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SMPTE STANDARD

for Television — Declarative Data Essence — Transitional



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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.

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Declarative Data Essence — Transitional

1 Scope

This document defines a standard for the authoring of declarative data content intended to be combined primarily with video and/or audio services, and distributed to data-capable television signal receivers. The data essence defined in this standard may be used in conjunction with that defined in the Declarative Data Essence – Content Level 1 specification [DDE-1]. It will be possible for applications authored according to the essence specified herein to execute on the vast majority of currently fielded interactive digital television systems, either directly or after being transcoded. Declarative content is generally nonprocedural, and most commonly in the form of HTML. However, procedural scripting is also defined.

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.

[CSS-TV] CR-css-tv-20020807, W3C Candidate Recommendation: CSS TV Profile 1.0 (August 8th, 2002).

[DOM-0] SMPTE 366M-2002, Television — Declarative Data Essence — Document Object Model Level 0 (DOM-0) and Related Object Environment.

[DOM2-Core] REC-DOM-Level-2-Core-20001113, W3C Recommendation: Document Object Model (DOM) Level 2 Core Specification Version 1.0 (November, 13th, 2000).

[DOM2-Style] REC-DOM-Level-2-Style-20001113, W3C Recommendation: Document Object Model (DOM) Level 2 Style Specification Version 1.0 (November 13th, 2000).

[DOM2-HTML] REC-DOM-Level-2-HTML-20030109, W3C Recommendation: Document Object Model (DOM) Level 2 HTML Specification Version 1.0 (January 9th, 2003).

[DOM2-Events] REC-DOM-Level-2-Events-20001113, W3C Recommendation: Document Object Model (DOM) Level 2 Events Specification Version 1.0 (November 13th, 2000).

[ECMA-262] ECMA-262, ECMA Standard: ECMAScript 3rd edition (December 1999).

[ECMA-327] ECMA-327, ECMA Standard: ECMAScript 3rd edition, Compact Profile (June 2001).

[HTML-4.01] REC-html401-19991224, W3C Recommendation: HTML 4.01 Specification (December 24th, 1999).

[HTTP-1.1] RFC2616, IETF: Hypertext Transfer Protocol -- HTTP/1.1 (June 1999).

[HTTPS] RFC2818, IETF: HTTP Over TLS (May 2000).

[ITU-R BT.601-5] ITU-R BT.601-5, Studio Encoding Parameters of Digital Television for Standard 4:3 and Wide-Screen 16:9 Aspect Ratios (10/95).

[JPEG] ISO/IEC 10918-1, Digital compression encoding of continuous-tone still images (JPEG), 1992.

[MPEG2-Audio] ISO/IEC 13818-3, 2nd edition, Information technology – Generic coding of moving pictures and associated audio – Part 3: MPEG-2 Audio, (1998).

[MPEG2-Video] ISO/IEC 13818-2 Information technology – Generic coding of moving pictures and associated audio information – Part 2: MPEG-2 Video, (1996).

[PNG] EC-png, W3C Recommendation: PNG (Portable Network Graphics) Specification Version 1.0 (October 1996).

[URI-TV] RFC2838, IETF: Uniform Resource Identifiers for Television Broadcasts (May 2000).

3 Glossary of acronyms, terms and data types

This section defines conformance keywords, acronyms, abbreviations, and terminology that apply to the specification in its entirety and to each constituent part.

3.1 Conformance keywords

As used in this document, the conformance keyword *shall* denotes a mandatory provision of the standard. The keyword *should* denotes a provision that is recommended but not mandatory. The keyword *may* denotes a feature whose presence does not preclude compliance, which may or may not be present at the option of the application implementer.

3.2 Acronyms and abbreviations

clut – color lookup table

CSS – Cascading Style Sheets

DOM -- Document Object Model

DVB – Digital Video Broadcasting

ECMA – European Computer Manufacturers Association

HTML – Hyper Text Mark-up Language

HTTP – Hyper Text Transport Protocol

JPEG – Joint Picture Expert Group

MHP – Multimedia Home Platform

MPEG – Motion Picture Expert Group

PNG – Portable Network Graphics

UA – User Agent

UI – User Interface

URL – Uniform Resource Locator

3.3 Terms

events – An instantiation of asynchronous notifications from a client platform to the interactive television content.

pel – A pixel in the broadcast video coordinate space.

service – A sequence of programs under the control of a broadcaster which can be broadcast as part of a schedule.

stream – A unidirectional continuous flow of content. Example: MPEG2 video.

tuning – The act of switching between two MPEG transport streams or multiplexes.

user agent – Any process that interprets HTML documents.

viewer's preferences – Choices that a viewer has made concerning which of several options for a particular functionality is to be set as a default; for example, choice of audio language or whether to use a keyboard or a remote control. Control over viewer's preferences is outside the scope of this specification because it is expected that receiver-specific applications would be used to set up the viewer's preferences and that these defaults would not be set by an interactive television application.

4 Introduction

As stated above, the goal of this specification is to document declarative data essence that will allow authors to design interactive tv content supportable by the vast majority of currently fielded interactive digital television systems.

4.1 Rendering model (informative)

This section is informative in its entirety.

4.1.1 Expected minimal client computing capabilities

Even though this specification is a content authoring specification and not a transcoding or receiver specification, it is useful for authors to understand some restrictions of the typical environment in which their applications will, at least initially, execute. Content authored according to this specification can be used to control the concurrent presentation of graphics and broadcast video. The content may be transcoded prior to dissemination to receivers because many of the receivers for which content is authored will have extremely limited memory and processing capabilities. Therefore, it is expected that some of the rendering, and the layout, may be done at a server in order to achieve adequate client performance. These limitations, and, hence, the need to perform some of the rendering at a server, explains why certain dynamic functionality is more restricted in this specification than in W3C specifications, for example.

4.1.2 Presentation model

The author using the essence described in this specification can designate content for both the video plane, which may render either apparently changing or constant/still video, and the graphics plane. For example, the author may select the service from which the video is to be displayed and may control the size and location of the video on the screen. The graphics plane logically lies on top of the video plane and, where supportable, transparency of content in the graphics plane with respect to the video underneath can be specified by the author.

Typically the video is viewed full screen and the content author can use this specification to indicate the size, location, and contents of a rectangle in the graphics plane that overlays the full screen video. However, this specification also allows the author to indicate graphics that occupy the entire screen and to specify the size, location, and contents of a video rectangle that appears, due to appropriate transparency, to be above or inset into the graphics plane. Even in this case, though, the video may be rendered in a plane logically below the graphics plane, with a transparent rectangle logically above it. Therefore, using the model with the video logically below the graphics plane, the content author can construct either what appears to be graphics on top of underlying full-screen video or a video window on top of underlying full-screen graphics.

4.1.3 Color and transparency

Besides memory and cpu restrictions, the majority of currently fielded receivers that are expected to be the first clients to present the content authored according to this specification typically have restricted color capabilities. Most often they cannot support true color models, but instead have support, in hardware, for the use of color palettes. With a palette-based model, the color of a pixel of an image or corresponding to characters of text is typically represented by an index into a color palette. However, specification of a palette index is not supported in HTML and is not proposed in this document, though a facility for providing a palette is supported. According to this specification, the author specifies a color by designating the color itself, rather than by designating an index into a palette. However, this specification provides a way for an author to indicate the entire palette. This model was chosen because it is better than both (1) requiring an author to specify the palette index and (2) disallowing the author from specifying a palette at all. Obviously without specially designed tools, option (1) is not very user friendly. Allowing the author to specify a palette which is in a form easily extractable via existing tools does allow an author to easily check that they have not used more colors than can be supported on a particular set of destination clients. If the clients are expected to be heterogeneous, or content has been authored to be interoperable on multiple heterogeneous networks, then both multiple palettes and alternative colors may be supplied, in conformance with CSS cascading rules. This specification allows a different palette to be specified per top level page, however, it is expected that clients that are limited so much that they rely on a hardware palette are also severely limited in other ways so that such clients would also not support an application model that would allow multiple top level pages to attempt to control the display simultaneously. Therefore, even though life cycle is beyond the scope of this specification (see below), it is expected that life cycle considerations in a given network will account for receiver hardware limitations.

In addition to restrictions on the number of total colors that are supportable on a given client, often the transparency models supported by a client are very limited. One of the most commonly supported models in digital receivers is that of allowing only a single transparent or semi-transparent color in the palette. On clients where there is only a single transparent or semi-transparent color available, it is useful for the content author to be able to specify the size and location of the contents of the graphics plane to be within a given rectangle. When so specified on such clients, the area outside the rectangle is not considered part of the graphics contents and therefore no color, and hence no transparency level, is associated with that area. Therefore, in very low end receivers, the only transparent or semi-transparent color will be available for use within the content of the specified rectangle within the graphics plane.

Another common transparency model is one that allows each palette element to have one of 2 values for their transparency attribute (often called the alpha channel); the first value being fully opaque and the second value being a palette-specific fixed transparency level.

As with color, the author can target their page at a particular transparency model or may supply transparency information for several models, allowing a user agent or transcoder to choose a model that the client supports.

4.2 Application model, life cycle, and security (informative)

This specification recognizes that application model, life cycle, and security are most often dictated by entities external to the author such as broadcasters and multi-system operators, or may be specified on a regional basis. Such operators may choose to use signalling as defined in other specifications [DVB-HTML, OCAP, BML] or may use their own proprietary signalling. Therefore, in order for authors in different regions of the world to be able to define interoperable applications using declarative data essence, this specification defines mechanisms for the author to use to control only presentation and viewer interaction. The only assumption concerning life cycle made in the definition of the data essence to be used by the author is that only a single application uses the screen resources at a time.

4.3 Organization of the specification

This specification is divided according to the class of data essence. Section 5 details the HTML markup available to the author, section 6 details the CSS style capabilities, section 7 defines the ECMAScript support expected, section 8 defines the IDL interfaces for the DOM capabilities and bindings from those interfaces to ECMAScript; section 9 defines media types available to the author, and section 10 defines the locator formats available to the author. Each of the sections is divided according to the following organization.

- Each of the sections relies heavily upon a basis derived from existing standards from the following groups: W3C, ECMA, SMPTE, and IETF. In those cases where entire specifications from those organizations are adopted, they are normatively referenced in their entirety.
- After the description of the primary specification or specifications upon which a section is based, a description of additional uses of the syntax and semantics from those references, if any, is presented. For example, the style section describes how the clip property from CSS2 [CSS2R1], when applied to a top level div element, can be used to improve performance and presentation.
- The next subsection describes portions of this specification that originate in other specifications, most notably various interactive television specifications such as DVB-HTML[DVB-HTML] and DASE[DASE-1].
- The last subsection of each section describes syntax and associated semantics introduced by this specification. This new syntax and semantics were designed in order to provide data essence content authors with functionality commonly employed by content authors using procedural-only interfaces on currently fielded systems, but which functionality has been missing from previously specified data essence specifications.

Where appropriate, many definitions, whether originating here or in a previous specification, are preceded by an informative introduction placing the definition in context.

5 HTML markup

5.1 HTML 4.01/XHTML 1.0

5.1.1 Compliance with HTML 4.01

Authors may provide either XHTML 1.0 [XHTML-1.0] or HTML 4.01 [HTML-4.01] content containing any of the elements below.

This specification includes all elements and attributes specified in HTML 4.01. As stated in Section A.3.1 of HTML 4.01, several HTML 3.2 elements (e.g., isindex) are deprecated.

5.2 HTML 4.01 syntax with additional semantics

5.2.1 Placing video within an object

5.2.1.1 Introduction to placing video within an object (informative)

Although the video plane is logically behind the graphics plane, content authors often want the entire video content to appear to be scaled to a rectangular region with graphics presented around and possibly overlapping the video. In the next subsection, this specification indicates how the author can achieve this effect by supplying an appropriate URI for certain attributes of particular elements. (For placement of a rectangular subset of the entire video content, see Section 6.3.1.)

5.2.1.2 Using tv: to place video within an object

A "tv:" URI, as described in section 10, can be used as either the src attribute of an img element or as the data attribute of an object element. Using CSS absolute positioning for the img or object element allows the content author to position the video rectangle. Additionally, the author can specify appropriate values for the CSS width and height properties in order to scale the video element. For more details on sizing and positioning, see section 6.1.

5.2.2 Tuning and stream selection

5.2.2.1 Using tv: for tuning and stream selection

When the content author has a priori knowledge of the DNS name that corresponds to a given channel, the author can use HTML to cause tuning to that channel using the href attribute in the A element. For example, the following HTML

```
<A id="my_link" href="tv://example.com">Click Me</A>
```

allows the HTML document to present a link, my_link, which requests the tuner to select a possibly new service (see section 10.2). If the request is authorized and resolves to a valid service, then the HTML document will be unloaded and replaced with a TV media handler playing the default video and audio streams associated with the service.

URLs defined in section 10.2, may be used in the following HTML element attributes in order to cause tuning or service selection: a.href, img.src, and object.data. These attributes may be dynamically changed using the DOM as stated in Section 8.1.2. Tuning and/or service selection can also be achieved via CSS (see Section 6.2.3.2).

5.2.3 The accesskey attribute

5.2.3.1 Additional values for the accesskey attribute

This specification supports the HTML accesskey attribute. In addition to the accesskey values permitted by HTML 4.01, values for this attribute may also be chosen from the key name space defined below (see section 8.2).

5.3 New values for HTML Markup

5.3.1 When to render

5.3.1.1 Introduction to when to render (informative)

Since video is often displayed behind or concurrently with graphics in interactive television, it is not always appropriate to display portions of the graphics as they become available. Sometimes the author does not want any graphics displayed until some other resource is available; for example, until the background video or audio has started. This section describes how the author can use the LINK and META elements to stipulate resources that must be available prior to displaying any graphics. Additionally, it describes how to specify which of several rendering policies to use with the graphics content. Finally, it also describes how the author can specify a timeout, after which the author would desire the graphics to be rendered, independent of whether all of the prerequisites have been obtained and regardless of the particular rendering policy that was requested.

5.3.1.2 Using the LINK element to specify prerequisites

When used with a LINK element and an href attribute, the "rel" attribute with a value of "prerequisite" is used to indicate that no rendering of the page is to occur prior to acquiring the resource specified by the href attribute, assuming that no timeout (see Section 5.3.1.4) has expired.

For example,

```
<LINK href="http://www.example.com/background.mpg" rel="prerequisite">
```

5.3.1.3 Using the META element to indicate the rendering policy

The author can use the name/content pair within a META element in the head of a document to indicate the desired rendering policy. When an author uses this feature, they should specify name = 'dde-render -