SMPTE OVERVIEW

Dynamic Metadata for Color Volume Transformation — Overview for the SMPTE ST 2094 Document Suite

1 Document Suite Overview

The SMPTE ST 2094 suite of documents define metadata for use in color volume transforms of content. The metadata are content-dependent and can vary scene-by-scene or image-by-image. The metadata are intended to transform High Dynamic Range and Wide Color Gamut (HDR/WCG) image essence for presentation on a display having a smaller color volume than that of the mastering display used for mastering the image essence. Multiple applications provide particular color volume transforms.

SMPTE ST 2094-1, Dynamic Metadata for Color Volume Transformation — Core Components, specifies a “core” set of common metadata items and provide a framework for the specification of applications.

SMPTE ST 2094-10, SMPTE ST 2094-20, SMPTE ST 2094-30 and SMPTE ST 2094-40 define individual applications. Each application document specifies a metadata set that fully defines a color volume transformation.

SMPTE ST 2094-2 specifies metadata essence comprising KLV and MXF representation of individual metadata sets defined in the application documents.

Figure 1 illustrates the overall layout of the SMPTE ST 2094 document suite where SMPTE ST 2094-1 is the root which provides the core components and framework for the four applications.

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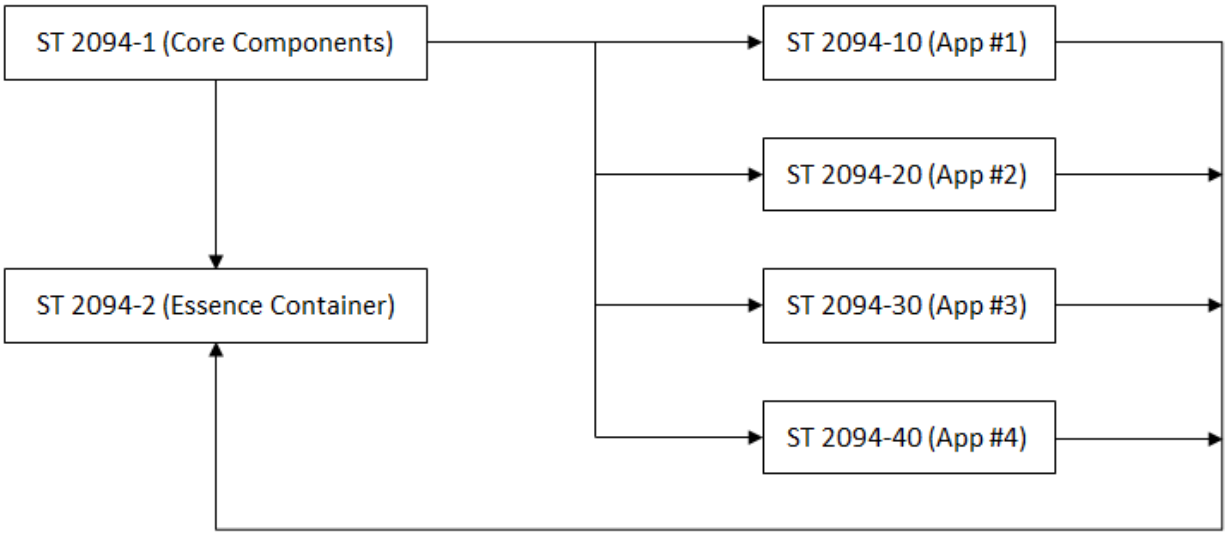

Figure 1 – SMPTE ST 2094 document suite layout
(arrows indicate the dependency of all parts on the core components and the dependency of part 2 on the applications)

2 Scope

This document provides context to the SMPTE ST 2094 “family” of the core standard and the applications. This document is introductory and does not contain any normative requirements.

2.1 SMPTE ST 2094-1

Part 1 specifies common definitions, including a transform metadata set, and metadata parameters, for use by other parts of the SMPTE ST 2094 suite.

2.2 SMPTE ST 2094-2

Part 2 specifies Key-Length-Value (KLV) representations of metadata sets defined in SMPTE ST 2094-10, SMPTE ST 2094-20, SMPTE ST 2094-30, and SMPTE ST 2094-40.

Part 2 specifies frame-based mapping of KLV-encoded SMPTE ST 2094 metadata sets into the MXF generic container. Part 2 specifies the key and value fields of the essence elements, the essence container label and the essence descriptor.

2.3 SMPTE ST 2094-10

Part 10 specifies the content-dependent color volume transform metadata items for Application #1, a specialized model of the generalized color volume transform defined by the core components document ST SMPTE ST 2094-1. This color volume transform is based on a parametrically-defined tone mapping curve, the shape of which is defined both by the image essence characteristics (algorithmically computed from the input image essence) as well as by manually-set adjustments. The metadata set supporting the application is generated as a part of the mastering process. The adjustment parameters are decided on as a creative adjustment.

2.4 SMPTE ST 2094-20

Part 20 specifies the content-dependent Color Volume Transform metadata set for Application #2, a specialized model of the color volume transform defined by the core components document SMPTE ST 2094-1.

The Color Volume Transform is based on a tone mapping curve that operates on image data in a perceptually-uniform domain and a luminance-dependent saturation gain curve. Both the tone mapping curve and the saturation gain curve are fully characterized by a set of parameters.

2.5 SMPTE ST 2094-30

Part 30 specifies Dynamic Metadata for Color Volume Transform Application #3, Reference-based Color Volume Remapping. It is a specialization of the content-dependent transform metadata entries and processing blocks of the generalized color volume transform model defined in the SMPTE ST 2094-1 Dynamic Metadata for Color Volume Transform – Core Components standard.

2.6 SMPTE ST 2094-40

Part 40 specifies the metadata for Color Volume Transform Application #4, Scene-based Color Volume Mapping. It is a specialization of the content-dependent transform metadata entries and processing blocks of the generalized color volume transform model defined in the SMPTE ST 2094-1 Core Components standard.

Scene-based Color Volume Mapping consists of scene-based tone mapping and scene-based color saturation mapping processing blocks. These processing blocks make use of the peak luminance behaviors of the display used for mastering the image essence (i.e. the “mastering display”) and the targeted system display as their ability to achieve peak luminance varies with the average brightness level of the pixels and the number of bright pixels within the scene. In addition to these adjustments that can be algorithmically determined from known display and content characteristics, Scene-based Color Volume Mapping also allows creatively approved adjustments.