values.

— *onLoad*: linking a subset of CI data immediately on loading of the current CI document.

— *onRequest*: linking a subset of CI data when they are available or on user request (on-demand).

5.3.10 The *viewRole* attributes

The *viewRole* attribute indicates the role of the **view** element. Several **view** elements can be contained in one CI document, and this attribute can be used to distinguish each of them. The following table defines the meaning of the possible values for the *viewRole* attribute.

Table 1 — the *viewRole* for multi-screen presentation

Value	Description
Default	Indicates that this view is meant to be consumed on the main screen without required interaction with other screens.
Multiple	Indicates that the view is meant to be consumed in a multi-screen environment.
Receptible	Indicates that the view is a placeholder to be used to receive content in a multi-screen presentation.

5.3.11 The *isDependent* attributes

The *isDependent* attribute indicates whether the media element depends on another media element or not, in order to be properly decoded and presented. If the *isDependent* attribute is "true", the media element depends on other media elements that are listed in *depId*.

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5.3.12 The *depId* attributes

The *depId* attribute is a whitespace-separated list of refId of media elements on which the current media element depends on. The *depId* attribute exists if and only if the isDependent attribute is set to “true”.

5.3.13 The *refId* attribute

The *refId* attribute identifies a media element (**video**, **audio**, **img**, **track**, **object** element of [W3C HTML5]). This attribute is used for linking with a **MediaSync** element.

5.3.14 The *mediaSrc* attribute

The *mediaSrc* attribute indicates the address of media data (e.g. a particular MPU of an MMT Asset). The *mediaSrc* attribute MAY also refer to an MPD. When an MPD is referenced the MPD@availabilityStartTime shall be ignored and the time defined in the *begin* attribute is used instead to determine when to start playback of the Presentation. When the *mediaSrc* attribute refers an MMT MPU, the URL format is provided in ISO/IEC 23009-1.

```
<!-- mmtci:begin Type -->
<xsd:simpleType name=”beginType”>
     <xsd:list itemType=”beginValueType”/>
</xsd:simpleType>
<!-- mmtci:beginValue Type -->
<xsd:simpleType name=”beginValueType”>
     <xsd:union memberTypes=”offsetType syncType eventType wallclockType”/>
</xsd:simpleType>
<!-- mmtci:end Type -->
<xsd:simpleType name=”endType”>
     <xsd:list itemType=”endValueType”/>
</xsd:simpleType>
<!-- mmtci:endValue Type -->
<xsd:simpleType name=”endValueType”>
     <xsd:union memberTypes=”offsetType syncType eventType wallclockType indefiniteType”/>
</xsd:simpleType>
<!-- mmtci:offsetType -->
<xsd:simpleType name=”offsetType”>
     <xsd:restriction base=”xsd:token”>
          <xsd:pattern value=”[0-9]+?(\.[0-9]+)?(h|min|s|ms)”/>
     </xsd:restriction>
</xsd:simpleType>
<!-- mmtci:durType -->
<xsd:simpleType name=”durType”>
     <xsd:restriction base=”xsd:token”>
          <xsd:pattern value=”[0-9]+?(\.[0-9]+)?(h|min|s|ms)”/>
     </xsd:restriction>
</xsd:simpleType>
<!-- mmtci:sync Type -->
<xsd:simpleType name=”syncType”>
     <xsd:restriction base=”xsd:token”>
          <xsd:pattern value=”([\i-[:]][\c-[:]]*\.)?[\i-[:]][\c-[:]]*\.(begin|end)”/>
     </xsd:restriction>
</xsd:simpleType>
<!-- mmtci:event Type -->
<xsd:simpleType name=”eventType”>
     <xsd:restriction base=”xsd:token”>
          <xsd:pattern value=”([\i-[:]][\c-[:]]*\.)?[\i-[:]][\c-[:]]*\.\c+”/>
     </xsd:restriction>
</xsd:simpleType>
<!-- mmtci:wallclockType -->
<xsd:simpleType name=”wallclockType”>
     <xsd:restriction base=”xsd:token”>
          <xsd:pattern value=”[0-2][0-9]:[0-5][0-9](:[0-5][0-9](\.[0-9]+)?)?”/>
     </xsd:restriction>
</xsd:simpleType>
<!-- mmtci:indefiniteType -->
<xsd:simpleType name=”indefiniteType”>
     <xsd:restriction base=”xsd:token”>
```

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