

Matroska Container and FFV1 Video Codec

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FRAME Tech
hosted online by INA, France
17–24 November 2021

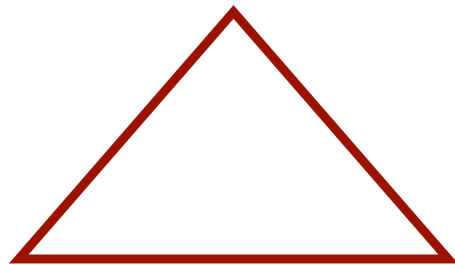
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Summary

- Past
- Present
- Future

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image quality



encoding time

file size

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Compression

- uncompressed
- lossless compression
- lossy compression
- chroma subsampling
- born compressed

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Uncompressed

- + data simpler to process
- + software runs faster
- bigger files
- slower writing, transmission and reading

Examples: TIFF, DPX, DNG, OpenEXR

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Lossless Compression

- + smaller files
- + faster writing, transmission and reading
- data processing complexer
- software runs slower

Examples: JPEG 2000, FFV1

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	avantages	disavantages
TIFF DPX DNG OpenEXR	data easier to process	bigger files
JPEG 2000 FFV1	smaller files	data complexer to process

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RAWcooked

- encoding into Matroska (.mkv) using FFV1 video codec and FLAC audio codec
- all metadata preserved
- decoding with bit-by-bit reversibility
- possibility to embed sidecar files (e.g. MD5, LUT, XML)
- compatibility with media players

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Past

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Matroska

- Steve Lhomme
- 2002
- “.mkv” files

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FFV1

- Michael Niedermayer
- FFV1 = FF Video codec 1
- FF = Fast Forward (FFmpeg)
- 2003

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FFV1: Versions

- FFV1 version 0
- FFV1 version 1
- FFV1 version 2
- FFV1 version 3

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Michael Niedermayer

- Peter Bubestinger-Steindl
- Hermann Lewetz
- Georg Lippitsch
- Carl Eugen Hoyos
- Dave Rice
- ...

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Present

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FFV1

- support for interlaced video
- support for gbrp16le and rgb24 data

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IETF and CELLAR

- IETF = Internet Engineering Task Force
- CELLAR = Codec Encoding for LossLess Archiving and Realtime transmission
- CELLAR is an IETF working group

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CELLAR

- data format: EBML
- audiovisual container: Matroska (the “.mkv” files)
- video codec: FFV1
- audio codec: FLAC

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EBML

- Steve Lhomme
- ca. 2002

- EBML = Extensible Binary Meta Language
- IETF RFC 8794

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Stream: Internet Engineering Task Force (IETF)
RFC: [8794](#)
Category: Standards Track
Published: July 2020
ISSN: 2070-1721
Authors: S. Lhomme D. Rice M. Bunkus

RFC 8794 Extensible Binary Meta Language

Abstract

This document defines the Extensible Binary Meta Language (EBML) format as a binary container format designed for audio/video storage. EBML is designed as a binary equivalent to XML and uses a storage-efficient approach to build nested Elements with identifiers, lengths, and values. Similar to how an XML Schema defines the structure and semantics of an XML Document, this document defines how EBML Schemas are created to convey the semantics of an EBML Document.

Status of This Memo

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Matroska

- IETF Internet Draft
- widely used for broadcast

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FFV1

versions 0, 1 and 3

- IETF RFC 9043

version 4

- IETF Internet Draft

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Stream: Internet Engineering Task Force (IETF)
RFC: [9043](#)
Category: Informational
Published: August 2021
ISSN: 2070-1721
Authors: M. Niedermayer D. Rice J. Martinez

RFC 9043

FFV1 Video Coding Format Versions 0, 1, and 3

Abstract

This document defines FFV1, a lossless, intra-frame video encoding format. FFV1 is designed to efficiently compress video data in a variety of pixel formats. Compared to uncompressed video, FFV1 offers storage compression, frame fixity, and self-description, which makes FFV1 useful as a preservation or intermediate video format.

Status of This Memo

This document is not an Internet Standards Track specification; it is published for informational purposes.

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FLAC

- Josh Coalson
- FLAC = Free Lossless Audio Codec
- 2000

- IETF Internet Draft
- widely used

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Future

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Directions

- support of Gray code (in addition to regular binary)

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FFV1: Directions

- support any channel
- 1D and 3D LUTs
- support Bayer data
- $Y'CoC_G$

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FLAC: Directions

- extraction of technical metadata

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