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S T A N D A R D S

Digital Video Subcommittee

SCTE STANDARD

SCTE 128-2 2018

**AVC Video Constraints for Cable Television
Part 2- Transport**

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140 Philips Road
Exton, PA 19341

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Editorial Note: Table numbers in this Part of SCTE 128 are not consecutive and retain the table numbers that appeared before SCTE 128 was split into two Parts.

1. Introduction

1.1. Executive Summary

This document assists in transport of an AVC coded video elementary stream constrained per SCTE 128 Part 1 and is intended for broadcast purposes. There are other applications: time-shifting (e.g., PVR/DVR service), Video-on-Demand service, unicast, multicast, splicing (e.g., Ad-insertion) that could employ the specifications in this document. However, constraints specific to those applications are outside of the scope of this document.

1.2. Scope

This document defines the transport constraints on ITU-T Rec. H.264 | ISO/IEC 14496-10 [5] video compression (hereafter called "AVC") for Cable Television. In particular, this document describes the transmission of AVC coded video elementary streams constrained per SCTE 128 Part 1 in an MPEG-2 service multiplex (single or multi-program Transport Stream).

Note: The carriage of MPEG-2 video in the MPEG-2 service multiplex is described in SCTE 54 [1].

2. Normative References

The following documents contain provisions, which, through reference in this text, constitute provisions of this document. At the time of Subcommittee approval, the editions indicated were valid. All documents are subject to revision; and while parties to any agreement based on this document are encouraged to investigate the possibility of applying the most recent editions of the documents listed below, they are reminded that newer editions of those documents might not be compatible with the referenced version.

2.1. SCTE References

- [1] ANSI/SCTE 54 2015, Digital Video Service Multiplex and Transport System Standard for Cable Television.
- [2] SCTE 128 Part 1 2018, AVC Video Systems Constraints for Cable Television

2.2. Standards from Other Organizations

- [3] ATSC A/65:2013 Program and System Information Protocol for Terrestrial Broadcast and Cable; Section 6.9.2.
- [4] ISO/IEC 13818-1, (2018), "Information Technology – Generic coding of moving pictures and associated audio – Part 1: Systems."
- [5] ITU-T Rec. H.264 | ISO/IEC 14496-10, (09/2014), "Information Technology – Coding of audio visual objects – Part 10: Advanced Video Coding."
- [6] ETSI TS 101 154 V2.4.1 Digital Video Broadcasting (DVB): Specification for the use of Video and Audio Coding in Broadcasting Applications based on the MPEG-2 Transport Stream, 2014.

2.3. Published Materials

- No normative references are applicable.

3. Informative References

The following documents might provide valuable information to the reader but are not required when complying with this document.

3.1. SCTE References

- [7] ANSI/SCTE 43 2015 Digital Video Systems Characteristics Standard for Cable Television.
- [8] ANSI/SCTE 21 2017 Standard for Carriage of NTSC VBI Data in Cable Digital Transport Streams.
- [9] ANSI/SCTE 07 2013 Digital Transmission Standard for Cable Television.
- [10] ANSI/SCTE 172 2017 Constraints on AVC Video Coding for Digital Program Insertion.

3.2. Standards from Other Organizations

- [11] SMPTE ST 170, Television – Composite Analog Video Signal – NTSC for Studio Applications.
- [12] SMPTE ST 274 Standard for television, 1920 x 1080 Scanning and Interface.
- [13] SMPTE ST 296, Standard for television, 1280 x 720 Scanning, Analog and Digital Representation, and Analog Interface.
- [14] ITU-R BT.601-6 Encoding parameters of digital television for studios.
- [15] ITU-R BT.709-6, Basic Parameter Values for the HDTV Standard for the Studio and for International Programme Exchange.
- [16] ITU-T J.83, Digital Video Transmission Standard for Cable Television.
- [17] CTA-CEB16: Active Format Description (AFD) & Bar Data Recommended Practice.
- [18] SMPTE ST 125, Standard for television, Component Video Signal 4:2:2, Bit Parallel Digital Interface.
- [19] SMPTE ST 293, Standard for television, 720x483 Active Line at 59.95 Hz Progressive Scan Production, Digital Representation.
- [20] SMPTE ST 267, Standard for television, Bit Parallel Digital Interface- Component Video Signal 4:2:2 16x9 Aspect Ratio.
- [21] ATSC A/53, Part 3, “Service Multiplex and Transport Subsystem Characteristics”
- [22] CTA-861-G “A DTV Profile for Uncompressed High Speed Digital Interfaces”
- [23] ISO/IEC 13818-2 (2013), Information Technology – Generic coding of moving pictures and associated audio - Part 2: Video

3.3. Published Materials

- No informative references are applicable.

4. Compliance Notation

<i>shall</i>	This word or the adjective “ <i>required</i> ” means that the item is an absolute requirement of this document.
<i>shall not</i>	This phrase means that the item is an absolute prohibition of this document.
<i>forbidden</i>	This word means the value specified shall never be used.
<i>should</i>	This word or the adjective “ <i>recommended</i> ” means that there may exist valid reasons in particular circumstances to ignore this item, but the full implications should be understood and the case carefully weighted before choosing a different course.
<i>should not</i>	This phrase means that there may exist valid reasons in particular circumstances when the listed behavior is acceptable or even useful, but the full implications should be understood and the case carefully weighed before implementing any behavior described with this label.
<i>may</i>	This word or the adjective “ <i>optional</i> ” means that this item is truly optional. One vendor may choose to include the item because a particular marketplace requires it or because it enhances the product, for example; another vendor may omit the same item.
<i>deprecated</i>	Use is permissible for legacy purposes only. Deprecated features may be removed from future versions of this document. Implementations should avoid use of deprecated features.

5. Abbreviations and Definitions

5.1. Abbreviations

ATSC	Advanced Television Systems Committee
AU	access unit
DPI	digital program insertion
DTS	decoding time stamp
DTV	digital television
DVB	digital video broadcasting
DVS	Digital Video Subcommittee
ESPI	elementary_stream_priority_indicator
HDTV	high definition television
IDR	instantaneous decoding refresh
IEC	International Electrotechnical Commission
ISO	International Organization for Standardization
MPEG	moving picture experts group
NAL	network abstraction layer
nPVR	network based personal video recorder
PPS	picture parameter set
PTS	presentation time stamp
PVR	personal video recorder
QAM	quadrature amplitude modulation
RAI	random_access_indicator
SDTV	standard definition television
SEI	supplemental enhancement information
SPS	sequence parameter set

SRAP	SCTE random access point
T-STD	transport stream system target decoder
TS	transport stream
VUI	video usability information

5.2. Definitions

AVC ITU-T Rec. H. 264 | ISO/IEC 14496-10 Advanced Video Coding standard

AVC Receiver The term "AVC Receiver" in this standard means a receiver having at least the attributes listed below:

1. Able to parse and decode the normative elements from AVC [5] that are specified with constraints in this standard;
2. Not adversely affected by the presence or absence of optional and informative elements from AVC [5];
3. Not adversely affected by the presence or absence of optional and informative elements in this standard;
4. Able to parse and process all elements from AVC [5] Annex D (SEI messages) and Annex E (VUI syntax elements) that are specified as normative in this standard and conveyed in-band; Note: These are optional elements in the AVC specification;
5. Able to parse and decode all the normative elements from ISO/IEC 13818-1 [4] that are normatively included and/or constrained by this standard;
6. Not adversely affected by the presence or absence of optional elements from ISO/IEC 13818-1 [4] (such as data in adaptation fields) that are specified with constraints in this standard;
7. Supports the processing of end_of_stream_rbsp() syntax element required by applications where another bitstream follows the end_of_stream NAL unit. The bitstream that follows will start with an IDR picture and may be accompanied by a time base discontinuity.
8. Supports the processing of elementary streams in Low Delay Mode and Still Pictures.

Note: The additional information from items 6 and 7 is optionally provided for the benefit of AVC receivers that include support for applications such as PVR, DPI and VOD.

Program An ISO-IEC 13818-1 MPEG-2 Program

SGOP A SCTE Group Of Pictures (SGOP) is the group of pictures spanning two consecutive SRAPs including the prior SRAP AU but not including the subsequent SRAP AU.

SRAP Picture An I- or IDR-picture that is part of an SRAP Access Unit.

Numerical formats are defined in the following table: