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Recommended file formats for long-term archiving and for web dissemination in Phaidra

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Premise

This document is intended to provide an overview of the file formats to be used depending on two possible destinations of the digital document: long-term archiving and uploading to Phaidra, and subsequent web dissemination.

When the document uploaded to Phaidra is also the only saved file, the two destinations coincide; in general, one will probably want to produce two different files in two different formats to meet the differences in requirements and use at the final destinations.

In the following tables, the recommendations for long-term archiving are distinct from those for dissemination in Phaidra.

There are no absolute criteria for choosing the file format. The choice is always dependent on different evaluations that the person who is carrying out the archiving will have to make on a case-by-case basis and will often result in a compromise between the best achievable quality and the limits imposed by the costs of production, processing and storage of files, as well as, for the preceding, by the opportunity of a conversion to a new format.

This choice is particularly significant from the perspective of long-term archiving, for which a quality that respects the authenticity and integrity of the original document and a format that guarantees long-term access to data are desirable.

This document should be seen more as an aid to the reasoned choice of the person carrying out the archiving than as a list of guidelines to be followed to the letter.

In the tables that follow, the "Recommended Web" column includes only those formats that allow direct viewing in the browser, without the aid of external applications. The column headed "Type of object in Phaidra" has the practical function of specifying which "type of object" must be selected by those who are archiving in Phaidra at the time of loading.

For an explanation of the abbreviations used here, see the "Abbreviations used" section at the end of the document.

Format selection criteria

There are general criteria to follow when choosing the most suitable archiving format. Although there are some discrepancies, archives and institutions involved in the preservation of digital heritage identify the most important as summarised below.

Openness: an open format is defined as conforming to public specifications, i.e. available to anyone interested in using that format. The availability of the format's specifications should make it possible to decode it, even in the absence of products that perform this operation automatically. Some archives specify more strictly that the format must not be proprietary¹.

Portability: means the ease with which formats can be used on different platforms, both hardware and software. When defining the portability of a format, account is also taken of the availability of tools that make it accessible both when creating files and when accessing data. The presence of external dependencies, technical protection mechanisms or patents is in contrast to portability.

Quality and functionality: the ability of a format to provide features that ensure quality and richness of data, good performance in terms of speed (and possibly compression), inclusion of metadata and data of different natures.

Development support: this refers to the resources needed to maintain and develop the format and the IT products that manage it.

Diffusion: measures the degree of diffusion of the format in the world, and in particular the level of adoption by the most important international archives. The diffusion of a format has implications for the probability that it will be supported over time, through the availability of computer products suitable for its management and visualisation.

Transparency: refers to the degree to which the digital representation is open to direct analysis with basic tools. Transparency is best if the content is encoded in standard encodings. Encryption is incompatible with transparency; compression inhibits transparency (however, for practical reasons, digital audio and video are rarely stored in an uncompressed form).

Self-documentation: digital objects that are self-documenting are more sustainable and less vulnerable in the long run than objects that are stored separately from the metadata needed to make them usable. A digital object that contains basic descriptive metadata (the analogue to the title page of a book) and incorporates technical and administrative metadata related to its creation and early stages of its life cycle will be easier to manage, to monitor for integrity and usability, and to transfer from one archiving system to the next.

For more information on format selection criteria, compare:

DPCM 3 dicembre 2013, alleg. 2 *“Regole tecniche in materia di sistema di conservazione”*, ai sensi del *“Codice dell’amministrazione digitale”*
https://www.agid.gov.it/sites/default/files/repository_files/leggi_decreti_direttive/dpcm_3-12-2013_conservazione.pdf pag. 17

LOC, *Sustainability of Digital Formats: Planning for Library of Congress Collections*, 2017
<https://www.loc.gov/preservation/digital/formats/sustain/sustain.shtml#disclosure>

¹ Generally, "proprietary" format means a format that is not open, is covered by patents or licenses, or whose specifications are not fully available.

Evelyn Peters McLellan, *Selecting Formats for Digital Preservation: Lessons Learned during the Archivematica Project*, 2010
https://groups.niso.org/apps/group_public/download.php/4237/IP_McLellan_Selecting_Formats_isqv22no2.pdf

Universität Wien, *Formats for long-term preservation*
<https://datamanagement.univie.ac.at/en/about-phaidra/formats/formats-for-longterm-perservation/>

NARA, *Frequently asked questions about Digital Audio and Video*, 2016 <https://www.archives.gov/records-mgmt/initiatives/dav-faq.html>

PACKED, *A short guide to choosing a digital format for video archiving masters*, 2014
<https://www.scart.be/?q=en/content/short-guide-choosing-digital-format-video-archiving-masters>

Text

Archiving Recommended	Archiving Possible	Web Recommended	Web Possible	Object type in Phaidra	Notes
PDF/A		PDF/A		Document (PDF, TeX)	A widely used archiving format, which prohibits the use of some functions of PDF that may be difficult to render in the future. Well supported; fully available specifications.
	PDF	PDF		Document (PDF, TeX)	Generally, lighter than PDF/A, but not suitable for long-term archiving.
	TeX, LaTeX		TeX, LaTeX	Document (PDF, TeX)	Markup format particularly used for the representation of mathematical formulas. Without its own accessory files (images, table of contents, bibliographies...), there can be loss of content, formatting, and functionality. For Phaidra, it is preferable to export to PDF/A.
	HTML, XHTML		HTML, XHTML	Unknown	Without its own accessory files (images, CSS, JavaScript...), there can be a loss of content, formatting, and functionality. For Phaidra, it is preferable to export to a compressed folder (e.g. ZIP) that also contains the accessory files. There is also the possibility of archiving in WARC format (WebARChive), which is, however, complex both in creation and in reading.

	XML		XML	Unknown	Includes XML-based markup formats, including DTD/Schema and XSD/XSL stylesheets (TEI, DocBook...). Character encoding may vary (UTF-8, UTF-16, ASCII, etc.) and must be explicitly stated.
	EPUB		EPUB	Unknown	XML-based format. Not widely used, but well documented. Must not be encrypted or contain access restrictions.
	TXT		TXT	Unknown	The simplest and most supported text format. Character encoding may vary (UTF-8, UTF-16, ASCII, etc.). UTF-8 is recommended.
	ODT (ODF)		ODT (ODF)	Unknown	Open format. Fully documented specifications. PDF/A export preferable.
	ODT (ODP)		ODP (ODF)	Unknown	Open format. Fully documented specifications. PDF/A export is preferable.
	DOCX (OOXML)		DOCX (OOXML)	Unknown	Open format. Fully documented specifications. PDF/A export is preferable. To exclude: macros, binary files, cross-references with external files.
	PPTX (OOXML)		PPTX (OOXML)	Unknown	Open format. Fully documented specifications. PDF/A export is preferable.

Image

Archiving Recommended	Archiving Possible	Web Recommended	Web Possible	Object type in Phaidra	Notes
	JPEG	JPEG		Image	Widely used, particularly for web usage (compressed files, with loss). Not suitable for long-term archiving of quality images.
	JPEG 2000 (JP2)		JPEG 2000 (JP2)	Unknown	Standard covered by patents; only Part 1 specifications are fully available. Several implementations are not necessarily compatible with each other. Not yet widely used, but with increasing diffusion. Allows lossless compression. For long-term archiving must include descriptive and technical metadata.
TIFF			TIFF	Image	Fully documented specifications. This is the <i>de facto</i> standard for archiving images. It must be an uncompressed TIFF 6.0, with Intel byte order (PC), and inclusion of descriptive and technical metadata. Compared to lossy images, e.g. JPEG, these are heavy files.
	PNG	PNG		Image	Lossless compressed format, fully open. Widely used in particular contexts.
	PDF, PDF/A	PDF, PDF/A		Document (PDF, TeX)	Widely used archiving format. Well supported; specifications fully available.

					PDF/A prohibits the use of certain PDF functions that may be difficult to render in the future.
SVG		SVG		Unknown	Based on XML. Open and fully documented format, suitable for archiving vector images.
	DNG			Unknown	It is the open RAW (digital negative) format; it is fully documented.
	RAW proprietari (NEF, CRW, 3FR...)			Unknown	The RAW formats (digital negatives) produced by cameras (CAM_RAW) are not suitable for long-term archiving, as they are proprietary (except DNG). However, provided that a copy in TIFF format is also archived, storing RAW files is useful since they contain raw data.

Clarifications

In general, for the distribution of raster images over the Web, it is preferable to use the compressed JPEG format; however, for PNG images that one wants to distribute without loss of quality, use the native format.

The PDF format has been included here - in addition to the text formats - because it can be composed only of images, for example, in the case of scanned books. Note that there is no unanimous view on whether PDF/A should be used for PDFs that contain only images, for which a conversion to PDF/A does not improve their long-term preservation (see, for example, that written by *The Open Preservation Foundation*)².

For a comparison of image formats, see also: FADGI, *Summary Table: Raster Still Images for Digitization: A Comparison of File Formats*, 2014, page 6 http://www.digitizationguidelines.gov/guidelines/FADGI_RasterFormatCompare_p3_20140417_r.pdf

² <https://openpreservation.org/blog/2014/08/27/when-not-migrate-pdf-pdfa/>

Audio

Archiving Recommended	Archiving Possible	Web Recommended	Web Possible	Object type in Phaidra	Notes
WAVE, Broadcast Wave (BWF)			WAVE, Broadcast Wave (BWF)	Audio	It's a <i>de facto</i> standard ³ , well-documented. For archiving, it should only contain uncompressed, Linear PCM bitstream (LPCM) encoded audio. WAVE files are relatively heavy compared to lossy formats. Broadcast Wave (BWF) files are WAVE files with metadata included, and are the preferred archiving format by IC, LOC, NAA, SIA, IASA, LAC and NARA (for NARA, along with FLAC).
	MP3	MP3		Audio	Format originally covered by patents (now expired), public specifications. Widely used, also thanks to the high compressibility. Lossy compression, therefore not suitable for long-term storage.
FLAC			FLAC	Audio	Open format, developed as an open source project. It allows lossless compression, with production of files that are about a third the size of uncompressed files. When converting from BWF, it allows the inclusion of the metadata present ⁴ . For NARA, it is

³ https://www.webarchive.org.uk/wayback/archive/20160101152346/http://www.jiscdigitalmedia.ac.uk/infokit/file_formats/audio-wrappers

⁴ <http://dericed.com/2013/flac-in-the-archives/>

					one of the two preferred formats (along with BWF). Does not use the Phaidra player
	MPEG-4 AAC		MPEG-4 AAC	Unknown	Widely used, also for its high compressibility. Lossy compression and covered by patents, therefore not suitable for long-term storage. Does not use the Phaidra player.
	AIFF		AIFF	Unknown	For archiving, it should only contain uncompressed, Linear PCM bitstream (LPCM) encoded audio. Does not use the Phaidra player.

Clarifications

Usually, for archiving purposes, uncompressed formats are preferred (although discussion is open, particularly for the FLAC format), and at the native resolution rather than through resampling.

See also: CAVPP, *Target Audio and Video Specifications*, 2017

<https://calpreservation.org/wp-content/uploads/2017/03/CAVPP-File-Specs-2017.03.08.pdf>

Video

A video format is a complex object, which can be seen as a container of multiple files of a different nature: audio, video, subtitles and others. These files can be compressed with different encodings, some more suitable for long-term preservation and others for web use. Therefore, here it is necessary to detail both the container formats and the encodings of the video and audio contents (in general, for long preservation, the audio will be uncompressed WAVE, or alternatively FLAC); consequently, the following two tables should be used together⁵.

Unlike what occurs in audio digitisation, where WAVE (normally in the BWA variant) is widely considered the *de facto* standard for archiving, in the video field, there is no consensus among archiving institutions.

For video archiving, historically, there are two opposing trends: television broadcasting agencies, possessing enormous amounts of video footage in which content is often more important than image quality, tend to archive in compressed and lossy format, so as to speed up procedures and reduce storage costs⁶. Conversely, the institutions (archives, museums, libraries) that must preserve the cultural and video heritage of which they are the repositories, prefer to archive the material in the best possible quality, uncompressed or, more frequently, with lossless compression, that is, without loss of data⁷.

For long-term archiving, large international archives suggest several containers - AVI, MOV, MXF, Matroska - and several encodings - JPEG 2000, FFV1 or V210.

According to an analysis of FADGI's comparative study of major digitization projects⁸, there are two different approaches, or "communities", that of large national archives and libraries more likely to use standards with a capital "S" (MXF or MOV with JPEG 2000 encoding) and those of specialists, mainly located in Europe, active in the adoption of formats created in open source projects even when not widely established or not well documented⁹ (Matroska with FFV1 encoding)¹⁰.

⁵ For a correspondence between containers and supported encoding formats, see Wikipedia "*Comparison of video container formats*" https://en.wikipedia.org/wiki/Comparison_of_video_container_formats.

⁶ The Digital Learning and Multimedia Office of the University of Padova, for example, recommends archiving in the original format, but, if the format is obsolete, accompanied by a copy in a widely used format, even compressed and lossy (e.g., MP4 or Matroska, with H.264 video encoding, and FLAC audio) (Marco Toffanin, voice communication).

⁷ http://download.das-werkstatt.com/pb/mthk/info/video/comparison_video_codecs_containers.html#lossy_vs_lossless

⁸ http://www.digitizationguidelines.gov/guidelines/video_reformatting_compare.html?loclr=blogsig

⁹ The limit of not being well documented present in FFV1 is destined to disappear shortly since the specifications for FFV1 are now at the status of "last call" thanks to the IETF cellar working group. (<https://datatracker.ietf.org/doc/draft-ietf-cellar-ffv1/> February 2019).

¹⁰ <https://blogs.loc.gov/thesignal/2014/12/comparing-formats-for-video-digitization/>

For the video quality of files intended for long-term preservation, the resolution¹¹, bitrate¹² and all other parameters that best preserve the authenticity and integrity of the original video are also taken into consideration. In particular, in the case of conversion to a new format, the resolution and bitrate of the original must be maintained. In general, archiving in the original format is recommended for preservation, but if the format is obsolete, it is also recommended to archive a copy in a format currently widely used and suitable for the purpose (i.e. well documented, uncompressed or lossless compressed, etc.).

As for the display in Phaidra, the player currently used ([Video.js](#)) plays the MP4 format with H.264 video encoding and MP3 or AAC audio encoding. In the future, Phaidra is expected to adopt more efficient streaming solutions, compatible with a wider range of formats and encodings.

Containers

Archiving Recommended	Archiving Possible	Web Recommended	Web Possible	Object type in Phaidra	Notes
AVI			AVI	Video	Very popular format, well supported and with fully documented specifications. For archiving, IC recommends uncompressed AVI (encoding not specified). LAC also prefers this format (AVI with 4:2:2:2 chroma subsampling; uncompressed), along with MXF and MOV.
	MP4 (MPEG-4 part 14)	MP4 (MPEG-4 part 14)		Video	Very popular and well-documented container.

¹¹ In ascending order, from the worst to the best resolution: VHS, PAL, DVD, Blu-Ray (720p, 1080p), 4K, 8K (<https://datamanagement.univie.ac.at/en/about-phaidra/formats/background-knowledge/>).

¹² In ascending order, from the worst to the best *bitrate*: 1 Mbps (480p), 2-5 Mbps(720p), 4.5 Mbps (1080p), 9.8 Mbps (DVD), 40 Mbps (HB Blu-Ray) (<https://datamanagement.univie.ac.at/en/about-phaidra/formats/background-knowledge/>).

					Usually used with MPEG-H Part 2 (H.265/HEVC), MPEG-4 Part 10 (H.264/AVC) and MPEG-4 Part 2 video encoding; MPEG-4 AAC is the only allowed audio encoding. For access, IC and CAVPP recommend MPEG-4.
Motion JPEG 2000 (MJP2 or MJ2)			Motion JPEG 2000 (MJP2 or MJ2)	Unknown	Diffuse format, with fully documented specifications. Intraframe compression. Heavy files. NAA uses Motion JPEG 2000 for its projects.
MXF			MXF	Unknown	Popular format more professional than desktop, with fully documented specifications. The LOC National Audio-Visual Conservation Center uses MXF (JPEG 2000 included in MXF) when reformatting videotapes for preservation. LAC also prefers this format (always in combination with lossless compressed JPEG 2000), along with AVI and MOV (4:2:2 chroma subsampling; uncompressed).
Matroska (MKV)			Matroska (MKV)	Video	Developed as an open source project. Open, widely used, and rapidly expanding format. Supports a large number of audio and video encodings. Can contain complex objects. Format recommended by PREFORMA. Archivematica and SNA use Matroska for preservation (with

					FFV1 video and LPCM audio encoding).
QuickTime (MOV)			QuickTime (MOV)	Video	Very common format. Fully available specifications. Can be considered as a variant of MP4 to which it has given rise and from which it incorporates many updates ³ . May contain complex objects. Used by CAVPP for masters. LAC also prefers this format (MOV with uncompressed 4:2:2 encoding), along with MXF and AVI.
	OGG		OGG	Unknown	Open format, developed by the open source project Xiph. Limited diffusion. Can incorporate different audio and video encodings.
DPX			DPX	Unknown	Open format. It is considered a standard for high-quality digital conversion from cinematic films. Normally, it does not include audio, which is saved separately (usually in WAVE). Used by the Motion Picture, Broadcasting, and Recorded Sound Division (LOC), NARA and LAC.

Video coding formats ¹³

Archiving Recommended	Archiving Possible	Web Recommended	Web Possible	Notes
	H.264 (also AVC) (MPEG-4 part 10)	H.264 (also AVC) (MPEG-4 part 10)		Compressed format, lossy or lossless ¹⁴ , widely used especially for web use. Protected by various patents. For web access, LOC and CAVPP use MPEG-4_AVC.
	H.265 (also HEVC) (MPEG-H Part 2)	H.265 (also HEVC) (MPEG-H Part 2)		Successor format of H.264, more efficient, but extremely demanding in terms of CPU resources. Covered by numerous patents. Growing circulation.
JPEG 2000 (JP2)			JPEG 2000 (JP2)	Standard covered by patents, lossy or lossless compression (intraframe). Demanding in terms of CPU resources. Supported by a few software programs. Adopted by important audio-video archives. Various implementations are not necessarily compatible with each other. Used by NAA for its projects (in Motion JPEG 2000 container), by the National Audio-Visual Conservation Center of the LOC in the reformatting of <i>videotapes</i> for preservation (in MXF container) and by LAC.
	Theora		Theora	Open format, developed by the open source project Xiph. Compression with loss. Limited diffusion.
FFV1			FFV1	Open format, developed as an open source project. Created for digital preservation. Intraframe compression like Motion JPEG 2000, but much more efficient. Good performance; well supported

¹³ Erroneously, sometimes we refer to encoding formats with the English term *codec* (which stands for "coder-decoder"). For a terminological distinction between "*encoding format*" and "*codec*" see Wikipedia: https://en.wikipedia.org/wiki/Video_coding_format#Distinction_between_format_and_codec

¹⁴ In reality the encoding format is not optimized for lossless compression and most players are not able to read compressed H.264 without loss (personal communication by Peter Bubestinger-Steindl).

				by software. Still little used, but of increasing popularity in archiving ¹⁵ . For storage, Archivemata uses FFV1 in Matroska container, OM uses FFV1 in AVI container. On FFV1 in Matroska, see also FIAF ¹⁶ .
	Dirac		Dirac	Compressed encoding format, lossless or lossy, not covered by patents. Limited distribution. Demanding in terms of CPU resources. Developed by the BBC.
<i>V210, YUY2, UYVY e altri (tutti con 4:2:2 chroma subsampling)</i>			<i>V210, YUY2, UYVY e altri (tutti con 4:2:2 chroma subsampling)</i>	Well-documented and well-supported formats, uncompressed, used by many archives. They result in large files. V210 is used by CAVPP for the master files. YUY2 is used by NARA for reformatting videotapes.

Clarifications

Figure 1 graphically summarises the diffusion of video containers and encodings recommended for long-term preservation by some important archives and projects in the world.

It can be noted that some archives leave a wide spectrum of choice, even including formats considered "at risk" (e.g. WMV), while others restrict the choice to practically a single format (e.g. PREFORMA with FFV1 encoding format included in MKV container, or LOC with JPEG 2000 encoding format included in MXF container). NARA has also been included in the figure of the recommended formats, although these archives, for video formats, provide only "accepted" formats and no "preferred" ones.

Among the containers, besides the "classic" MOV and AVI, also MXF and Motion JPEG 2000 are widely used, and also the open source MKV is beginning to have a significant basis of use for professional preservation.

Among the encoding formats, besides the uncompressed ones (4:2:2 and others), the use of JPEG 2000 and the open source format FFV1 stand out.

¹⁵ https://www.webarchive.org.uk/wayback/archive/20160101152356/http://www.jiscdigitalmedia.ac.uk/infokit/file_formats/video-codecs

¹⁶ https://www.fiafnet.org/images/tinyUpload/E-Resources/Commission-And-PIP-Resources/TC_resources/FFV1_and_Matroska_reading_list.pdf

Figure 1: Diffusion of video containers (columned on the left) and codings (on the right) recommended for long preservation by some important archives and projects in the world (in the centre).

A useful tool to determine the technical data of a video file (container, encoding, bitrate, frame rate, colour space, bit depth and more) is MediaInfo, available for Windows, macOS, and Linux: <https://mediaarea.net/en/MediaInfo>. The MediaInfo developers themselves are working on a more in-depth analysis tool, MediaTrace (<https://mediaarea.net/MediaTrace>), available, for example, in MediaConch (<https://mediaarea.net/MediaConch>).

Due to the complexity of the topic, for more information on the formats of video files intended for preservation, please refer to the extensive documentation on the network:

FADGI, *Digital File Formats for Videotape Reformatting – Part 5. Narrative and Summary Tables*, 2014. On pages 16-17 two tables, one for the containers and one for the coding formats

http://www.digitizationguidelines.gov/guidelines/FADGI_VideoReFormatCompare_p5_20140908.pdf

FADGI, *Digital File Formats for Videotape Reformatting*, 2014

http://www.digitizationguidelines.gov/guidelines/video_reformatting_compare.html

FADGI, *Guidelines: MXF Application Specification*, 2017 http://www.digitizationguidelines.gov/guidelines/MXF_app_spec.html

FADGI, *Creating and Archiving Born Digital Video*, 2014 http://www.digitizationguidelines.gov/guidelines/FADGI_BDV_p1_20141202.pdf

http://www.digitizationguidelines.gov/guidelines/FADGI_BDV_p2_20141202.pdf

http://www.digitizationguidelines.gov/guidelines/FADGI_BDV_p3_20141202.pdf

http://www.digitizationguidelines.gov/guidelines/FADGI_BDV_p4_20141202.pdf

NDL, *File formats*, page 13 and following <http://digitalpreservation.fi/files/File-Formats-1.6.1-en.pdf>

Wikipedia, *Comparison of video container formats* https://en.wikipedia.org/wiki/Comparison_of_video_container_formats

Harvard Library Digital Preservation Program, *Video Format Matrix*, 2016

<https://wiki.harvard.edu/confluence/display/digitalpreservation/Video+Formats>

IASA, *Guidelines for the Preservation of Video Recordings IASA-TC 06*, 2018

https://www.iasa-web.org/sites/default/files/publications/IASA-TC_06-B_20180518.pdf

https://www.iasa-web.org/sites/default/files/publications/IASA-TC_06-B-app_20180520.pdf

CAVPP, *Target Audio and Video Specifications*, 2017

<https://calpreservation.org/wp-content/uploads/2017/03/CAVPP-File-Specs-2017.03.08.pdf>

AMIA, *Digital Formats - Video Part One*, 2017 <https://www.youtube.com/watch?v=BkYLEsjldK4>

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<https://library.stanford.edu/research/digitization-services/labs/stanford-media-preservation-lab/capture-specs>

RUcore, *Video and Moving Image Objects: Recommended Minimum Standards For Archival and Presentation Datastreams*, 2015
<http://odin.rutgers.edu/standards/2015/Video%20Object%20Standards%20Analysis-2015.pdf>

ALCTS, *Minimum Digitization Capture Recommendations*, 2013
<http://www.ala.org/alcts/resources/preserv/minimum-digitization-capture-recommendations>

George Blood [for the LOC], *Refining Conversion Contract Specifications: Determining Suitable Digital Video Formats for Medium-term Storage*, 2011 http://www.digitizationguidelines.gov/audio-visual/documents/IntrmMastVidFormatRecs_20111001.pdf

New York University Libraries, *Digitizing Video for Long-Term Preservation: An RFP Guide and Template*, 2013
<http://memoriav.ch/wp-content/uploads/2014/07/VARRFP.pdf>

CARLI (Consortium of Academic and Research Libraries in Illinois), *Guidelines for the Creation of Digital Collections, Digitization Best Practices for Moving Images*, 2017 https://www.carli.illinois.edu/sites/files/digital_collections/documentation/guidelines_for_video.pdf

FIAF, FFV1 and Matroska reading list
https://www.fiafnet.org/images/tinyUpload/E-Resources/Commission-And-PIP-Resources/TC_resources/FFV1_and_Matroska_reading_list.pdf

LAC, *Guidelines on File Formats for Transferring Information Resources of Enduring Value*, 2014
<https://www.bac-lac.gc.ca/eng/services/government-information-resources/guidelines/Pages/guidelines-file-formats-transferring-information-resources-enduring-value.aspx>

LAC shows a list of “container/coding format” pairs, preferred or acceptable, at page 14 of
<https://www.bac-lac.gc.ca/eng/services/government-information-resources/guidelines/Documents/file-formats-irev.pdf>

P. Bubestinger-Steindl, H. Lewetz, M. Jaks, *Comparing Video Codecs and Containers for Archives*, 2015
http://www.av-rd.com/knowhow/video/comparison_video_codecs_containers.html

P. Bubestinger-Steindl, *Risk Assessment Considerations: Using FFV1 for Preservation*, 2016
http://www.av-rd.com/knowhow/video/risk_assessment.html

eCommons: Cornell's Digital Repository, *Recommended File Formats*, 2018 <https://guides.library.cornell.edu/ecommons/formats>

Smithsonian Institution Archives, *Recommended Preservation Formats for Electronic Records*

<https://siarchives.si.edu/what-we-do/digital-curation/recommended-preservation-formats-electronic-records>

Reto Kromer, *Matroska and FFV1: One File Format for Film and Video Archiving?*, 2017

https://www.fiafnet.org/images/tinyUpload/Publications/Journal-Of-Film-Preservation/Matroska-and-FFV1_Kromer_JFP96.pdf

National Archives of the Netherlands, *Preferred formats National Archives of the Netherlands: in view of sustainable accessibility*, 2016

<https://www.nationaalarchief.nl/sites/default/files/field-file/National%20Archives%20of%20the%20Netherlands%20preferred%20and%20acceptable%20formats.pdf>

Reto Kromer, *Matroska and FFV1: One File Format for Film and Video Archiving?*, in *Journal of Film Preservation*, n. 96 (April 2017)

https://retokromer.ch/publications/JFP_96.html

Structured data

Archiving Recommended	Archiving Possible	Web Recommended	Web Possible	Object type in Phaidra	Notes
CSV		CSV		Unknown	Open format. <i>De facto</i> standard. One of the formats preferred by LOC.
TSV		TSV		Unknown	Open format. One of the formats preferred by LOC.
	ODS (ODF)		ODS (ODF)	Unknown	Open format. Fully documented specifications. Prefer to export to PDF/A or CSV. However, the following should be excluded: macros, binary files, and cross-references with external files.
	XLXS (OOXML)		XLXS (OOXML)	Unknown	Open format. Prefer to export to PDF/A or CSV. However, the following should be excluded: macros, binary files, and cross-references with external files.
JSON		JSON		Unknown	Open format. Typically, an interchange format for data. One of the formats preferred by LOC.
XML		XML		Unknown	Open format. In Phaidra, one can declare the encoding in the Metadata Editor (Technical Data → Requirements for using the object). E.g. UTF-8 and UTF-16 (with BOM), US-ASCII, ISO 8859, etc.
	PDF/A	PDF/A		Document (PDF, TeX)	Open format. Widely used storage format, which prohibits the use of

					certain functions of the PDF that may be difficult to render in the future. Well supported; fully available specifications.
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Clarifications

Data files and databases must be transferred as flat files or as rectangular tables, i.e. as two-dimensional arrays, lists or tables.

Structured data must be transferred together with the associated files needed to verify the validity of the data, e.g. DTDs, schemas and data dictionaries.

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¹⁷ Digital learning e multimedia Office of the University of Padova.

¹⁸ Dipartimento dei Beni Culturali of the University of Padova.

¹⁹ https://archive.fosdem.org/2018/schedule/speaker/jerome_martinez/

²⁰ <http://www.preforma-project.eu/advisory-board.html>

Abbreviations used

AGID = Agenzia per l'Italia digitale <https://www.agid.gov.it/>

ALCTS = Association for Library Collections & Technical Services
<http://www.ala.org/alcts/resources/preserv/minimum-digitization-capture-recommendations>

AMIA = Association of Moving Image Archivists <https://amianet.org/>

Archivemata https://wiki.archivemata.org/Media_type_preservation_plans

CAVPP = California Audiovisual Preservation Project <https://calpreservation.org/>

CORNELL = eCommons: Cornell's Digital Repository <https://guides.library.cornell.edu/eccommons>

CPP = California Preservation Program <https://calpreservation.org>

DCC = Digital Curation Centre <http://www.dcc.ac.uk/>

DPC = Digital Preservation Coalition <https://www.dpconline.org/>

FADGI = Federal Agencies Digitization Guidelines Initiative <http://www.digitizationguidelines.gov/>

FIAF = International Federation of Film Archives <https://www.fiafnet.org>

FIAT = Fédération Internationale des Archives de Télévision / The International Federation of Television Archives (FIAT/IFTA)
<http://fiatifta.org/index.php/about/>

IASA = International Association of Sound and Audiovisual Archives (IASA) <https://www.iasa-web.org/>

IC = Internet Culturale <http://www.internetculturale.it/it/1131/linee-guida-e-standard>

JISC = Joint Information Systems Committee Digital Media
https://www.webarchive.org.uk/wayback/archive/20160101151358/http://www.jiscdigitalmedia.ac.uk/infokit/file_formats/digital-file-formats

LAC = Library and Archives Canada <http://www.bac-lac.gc.ca/eng/Pages/home.aspx>

LOC = Library of Congress <https://www.loc.gov/preservation/digital/formats/fdd/descriptions.shtml>

NAA = National Archives of Australia

<http://www.naa.gov.au/information-management/managing-information-and-records/preserving/long-term-file-formats.aspx>

NAN = National Archives of the Netherlands <https://www.nationaalarchief.nl>

NARA = The U.S. National Archives and Records Administration <https://www.archives.gov/records-mgmt/policy/transfer-guidance-tables.html>

NDL = National Digital Library's Digital preservation service (Finland) <http://digitalpreservation.fi/en/specifications>

OM = Österreichische Mediathek <https://www.mediathek.at/>

PREFORMA – PREservation FORMAts for culture information and e-archives <http://www.preforma-project.eu/media-type-and-standards.html>

PRONOM – Digital Preservation Department of the UK National Archives <http://www.nationalarchives.gov.uk/PRONOM/Default.aspx>

SIA = Smithsonian Institution Archives <https://siarchives.si.edu/what-we-do/digital-curation/recommended-preservation-formats-electronic-records>

SMPTE = Society of Motion Picture and Television Engineers <https://www.smpte.org/>

SNA = Swedish National Archives <https://riksarkivet.se/startpage>

UNT = University of North Texas Libraries, Digital Projects Unit <https://library.unt.edu/digital-projects-unit/standards/>

UW = Universität Wien <https://datamanagement.univie.ac.at/en/about-phaidra/formats/>