



FRAME advanced

Tech 2026

15-19 JUNE



FIAT  IFTA

EBU
ACADEMY



Co-funded by the
Creative Europe Programme
of the European Union

The logo for Ina, consisting of the lowercase letters 'ina' in white on a purple square background.

ina

A stylized illustration of a modern office and archive space. The office area features a whiteboard with diagrams, a person presenting, and another person listening. The archive area shows shelves filled with film reels and a person standing among them. A person is also shown operating a camera on a tripod, and another person is sitting on a stool. The overall color palette is purple, brown, and white.

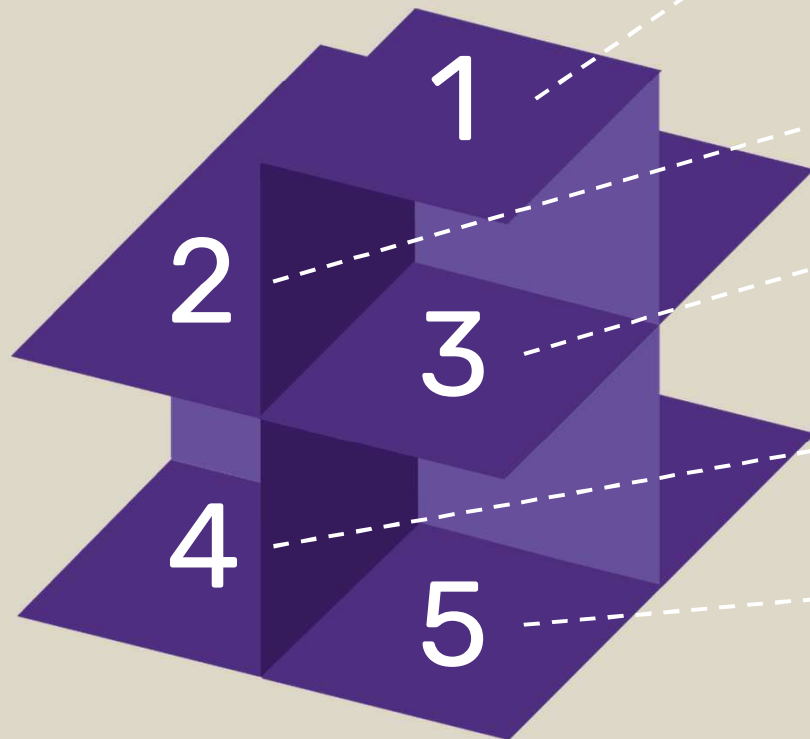
FRAME Advanced Tech 2026

The Open Source Ecosystem Made by Archivists

What is MediaArea

Open source software company focused on digital media analysis.

Not a single entity, but a group of independent developers.



Why QC is important?

Why open source?

MediaInfo

MediaConch

QCTools and more



Why quality control
is important?

Why quality control is important?

**If you don't handle that now,
content is definitely partially lost.**



Why quality control is important?

Your digital copy provider is available now
In the future, your content provider may have
disappeared, trashed content...

The original tape is still there, but for how long?
The original tape is still there, but for how long?
Or your tape becomes no more readable.

Why quality control is important?

Easier to catch quality issues and fix them now than later.

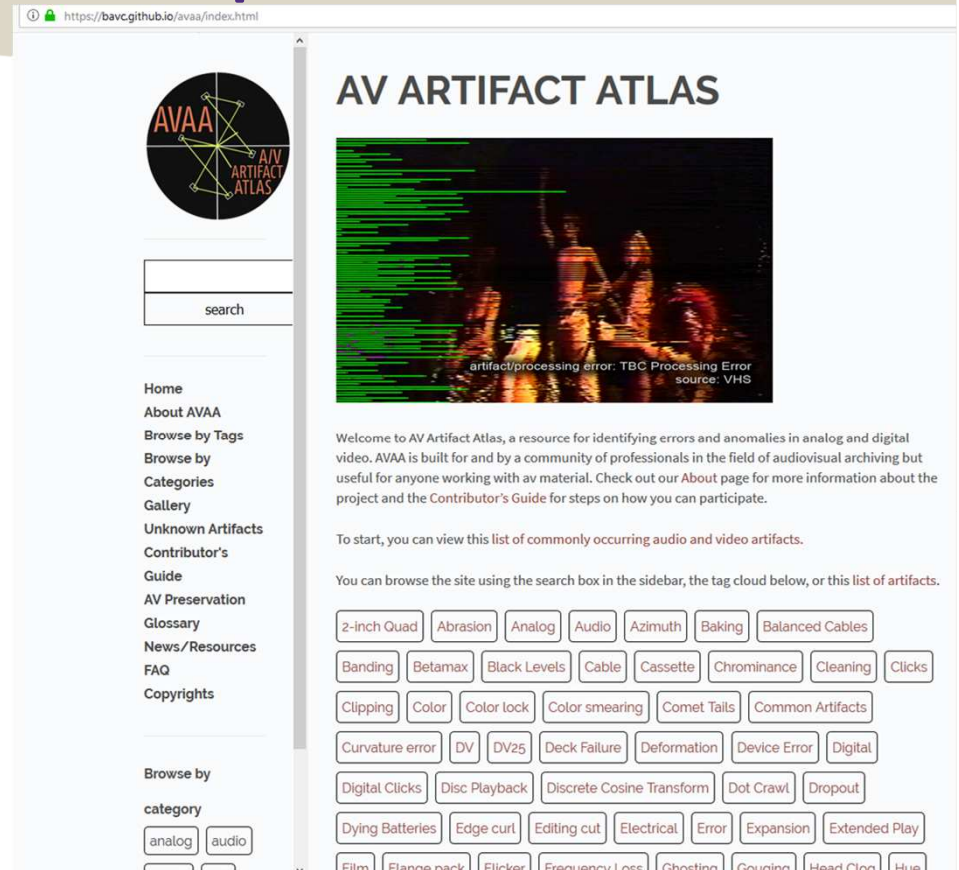
When someone else discovers quality issues, it may be too late.

Why quality control is important?

You are not alone

Example of online support:
AV Artifact Atlas, a resource for identifying errors and anomalies in analog and digital video. AVAA is built for and by a community of professionals in the field of audiovisual archiving but useful for anyone working with AV material.

<https://www.avartifactatlas.com>



The screenshot shows the AV Artifact Atlas website. The URL in the browser is <https://bavcgithub.io/avaa/index.html>. The page features a search bar, a navigation menu with links like Home, About AVAA, and Browse by Tags, and a main content area with a title "AV ARTIFACT ATLAS" and a video artifact example. The artifact is labeled "artifact/processing error: TBC Processing Error source: VHS". Below the artifact, there is a welcome message and a list of commonly occurring audio and video artifacts, including 2-inch Quad, Abrasion, Analog, Audio, Azimuth, Baking, Balanced Cables, Banding, Betamax, Black Levels, Cable, Cassette, Chrominance, Cleaning, Clicks, Clipping, Color, Color lock, Color smearing, Comet Tails, Common Artifacts, Curvature error, DV, DV25, Deck Failure, Deformation, Device Error, Digital, Digital Clicks, Disc Playback, Discrete Cosine Transform, Dot Crawl, Dropout, Dying Batteries, Edge curl, Editing cut, Electrical, Error, Expansion, Extended Play, Film, Flange rack, Flicker, Frequency Loss, Ghosting, Gouging, Head Clap, and Hub.

Why quality control is important?

You are not alone

Example of symposiums:

“No Time To Wait” symposiums are free events focused on open media, open standards, and digital audiovisual preservation.

Symposium program is made by archivists, who present how they work and the associated (open source) tools.

Past events:

<https://www.youtube.com/@MediaAreaNet>

Organization of symposiums has a cost.

- Hosting granted by a main sponsor
- Other archives or vendors may provide additional financial support

“No Time To Wait” 2026 will be at Filmoteka Narodowa – Instytut Audiowizualny (FINA) in Warsaw on October 14-16.

Current main additional sponsor is Centre national de l’audiovisuel Luxembourg (CNA)

<https://mediaarea.net/nttw10>



Why open source?

Why open source?

The archival domain

Relatively small market (niche)

Off-the-shelf products often focus on different use cases

Highly specialized demands

High potential for vendor dependence...

Why open source?

Why not Proprietary tools ?

Proprietary tools and formats are linked to one, and only one, vendor

If vendor disappears, it is impossible to get bug fixes
Without source code, you can not adapt yourself to new platforms: are you sure you'll be able to run the software in 100 years?

Vendor decides on the new features

Are you big enough for making the vendor develop your preferred feature?

Why open source?

The four freedoms of open source

Proprietary tools and formats are linked to one, and only one, vendor

- The freedom to run the program as you wish, for any purpose
- The freedom to study how the program works, and change it so it does your computing as you wish
- The freedom to redistribute copies
- The freedom to distribute copies of your modified versions to others

Why open source?

Reusability

Everyone can use everything

An example

FFmpeg: A complete, cross-platform solution to record, convert and analyze audio and video.

Adapted and reused in several MediaArea's open source tools
Sometimes tweaked

Why open source?

Open source does not mean not professional

Support contracts

Paid installation/integration

Hire developers

Why open source?

A real-world example

The lossless video codec FFV1

Austrian National Archive (Mediathek) wanted to do lossless digital video archiving

Not satisfied with existing products (Interoperability issues)

Found FFV1 in FFmpeg: Excellent codec, but we wanted/needed more...

Contacted and hired a FFV1 developer

Other parties involved for advices (pooled resources)

Budget calculated in reference to costs of proprietary alternatives

Now FFV1 version 3: faster and integrity-aware

So: other archives use FFV1, for free!

Why open source?

A real-world example

FFV1 version 3 is now a standard

FFV1 version 4 in progress:
float numbers, Bayer/RGGB...

Status:	Informational
More info:	Datatracker IPR Info page
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.

Why open source?

Quality of tools

Chicken and egg: if everyone waits, nothing happens
We start with needs easy to handle and we create dedicated open source tools
Tools become bigger, step by step, when more people join

YOU can decide about participating in lowering the overall cost for archives.

Why open source?

Funding

Driven by user requests

Most of tools were funded after a need is detected by users

Why paying for something you don't control? (is your current choice future proof?)

Everyone (you included) can develop or sponsor a development
You can fork if you think you have a better idea than others

 **FRAME**
advanced 2026

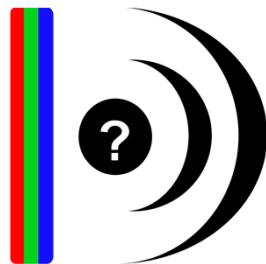


MediaInfo

MediaInfo

A technical information reporter

Convenient unified display of the most relevant technical and tag data for video and audio files.



MediaInfo

A technical information reporter

Output: text, XML, HTML, PBCore, EBUCore...

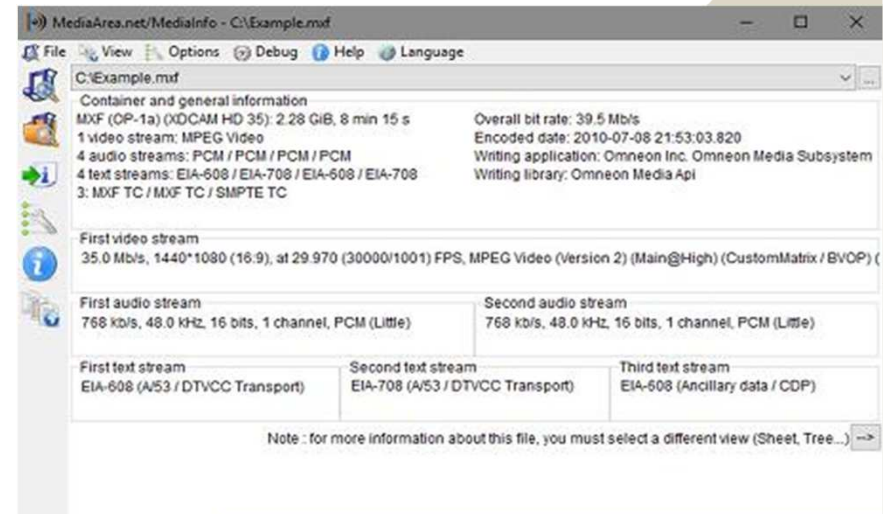
Container: format, profile, commercial name of the format, duration, overall bit rate, writing application and library, title, author, director, album, track number, date, duration...

Video: format, codec id, aspect, frame rate, bitrate, color space, chroma subsampling, bit depth, scan type, scan order...

Audio: format, codec id, sample rate, channels, bit depth, language, bit rate...

Text: format, codec id, language of subtitle...

Chapters: count of chapters, list of chapters...



 **FRAME**
advanced 2026



MediaConch

MediaConch

A conformance checker

Implementation checker
Policy checker
Reporter



MediaConch

Funding

Initial development sponsored by European Union
(PREFORMA project)

Focused on FFV1 and Matroska.

We added formats supported by MediaInfo to the policy
checker.



MediaConch

Implementation and Policy reporter

[Check by file upload](#)
[Check online files](#)
[Check server files](#)

Policy:
 Display:
 Verbosity:
Check files

Results × Close all results

Apply a policy to all results:

Show entries Search:

Files	Implementation	Policy	MediaInfo	MediaTrace	Status
ffv1_0.mkv	✓ Valid	N/A			✓ Analyzed
ffv1_0.mov	✓ Valid	N/A			✓ Analyzed
ffv1_test_pixfmt-bgr0_coder...	✓ Valid	N/A			✓ Analyzed
ffv1_test_pixfmt-gbrp14le_co...	✓ Valid	N/A			✓ Analyzed
ffv1_test_pixfmt-yuv422p_cod...	✓ Valid	N/A			✓ Analyzed

Showing 1 to 10 of 16 entries Previous **1** 2 Next

MediaConch

Implementation and Policy reporter

Compared to a specification or compared to your policy

MediaConch Report

File: C:/temp/FFV1+PCM_WithChecksum_Untouched.mkv

MediaConch EBML Implementation Checker

Toggle all verbosity:

- ▶ EBML-ELEM-START Tests run: 1 | Results: ✔
 - ▶ EBML-VER-COH Tests run: 1 | Results: ✔
 - ▶ EBML-DOCVER-COH Tests run: 1 | Results: ✔
 - ▶ EBML-ELEMENT-VALID-PARENT Tests run: 87 | Results: ✔
 - ▶ EBML-ELEMENT-NONMULTIPLES Tests run: 70 | Results: ✔
 - ▶ EBML-ELEMENT-CONTAINS-MANDATES Tests run: 43 | Results: ✔
 - ▶ EBML-ELEMENT-IN-SIZE-RANGE Tests run: 43 | Results: ✔
 - ▶ EBML-VALID-MAXID Tests run: 1 | Results: ✔
 - ▶ EBML-VALID-MAXSIZE Tests run: 1 | Results: ✔
 - ▶ HEADER-ELEMENTS-WITHIN-IDLENGTH-LIMIT Tests run: 1 | Results: ✔
 - ▶ ELEMENTS-WITHIN-MAXIDLENGTH Tests run: 1 | Results: ✔
 - ▶ HEADER-ELEMENTS-WITHIN-MAXSIZELENGTH Tests run: 1 | Results: ✔
 - ▶ ELEMENTS-WITHIN-MAXSIZELENGTH Tests run: 1 | Results: ✔
 - ▶ MKV-SEEK-RESOLVE Tests run: 4 | Results: ✔
 - ▶ EBML-CRC-FIRST Tests run: 6 | Results: ✔
 - ▶ EBML-CRC-VALID Tests run: 6 | Results: ✔
 - ▶ MKV-VALID-TRACKTYPE-VALUE Tests run: 2 | Results: ✔
 - ▶ MKV-VALID-BOOLEANS Tests run: 3 | Results: ✔
- MediaConch FFV1 Implementation Checker
- ▶ FFV1-SLICE-CRC-VALID Tests run: 4 | Results: ✔
- MediaConch PCM Implementation Checker

MediaConch Report

File: C:/temp/FFV1+PCM_WithChecksum_Untouched.mkv

▼ Example MKV FFV1 digitization policy ✗ fail

Example of a digitization specification of analog SD video to FFV1 and Matroska.

Type: and | Rules run: 17 | Fail count: 5 | Pass count: 12

- ▶ Is it Matroska? ✔ pass
- ▶ Matroska version 4 or greater? ✔ pass
- ▶ Unique ID is present? ✔ pass
- ▶ Is the video FFV1? ✔ pass
- ▶ FFV1 is version 3.4 or later? ✔ pass
- ▶ FFV1 is encoded in GOP size of 1? ✗ fail
- ▶ FFV1 uses slice crcs? ✔ pass
- ▶ Display Aspect Ratio is 4/3? ✗ fail (Actual: 1.222)
- ▶ Frame Rate is Constant? ✔ pass
- ▶ ColorSpace is YUV? ✗ fail (Actual: RGB)
- ▶ Chroma Subsampling is 4:2:2? ✗ fail
- ▶ Audio is PCM? ✔ pass
- ▶ Audio is 48000 Hz? ✔ pass
- ▶ Is this NTSC or PAL SD? ✗ fail
- ▶ Bit Depth is 8 or 10? ✔ pass
- ▶ Audio is Stereo or Mono? ✔ pass
- ▶ Bit Depth is 16 or 24? ✔ pass

MediaConch

File inspection

Offset	Key	Value
0x00000000	EBML (30 bytes)	
0x0000001e	Segment (35726 bytes)	
0x0000001e	Header (12 bytes)	
0x0000002a	SeekHead (115 bytes)	
0x0000009d	Void (88 bytes)	
0x000000f5	Info (139 bytes)	
0x00000180	Tracks (112 bytes)	
0x00000180	Header (5 bytes)	
0x00000185	CRC-32 (6 bytes)	
0x0000018b	TrackEntry (101 bytes)	
0x0000018b	Header (2 bytes)	
0x0000018d	CRC-32 (6 bytes)	
0x00000193	TrackNumber - 1 (3 bytes)	
0x00000196	TrackType - 1 (3 bytes)	
0x00000199	CodecID - V_FFV1 (8 bytes)	
0x000001a1	TrackUID - 1 (4 bytes)	
0x000001a5	FlagLacing - 0 (3 bytes)	
0x000001a8	Language - und (7 bytes)	
0x000001af	DefaultDuration - 40000000 (8 bytes)	
0x000001b7	Video (12 bytes)	
0x000001c3	CodecPrivate (45 bytes)	
0x000001c3	Header (3 bytes)	
0x000001c6	version	3 (0x3)
0x000001c6	micro_version	4 (0x4)
0x000001c6	coder_type	0 (0x0)

MediaConch

Policy editor

Policy list:

- Search
- [-] User policies
 - [-] Video file is MKV + FFV1-Intra + PCM or FLAC with CRC32 everywhere (or)
 - [-] MKV, FFV1 Intra, PCM/FLAC, error detection (and)
 - [-] **Container is MKV**
 - [-] Video is FFV1
 - [-] GOP size of 1
 - [-] Container uses error detection
 - [-] Video uses error detection
 - [-] Audio is PCM or FLAC (or)
 - [-] Has no video track
 - [-] matrix_coefficients not same (and)
 - [-] System policies
 - [-] Is this NTSC or PAL SD? (and)
 - [-] Example MKV FFV1 digitization policy (and)
 - [-] Matroska is well described? (and)
 - [-] CAVPP Preservation Master (and)
 - [-] Memoriar Video files Recommendations (or)

Rule type: MediaInfo MediaTrace

Rule name ⓘ:

Track type ⓘ *:

Field ⓘ *:

Occurrence ⓘ:

Validator ⓘ:

Content *:

MediaConch

You are not alone

Public policies page lists policies our users would like to share with you.

If you want to share yours, go to [policy editor page](#) (don't forget to [login](#) in order to associate your policy to your account), select the policy you want so share and set the "policy visibility" field to "public".

Video file is MKV + FFV1-Intra + PCM or FLAC with CRC32 everywhere

Test that the video file is suitable for archiving purposes from my point of view :-).

- Container format is Matroska with error detection (CRC)
- Video format is FFV1 with error detection (CRC) and with Intra mode (each frame is independent)
- Audio format is PCM (unfortunately it can not contain error detection) or FLAC (it has CRC by design)

Maintainer: Jérôme Martinez (MediaArea)
License: CC-BY-SA-4.0+

Add to my policies

Export

PDF is PDF/A

Test that a PDF is suitable for archives.

Note: for the moment, test that it is marked as PDF/A. Other ideas?

Maintainer: Jérôme Martinez (MediaArea)
License: CC-BY-SA-4.0+

Add to my policies

Export

TIFF is Raw

Test that a TIFF file is suitable for archive.

Note: for the moment, test that it is raw. Other ideas?

Maintainer: Jérôme Martinez (MediaArea)
License: CC-BY-SA-4.0+

Add to my policies

Export

Austrian Mediathek: Preservation Master (Video)

PAL/NTSC, FFV1 version 0/1, PCM 44.1/48kHz in AVI

Maintainer: Peter B.
License: CC-BY-4.0+

Add to my policies

Export



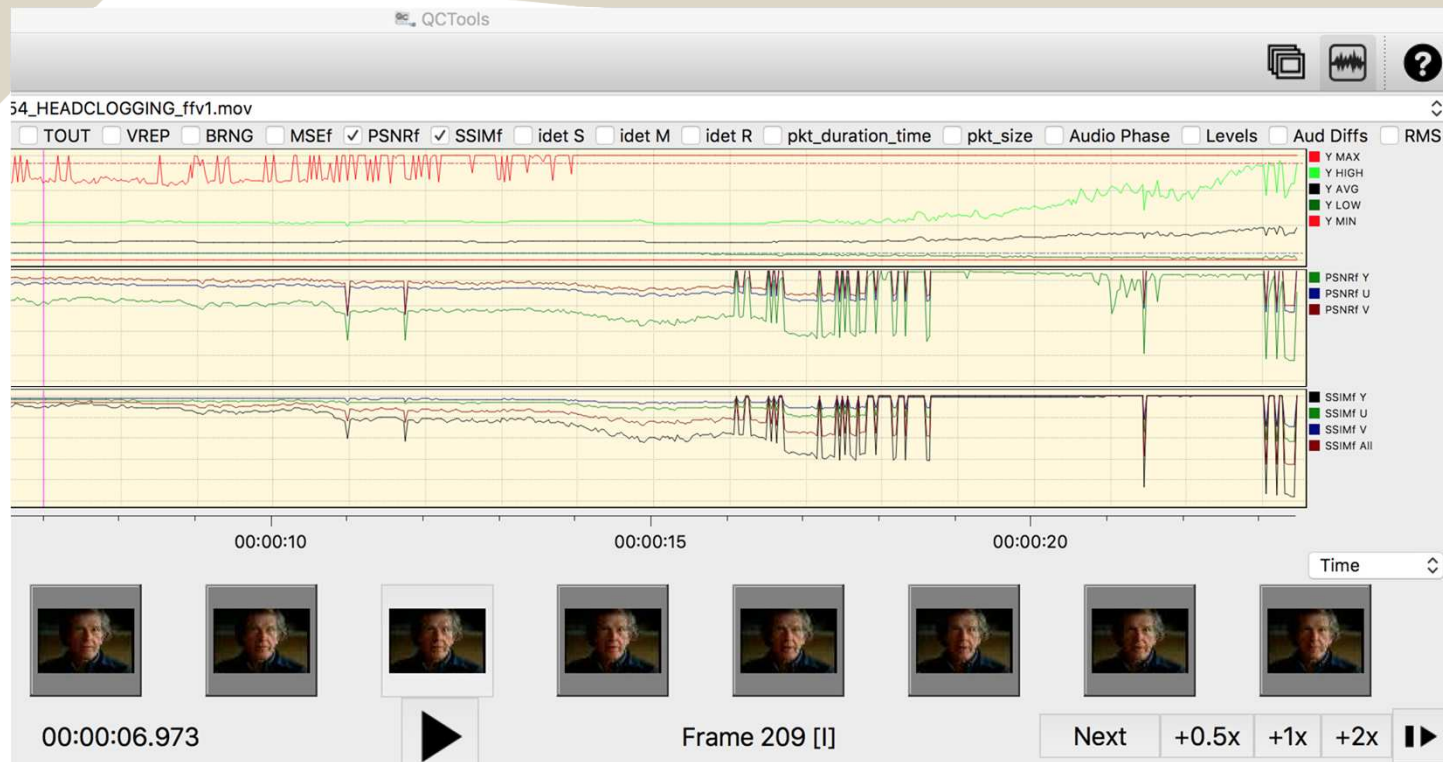
QCTools

QCTools

Helps users analyze and understand their digitized video files through use of audiovisual analytics and filtering.



QCTools



QCTools



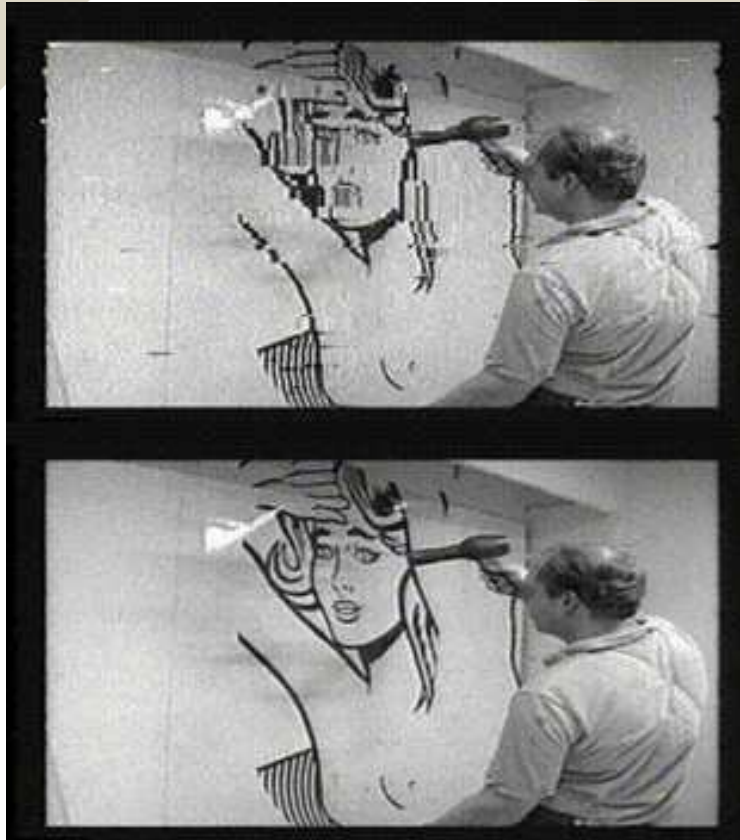
The screenshot displays the QCTools application window. The main interface is divided into several sections:

- Top Panel:** Contains a menu bar with icons for file operations and a toolbar with checkboxes for various analysis tools: Y values, U values, V values, YDiff, YDiffX, UDiff, VDiff, Diffs, TOUT, VREP, BRNG, and HEAD.
- Left Panel:** A video player showing a scene with two men. A timeline below the video indicates the current frame (Frame 2) at 00:00:00.067.
- Center Panel:** A waveform display showing signal levels over time, with a red horizontal line indicating a specific level.
- Right Panel:** A vertical menu listing various analysis options:
 - Normal
 - Field split
 - Field diff
 - Field histogram
 - Chroma split
 - Interlace
 - Waveform
 - Waveform (Field 1 Only)
 - Waveform (Field 2 Only)
 - Waveform (field-split)
 - Broadcast Range Pixels
 - Broadcast Range (field-split)
 - Vectorscope
 - Vectorscope (Field 1 Only)
 - Vectorscope (Field 2 Only)
 - Vectorscope (field-split)
 - Temporal Outlier Pixels
 - Temporal Outlier Pixels (field-split)
- Bottom Panel:** A detailed status bar showing technical parameters for the current frame, including YMIN, YLOW, YHIGH, YMAX, UMIN, UMAX, VMIN, VMAX, and various difference values (YDIF, UDIF, VDIF, VREP, BRNG, HEAD).

QCTools



QCTools



 **FRAME**
advanced 2026



RAWcooked

RAWcooked

The issue

- 1 DPX/TIFF file per video frame
- Not playable as is by several players (VLC...)
- Huge size
- So many DPX or TIFF format flavors (interoperability issues)

And need of keeping all metadata

RAWcooked

The goal

- 1 file with all (video, audio, sidecar files)
- Playable by a lot of players (MKV+FFV1+FLAC)
- Size divided by 2
- Reversible to source format if needed
- Easy to use

RAWcooked

The solution

Easy: just a short command line
"rawcooked YourDirectoryName"

Store DPX/TIFF headers/footers in a specific Matroska attachment
Store other sidecar files as Matroska attachments
Output is a single Matroska/FFV1/FLAC file

Encoding is reversible (bit-by-bit to original files)
"rawcooked YourMatroskaFileName.mkv"

RAWcooked

Long term sustainability

- ~50 RAWcooked sponsors
- A niche market
- No big company interested
- The initial effort was not small
- Each single entity needing that can not afford a full development
- We needed to find a different development model



RAWcooked

Long term sustainability

~50 RAWcooked sponsors

A different business model based on license key

We provide a key for other format flavors and features (temporary key possible)

1000 € for first flavor/feature

+ 500 € per additional flavor/feature

Except for GPU support (1000 €)

To be compared with storage cost saving
(storage cost divided by 2)





BWF MetaEdit

BWF MetaEdit

Metadata edition

Library of Congress (USA) centralized the management.

Edition of WAV/BWF metadata for conforming to their guidelines.

<https://www.digitizationguidelines.gov/guidelines/digitize-embedding.html>

BWF MetaEdit

Metadata edition

Technical Metadata Core Metadata Rules File management

Select which standards and rule sets to follow during use of BWF MetaEdit.
Selection of rule sets will constrained the allowed data entry and may add a
See documentation on BWF MetaEdit Rules within the Help documentation.

- BWF (EBU Tech 3285) requirements
- BWF (EBU Tech 3285) recommendations
- BWF CodingHistory (EBU Tech R98-1999) recommendations
- BWF OriginatorReference (EBU R99-1999) recommendations
- INFO (Microsoft definition) requirements
- INFO (Microsoft definition) recommendations
- Federal Agencies Digitization Guidelines Initiative recommendations

BWF MetaEdit

Open source! And versatile

Other entities needed metadata edition for other formats.

AVI MetaEdit and MOV MetaEdit are born.

Forks of BWF MetaEdit, same idea, same core source code.

Cheaper!



DVRescue

DVRescue

Improve DV dumps

DV format is complicated.

Lot of different vendors with specific issues.

National Endowment for the Humanities centralized the management.

Need to make capture easier



DVRescue

Improve DV dumps

DVRescue
dvrescue

FRAME#	TIMECODE	REC TIME
N/A	N/A	N/A

C:\Users\jerom\Downloads\v210.mkv [Simulator] (DeckLink) - 2

DVRescue

Improve analyze

The screenshot displays the DVRescue software interface. On the left, a vertical menu contains buttons for CAPTURE, ANALYSIS, MERGE, PACKAGE, SETTINGS, and HELP. The central video player shows a man's profile. Below the player are playback controls and a 'TC' (Timecode) button. At the bottom, there are two graphs: 'video error concealment (%)' and 'audio error concealment (%)'. The video error graph shows green bars for even frames and blue bars for odd frames. The audio error graph shows blue bars for even frames and orange bars for odd frames. On the right, a 'FILE' table lists loaded files, and a 'SEGMENT' table shows detailed analysis data for each frame.

File Name	Format	File Size	Frame Count	First Timecode	Last Timecode
1.dv	DV	480000	4	00:28:40;17	00:28:40;17
2.dv	DV	480000	4	00:28:40;17	00:28:40;17

Frame #	Timestamp	Timecode	Recording Time	Video Error %	Audio Error %
0	00:00:00.00	00:28:40;17	2020-08-29 16:14:05	74.81%	50%
1	00:00:00.03		2020-08-29 16:14:05	60.44%	10%
2	00:00:00.06	00:28:40;18	2020-08-29 16:14:05	7.49%	10%
3	00:00:00.10	00:28:40;20	2020-08-29 16:14:05	19.48%	0%

DVRescue

Optimize DV dumps

Now a tool for dumping DV from tape several times and peek the best dump.

Not by file... Not by frame... By macroblock.

 **FRAME**
advanced 2026



mkvnote

mkvnote

The issue to resolve

MKV is a container format.

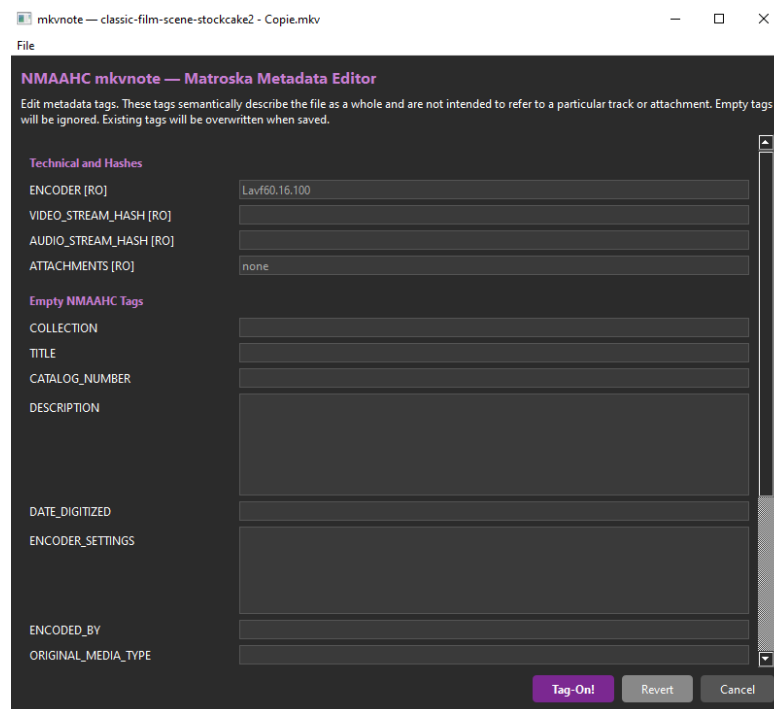
Lot of tools for editing MKV metadata.

But... Command line 😞.

Not everyone is able to use it.

mkvnote

The solution



mkvnote

A graphical interface easy to use

Smithsonian National Museum of African American History and Culture (NMAAHC) needed something easier to manage.
And adapted to their needs.

We develop a dedicated tool for the graphical interface,
using existing open source command line tools.

Not so expensive.



LeaveSD

LeaveSD

How to leave a proprietary format

STARDIVA® storage format based on NSV but with opaque metadata format and 8-ch single audio track for actually 8 independent mono content.

The old software version is not compatible with Windows 10+.
The new software version is super expensive.
Here is the trap!

Well... Let's do some reverse engineering.

LeaveSD

How to leave a proprietary format

Funded by an anonymous sponsor.

Not happy with the monopoly from one vendor on the file format support.

But past is past, files are there, very important.

LeaveSD

How to leave a proprietary format

Sponsorship of reverse engineering.

Risky, maybe no outcome.

Based on standard formats (NSV container, AVC video, AAC audio).
But not standard.

LeaveSD

How to leave a proprietary format

It was long but we succeeded to decode the files.

We used several open source tools (FFmpeg, FAAD, mkvmerge) and custom glue between them.

A couple of other users wanted to use it too.
But new version of the files are slightly different.

No budget, not supported 😞.

Maybe in the future, when there is budget.

Code is open source, available for everyone motivated.



Wrap-up

Wrap-up

Don't forget QC

Open source is another way to work

Archivists created an ecosystem for themselves.

You can improve tools or sponsor the improvements you need

Stay in touch

MediaArea: <https://MediaArea.net>, @MediaArea_net

Jérôme Martinez: jerome@MediaArea.net

Slides: <https://MediaArea.net/Events>

License (except images): CC BY