SMPTE OVERVIEW

VC-5 Video Essence — Overview for the SMPTE 2073 Document Suite

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Foreword

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SMPTE Engineering Documents are drafted in accordance with the rules given in its Standards Operations Manual.

SMPTE OV 2073-0 was prepared by Technology Committee 10E.

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Approved
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1 Introduction

The SMPTE 2073 document suite defines the syntax and semantics of the VC-5 bitstream.

The VC-5 codec is a variable-bit-rate codec intended for high-quality video acquisition and post-production, capable of encoding diverse image and video formats.

The key design goals of the VC-5 codec are: (1) very high visual quality (visually lossless in most applications); (2) efficient implementation of both decoders and encoders; (3) support for any color space or color difference component sampling; (4) direct encoding of camera sensor output without conversion to a different format; and (5) adaptability and ease of use in video editing and post-production.

Before encoding, an image unpacking process converts an image into an ordered set of component arrays that are represented in the VC-5 bitstream. A component array is like an image plane and typically would contain a single type of color or data with up to 24 bits per component and up to thousands of components. The image unpacking process is not specified in the SMPTE ST 2073 document suite.

The VC-5 codec is not restricted to a particular set of image dimensions, pixel formats, or color standards. Common image formats, including images with RGB and YCbCr color components with an optional alpha channel and subsampled color difference components, for example YCbCr with 4:2:2 or 4:2:0 sampling, can be represented in a VC-5 bitstream. Color Filter Array (CFA) images, including Bayer pattern images, and non-color data, such as disparity values, can be unpacked into component arrays and encoded into a VC-5 bitstream.

The encoded bitstream represents the ordered set of component arrays such that a decoding process can reconstruct the set of component arrays, except for losses due to compression, in the same order as input to the encoding process.

The decoding process can be followed by an image repacking process that converts the ordered set of component arrays into a packed representation of the image. The image repacking process is not specified in the SMPTE 2073 document suite.

The dependencies between documents in the VC-5 suite are illustrated in Figure 1. The arrows indicate that a lower numbered part should be read before a higher numbered part.

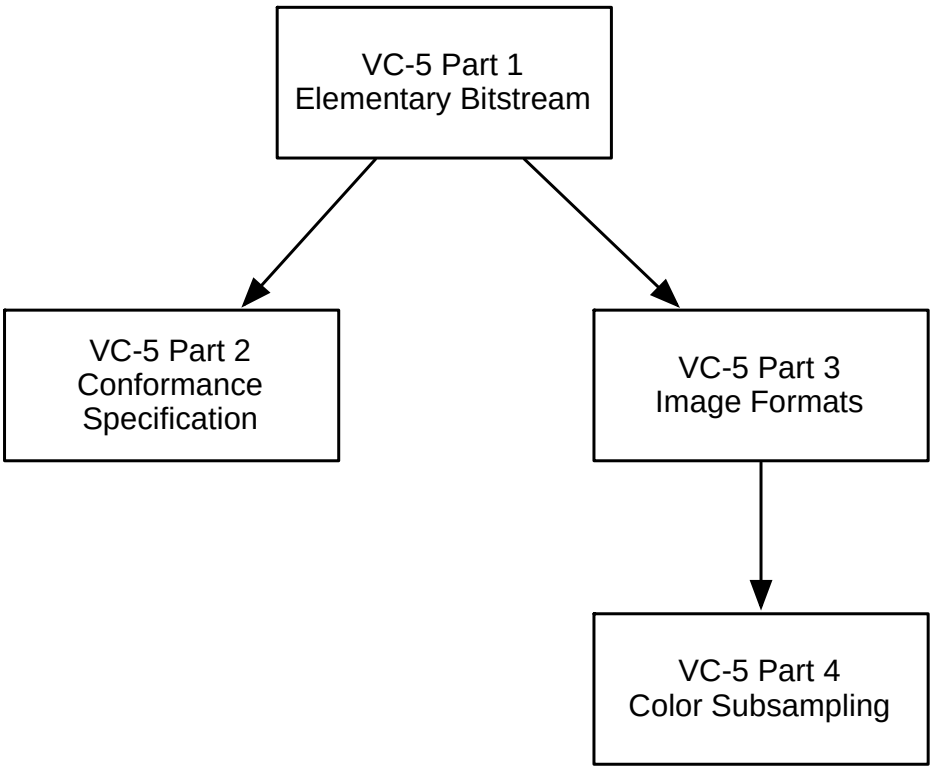

Figure 1 – Dependencies between documents in the VC-5 document suite

2 Scope

This informative overview describes the documents in the SMPTE 2073 suite.

2.1 Scope – SMPTE ST 2073-1:2014 Elementary Bitstream

SMPTE ST 2073-1 defines the compressed representation and decoding process for the VC-5 elementary bitstream. Any image or array of data that can be unpacked into component arrays can be represented by a VC-5 elementary bitstream.

2.2 Scope – SMPTE RP 2073-2:2014 Conformance Specification

SMPTE RP 2073-2 specifies the criteria and procedures for testing the conformance of encoder and decoder implementations to the VC-5 standard and describes the test materials used for conformance testing. The test materials used for conformance testing comprise a reference decoder for testing bitstreams created by implementations of a VC-5 encoder for compliance with the VC-5 standard and reference bitstreams for testing implementations of a VC-5 decoder for compliance with the VC-5 standard.

2.3 Scope – SMPTE ST 2073-3:2015 Image Formats

The VC-5 elementary bitstream defined in SMPTE ST 2073-1 does not specify the type of components that are represented in the bitstream.

SMPTE ST 2073-3 extends the elementary bitstream syntax with new elements for representing R′G′B′(A) images, $Y'C'_1C'_2$(A) images without color difference component sub-sampling, and Color Filter Array (CFA) images including Bayer image formats.

2.4 Scope – SMPTE ST 2073-4:2015 Subsampled Color Difference Components

SMPTE ST 2073-4 extends the $Y'C'_1C'_2$(A) image format defined in SMPTE ST 2073-3 to include subsampled color difference components, including 4:2:2, 4:2:0, 4:1:1, and 4:1:0 subsampling. An alpha channel is optional and can have the same resolution as the Y′ channel or the same resolution as the C'_1 and C'_2 channels.