

SMPTE RECOMMENDED PRACTICE

VC-1 Bitstream Storage in the ISO Base Media File Format



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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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This SMPTE Recommended Practice was prepared by Technology Committee C24.

Introduction

This section is entirely informative and does not form an integral part of this Recommended Practice.

This document was initiated by C24 in response to the need to store VC-1 coded bitstreams in file formats derived from the ISO Base Media File Format such as the MP4 file format and the 3GPP file format.

1 Scope

The purpose of this specification is to define the necessary structures for the integration of VC-1 coded bitstreams in a file format that is compliant with the ISO Base Media File Format. Examples of file formats that are derived from the ISO Base Media File Format include the MP4 file format and the 3GPP file format.

2 Conformance Notation

Normative text is text that describes elements of the design that are indispensable or contains the conformance language keywords: "shall", "should", or "may". Informative text is text that is potentially helpful to the user, but not indispensable, and can be removed, changed, or added editorially without affecting interoperability. Informative text does not contain any conformance keywords.

All text in this document is, by default, normative, except: the Introduction, any section explicitly labeled as "Informative" or individual paragraphs that start with "Note:"

The keywords "shall" and "shall not" indicate requirements strictly to be followed in order to conform to the document and from which no deviation is permitted.

The keywords "should" and "should not" indicate that, among several possibilities, one is recommended as particularly suitable, without mentioning or excluding others; or that a certain course of action is preferred but not necessarily required; or that (in the negative form) a certain possibility or course of action is deprecated but not prohibited.

The keywords "may" and "need not" indicate courses of action permissible within the limits of the document.

The keyword "reserved" indicates a provision that is not defined at this time, shall not be used, and may be defined in the future. The keyword "forbidden" indicates "reserved" and in addition indicates that the provision will never be defined in the future.

3 Normative References

The following standards contain provisions which, through reference in this text, constitute provisions of this recommended practice. At the time of publication, the editions indicated were valid. All standards are subject to revision, and parties to agreements based on this recommended practice are encouraged to investigate the possibility of applying the most recent edition of the standards indicated below.

SMPTE 421M-2006, Television — VC-1 Compressed Video Bitstream Format and Decoding Process

ISO/IEC 14496-12:2005, Information Technology — Coding of Audio-Visual Objects — Part 12: ISO Base Media File Format

4 VC-1 Track definition

In the terminology of the ISO Base Media File Format specification (ISO/IEC 14496-12), a VC-1 track is a video track. It therefore follows that these rules apply to the media box in the VC-1 track:

- In the Handler Reference box, the handler_type field shall be set to 'vide'.
- The Media Information Header box shall contain a Video Media Header box.
- The Sample Description Box shall contain a box derived from VisualSampleEntry. (For VC-1 tracks, this box is called **VC1SampleEntry** and is defined in section 6.)

As is the case with all video tracks in ISO Base Media File Format, references to VC-1 samples in the Sample Table Box shall be arranged in Decoding Time order. Decoding Time order is equivalent to the concept of "coded order" in SMPTE 421M.

5 VC-1 Sample definition

A VC-1 sample is defined as follows:

- For Simple and Main profiles: Exactly one VC-1 frame.
- For Advanced profile: One or more Encapsulated Bit-stream Data Units (EBDUs), as defined in Annex E of SMPTE 421M. The VC-1 sample shall contain data belonging to exactly one VC-1 frame.

In the case of interlaced video, a VC-1 frame consists of two fields that may be coded as separate pictures. The two pictures still belong to the same VC-1 frame and hence also to the same VC-1 sample.

It shall be noted that when Advanced profile is used, a VC-1 sample may contain EBDUs that are not part of a VC-1 frame, such as a Sequence Header EBDU. The following rules apply to such EBDUs:

- If a Sequence Header is present in a VC-1 sample, it shall be the first EBDU in the sample.
- If an Entry-point Header is present in a VC-1 sample, it shall be the first EBDU in the sample, unless a Sequence Header is also present, in which case the Entry-point Header shall follow directly after the end of the Sequence Header and any Sequence-level User Data.

The EBDU Start Code field is used to identify the type of the EBDU. The list of values for the EBDU Start Code field is given in SMPTE 421M, Annex E.5.

VC-1 samples shall be byte-aligned. If necessary, up to 7 zero-valued padding bits shall be added to the end of a VC-1 sample to achieve byte-alignment. The Padding Bits Box (defined in section 8.23 of ISO/IEC 14496-12) need not be used to record padding bits that are added to a sample to align its size to the nearest byte boundary.

5.1 Random access points

For Simple and Main profiles, each VC-1 sample that contains an I-picture shall be a random access point. For Advanced profile, a VC-1 sample shall be a random access point if any of the following conditions are met:

- The sample contains both a Sequence Header and an Entry-point Header.
- The sample contains an Entry-point Header and the **no_multiple_seq** bit in **VC1AdvDecSpecStruc** is 1.

The definition of **VC1AdvDecSpecStruc** is given in section 8.4.

The Sync Sample Box shall be used to mark all random access points in the track. The Sync Sample Box is defined in section 8.20 of ISO/IEC 14496-12.

6 VC1SampleEntry definition

The box type of the VC1SampleEntry Box shall be 'vc-1'.

The VC1SampleEntry Box is defined as follows: