High Dynamic Range Metadata

For Apple Devices (Preliminary)

Version 0.9

May 31, 2019

Introduction

This document describes the metadata and constraints for High Dynamic Range (HDR) video stored in a QuickTime Movie or ISO Base Media File required for proper display on Apple Platforms. Three types of HDR are detailed.

1. Dolby Vision™
2. HDR10
3. Hybrid Log-Gamma (HLG)

Note: The QuickTime Movie File Format Specification and the ISO Base Media File Format Specification use different terminology for broadly equivalent concepts: atoms and boxes; sample descriptions and sample entries. This document uses the former specification's terminologies without loss of generality.

This document covers file-based workflows, for HLS streaming requirements go to:

https://developer.apple.com/documentation/http_live_streaming/hls_authoring_specification_for_apple_devices

Dolby Vision™

Only Dolby Vision™ Profile 5 is supported. Refer to Dolby Vision™ Streams Within the ISO Base Media File Format [2] for the syntax and semantics of the metadata stored within the Dolby Decoder Configuration Record (‘dvcC’).

Constraints on Sample Description / Sample Entry

- The codec type shall be ‘dvh1'.
- HEVC shall be encoded at Main10 Profile
- Dolby Vision™ Profile 5.
- Only Single-track files are supported.
- The Dolby Decoder Configuration Record ('dvcC') shall be present.
- The color (‘colr’) atom with these values shall be present.
    - Color Primaries shall be set to 2 (Unspecified).
    - Color Transfer Function Index shall be set to 2 (Unspecified).
    - Color Matrix Index shall be set to 2 (Unspecified).

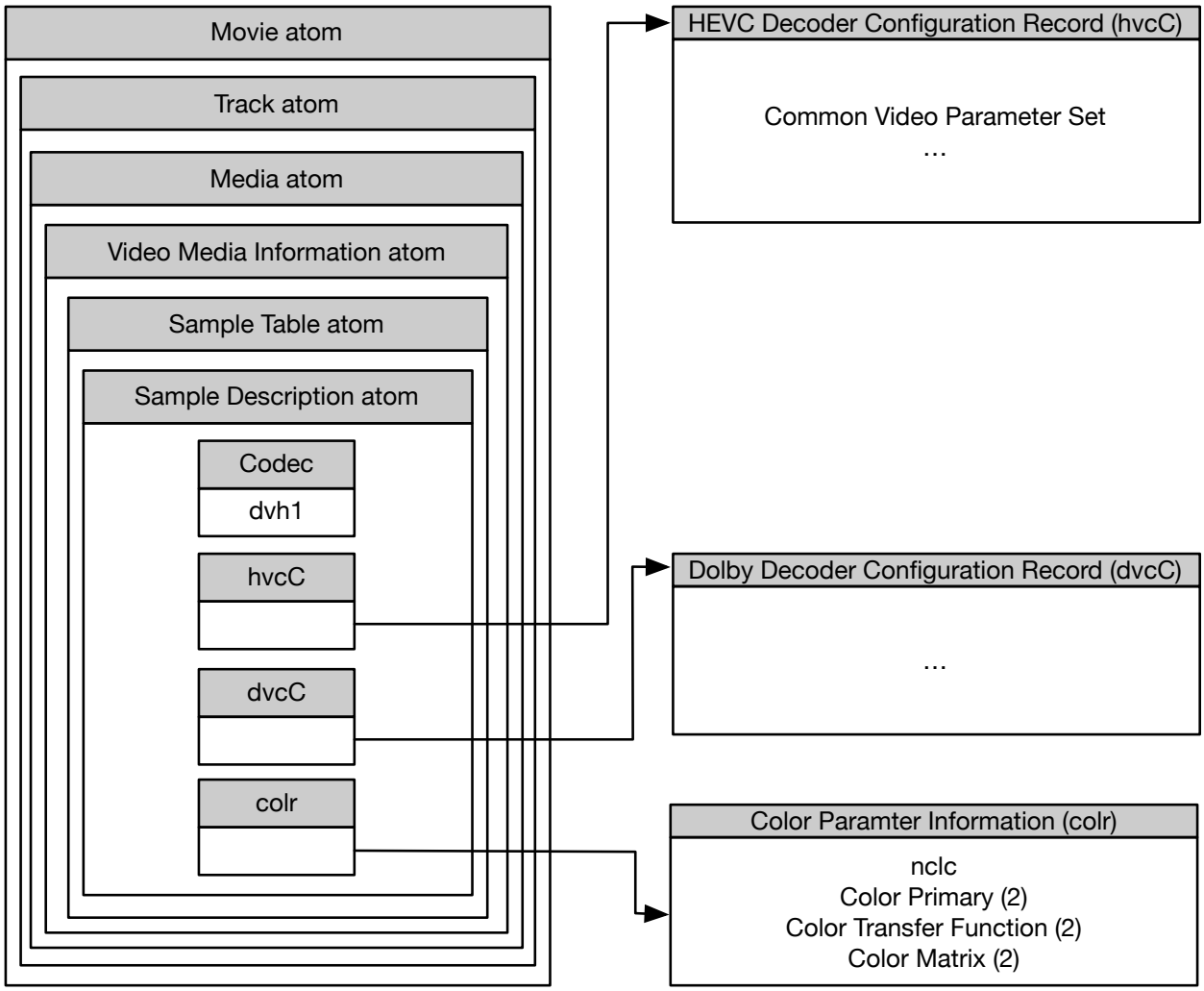

Figure 1. Dolby Vision™ Video Sample Description Extensions

HDR10

Constraints on Sample Description / Sample Entry

- The codec type shall be ‘hvc1' or Apple ProRes.
- For HEVC, HEVC shall be encoded at Main10 Profile.
- For HEVC, HEVC Decoder Configuration Record ('hvcC') shall be present.
- The Mastering Display Color Volume [3] (‘mdcv’) and Content Light Level Information (‘clli’) atoms, stored in big-endian, shall be present for Apple ProRes and is recommended for HEVC. For HEVC, if the atoms are not present, the ‘mdcv' and ‘clli’ shall be stored in SEI messages, as specified in the ISO/IEC HEVC Specification section D.3.28 and D3.35 [1], in the HEVC Decoder Configuration Record (hvcC).
- The color (‘colr’) atom shall be present. These values shall be present for HEVC and Apple ProRes.
    - Color Primaries shall be set to 9 (ITU-R BT.2020).
    - Color Transfer Function Index shall be set to 16 (PQ / SMPTE ST 2084).
    - Color Matrix Index shall be set to 9 (ITU-R BT.2020).

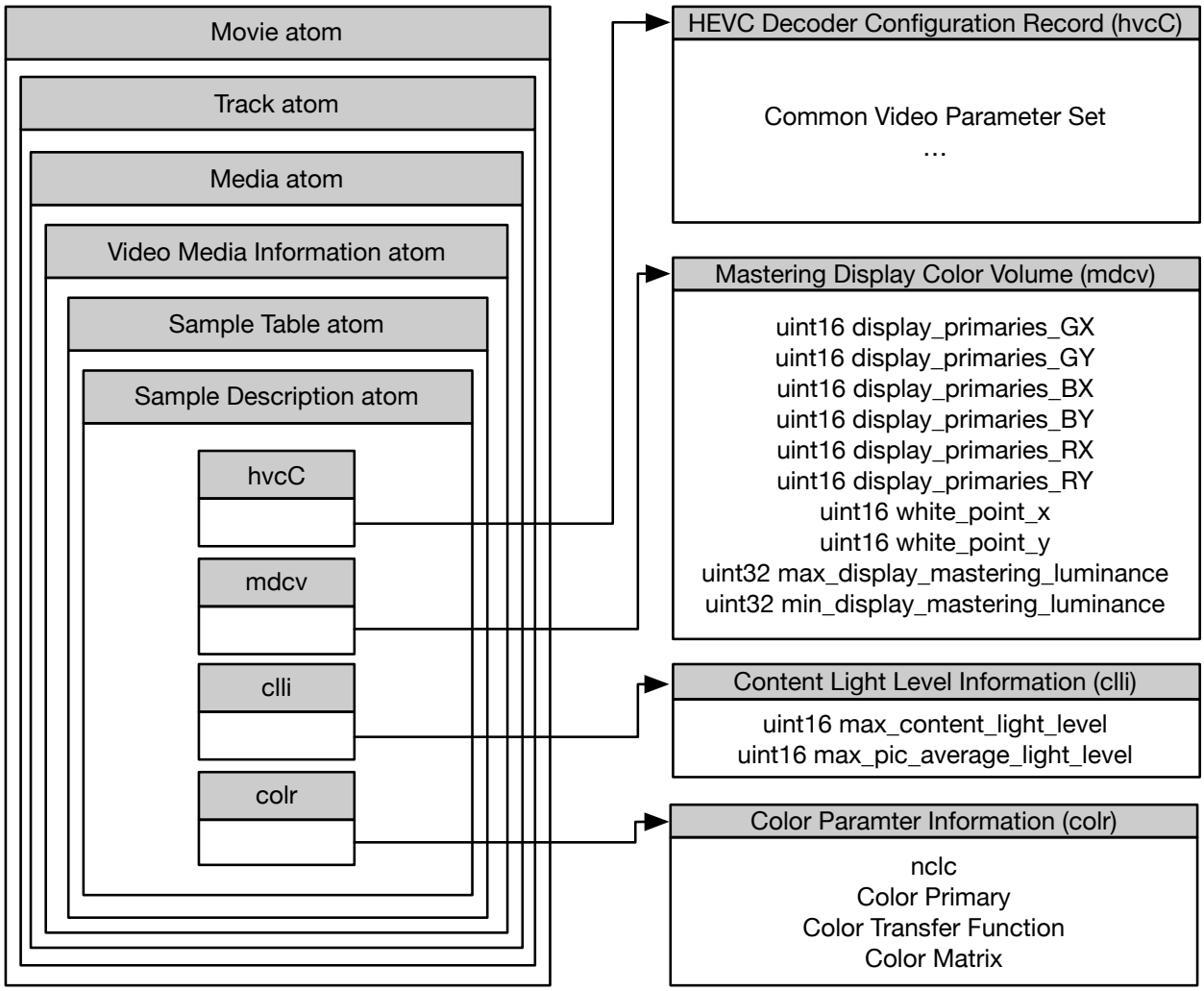

Figure 2. Video Sample Description Extensions for HEVC and HDR10 Static Metadata

Hybrid Log-Gamma (HLG)

Constraints on Sample Description / Sample Entry

- The codec type shall be ‘hvc1' or Apple ProRes.
- For HEVC the video shall be Main10 Profile.
- For HEVC the HEVC Decoder Configuration Record ('hvcC') shall be present.
- For HEVC the HEVC Decoder Configuration Record ('hvcC') may also contain an Alternative Transfer Characteristic (ATC) SEI message (147) as specified in the ISO/IEC HEVC Specification section D.3.28 [1]. The SEI message payload - preferred_transfer_characteristic is a single byte and must contain the value 18, representing the value for ITU-R BT.2100 Hybrid Log-Gamma (HLG).
- For HEVC any ATC SEI messages not in the ‘hvcC’ atom will be ignored.
- The color (‘colr’) atom shall be present. These values shall be present for HEVC and Apple ProRes.
    - Color Primaries shall be set to 9 (ITU-R BT.2020).
    - Color Transfer Function Index shall be set to 18 (ITU-R BT.2100 Hybrid Log-Gamma (HLG)).
    - Color Matrix Index shall be set to 9 (ITU-R BT.2020).

    Or with HEVC encoded video only, for backwards compatibility with an ATC SEI with value 18 in the ‘hvcC’ atom.

    - Color Primaries shall be set to 9 (ITU-R BT.2020).
    - Color Transfer Function Index shall be set to 1 (ITU-R BT.709).
    - Color Matrix Index shall be set to 9 (ITU-R BT.2020).

References

[1] ISO/IEC: “Information technology -- High efficiency coding and media delivery in heterogeneous environments -- Part 2: High efficiency video coding, ” Doc. ISO/IEC 23008-2
[2] Dolby Vision™ Bitstreams Within the ISO Base Media File Format v2.0
[3] ST 2086 - SMPTE Standard - Mastering Display Color Volume Metadata Supporting High Luminance and Wide Color Gamut Images
[4] ITU-R BT.2020 : Parameter values for ultra-high definition television systems for production and international programme exchange
[5] ITU-R BT.2100 : Image parameter values for high dynamic range television for use in production and international programme exchange

Document Revision History

This table describes the changes to *High Dynamic Range Metadata*

Date	Revision	Notes
2019-05-31	0.9	Preliminary release for WWDC19