

Presets for FFV1 and MKV: Choosing the right parameters for the job.

Peter Bubestinger-Steindl
(p.bubestinger @ AV-RD.com)

November 2019

FFV1 Video Codec

Parameters

- coder
- context
- slices
- slicecrc
- level

Coder

- 0 = **Golomb Rice** (Default 8bpc)
- 1 = **Range Coder** (Default > 8bpc)
(with **default** transition table)
- 2 = Range Coder
(with **custom** transition table)

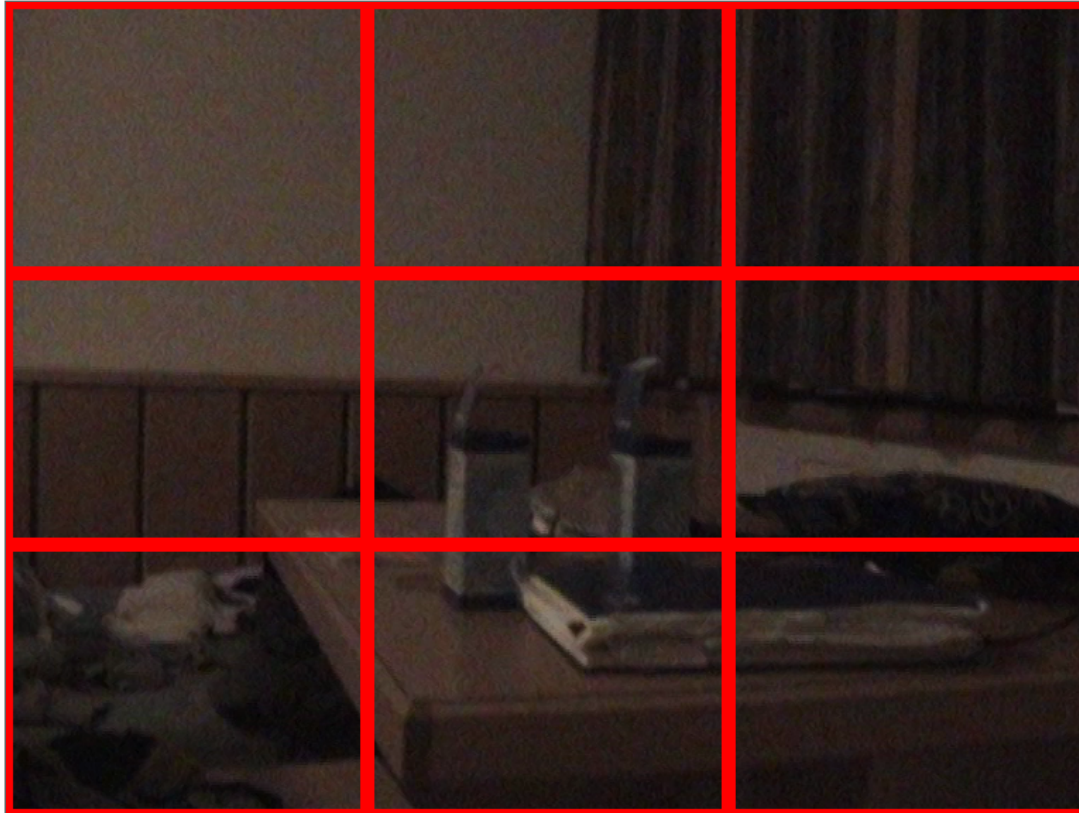
Context

- 0 = small (Default)
- 1 = large

Slices

- Image is divided into separate areas
- Used for parallel encoding
- Only with FFV1 version ≥ 2
- Each slice has its header
- But: More slices = slightly more space
(a few bytes/slice)

9 Slices



SliceCRC

- CRC = **Cyclic Redundancy Check**
- Checksum per slice
- More slices = more safety
- To *know* if a slice is okay.
- Decoders can choose:
“what to do if it’s not?”

Level = FFV1 version

- 0
- 1 (Default)
- **3** (Recommended)

Scan type

FFV1 can store field-order information independent of its container.

Scan type

aka “*picture structure*” (IETF specs)

- 0 = unknown
- 1 = top field first (TFF)
- 2 = bottom field first (BFF)
- 3 = progressive
- Other = reserved for future use

Default values

- level: 1 (!)
- coder:
 - = 8bpc: 0 (golomb rice)
 - > 8bpc: 1 (range)
- context = 0 (small)
- slices = 4
- slicecrc = 1

Matroska Container (MKV)

Some Parameters

- SegmentUID
- SeekHead
- Scan type
- Color information:
 - Sample range
 - Color primaries
 - Transfer characteristics
 - Matrix coefficients

SegmentUID

“A randomly generated unique ID to identify the Segment amongst many others (128 bits).”

SegmentUID

[Segment:] “The Root Element that contains all other Top-Level Elements (Elements defined only at Level 1). A Matroska file is composed of 1 Segment.”

– **Matroska.org**.

SeekHead

“Contains the Segment Position of other Top-Level Elements.”

– **Matroska.org**

It can be used to uniquely identify *this* MKV file and is part of the “MetaSeek” section.

MetaSeek

“The Metaseek section contains an index of where all of the other groups are in the file are located [...].”

“This element isn’t technically required, but you would have to search the entire file to find all of the other Level 1 elements if you did not have it.

This is because any of the items can occur in any order.”

*– **Matroska.org***

Fixity

CRC-32 per Element.

The magic's inside EBML.

Scan type

FlagInterlaced

- 0 = undetermined
- 1 = interlaced
- 2 = progressive

FieldOrder

- 0 = progressive
- 1 = top field first (TFF)
- 2 = undetermined
- 6 = bottom field first (BFF)
- 9 = BFF (swapped)
- 14 = TFF (swapped)

Color information (MKV/FFmpeg)

- **colour-range** (full, broadcast)

`-color_range mpeg`

- **colour-primaries**

`-color_primaries bt470bg`

- **colour-transfer-characteristics**

`-color_trc bt709`

- **colour-matrix-coefficients**

`-colorspace bt470bg`

Source: **“mkvpropedit -l”, vrecord**

Tagging

aka “Descriptive Metadata”.

“[...] contains all of the Tags that relate to the the file and each of the tracks. These tags are just like the ID3 tags found in MP3’s.”

Attachments

“The Attachment section is for attaching any type of file you want to a Matroska file. You could attach anything, pictures, webpages, programs, even the codec needed to play back the file.”

– **Matroska.org**

FFmpeg recipe (PAL)

```
ffmpeg -i VIDEO_IN \  
-c:v ffv1 -level 3 -coder 1 -context 0 -slices 24 -slicecrc 1 \  
-color_primaries bt470bg \  
-color_trc bt709 \  
-colorspace bt470bg \  
-color_range mpeg \  
-map 0 \  
-top 1 \  
-c:a copy \  
-g 1 -pix_fmt + \  
VIDEO_OUT.mkv
```

MXF-like profiles or presets

- Currently don't exist.
- But might make sense to define some.
- Don't overdo it.
- Works well without yet.

References

- **FFV1 Encoding (FFmpeg Wiki)**
- **FFV1 IETF Draft**
- **Matroska Specifications**
- **Matroska IETF Draft**
- **MKVToolNix**
- **EBML IETF Draft**

Questions?

Comments?