Preservation Action Plan: Moving Image/Digital Video
National Archives and Records Administration (NARA)

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Moving Image/Digital Video

Digital moving images consist of bitmap digital images or “frames” displayed in rapid succession at a constant rate, giving the appearance of movement. Digital Video is an electronic representation of moving images in the form of encoded digital data. The information is made up of a sequence of data rather than as a continuous signal. There are multiple dimensions to video: horizontal and vertical (both spatial), the succession rate of frames or interpolated/interleaved lines (temporal), saturation of luminance (brightness), and saturation and color temperature of chrominance (color). Digital video is defined as a video stream that has been created as, or converted into, digital form encoded as numerical samples in a sequence demarcated by frames and possibly subframes (interlaced). Each frame or subframe consists of a series of picture cells (pixels). Resolution is determined by the relative number of pixels per line,the number of bits per brightness and color sample, the number of lines per frame, and the number of frames per second. Resolution is commonly referred to as definition, e.g. Standard Definition (SD), High Definition (HD), Ultra High Definition (UHD). Digital video formats are generally composed of an encoding/decoding method (codec) and a container/wrapper format which encapsulates the bitstreams and includes other associated data such as metadata. The file extension typically denotes the container/wrapper format. See NARA’s Internal Products and Services “Glossary of Useful Terms.”

Significant Properties of Digital Video

To render an authentic digital video file one must also preserve the structural and technical metadata that allows for proper rendering of the video stream, e.g. codec type, interleaving of data, spatial resolution, bit depth, frame rate, interlacing of lines, chroma subsampling and interpolation, color space, duration, and the number and type of audio channels..

General requirements for digital video records: Migrate or digitize to standards appropriate for the accurate preservation of the original video when converting analog material (e.g., video cassettes such as U-matic, Betacam, VHS, and open reel video such as 1” Type A, EIAJ 1”, ¼” Akai, 2” Quadraplex, etc.). When transcoding from a digital original (born digital) to a file (e.g., Digital Betacam, XDCAM, D2, DVC, HDCAM, or from a different digital file format, etc.), strive to keep the same sampling attributes as the digital original (i.e., sample bit depth and frequency), and the same sound field and compression schemes if appropriate for the new preservation file format. For reformatted video, 8-bit is acceptable but 10-bit is preferred.

Appearance

Name	Definition	Function Description
Color	Coloring is determined by the integrity of the original media piece.	Analog to digital adjustments can be done to the image through the saturation, gain, hue, etc.

Structure

Name	Definition	Function Description
Layout Structure	Embedded technical metadata describing, among other things: GUID, file size, format, duration, codec, frame rate, frame width, frame height, bit depth, and bitrate for video and audio components.	

Behavior

Name	Definition	Function Description
Display	Image	Video display is described above.
Audio	Sound is an audio waveform that has been created as, or converted into, digital form and can be heard during playback of the video. The data is generally interleaved to allow for simultaneous play of audio and video.	
Resolution	Resolution is based on the amount of pixels and bitrates.	Factors that can change that include codex, bit rate, frame rate, and aspect ratio.

Context

Name	Definition	Function Description
Metadata	May include administrative, descriptive, and/or technical metadata.	Metadata can be embedded or saved as a sidecar file. Examples of metadata fields include coding history, origination date, title, creator, collection, unique identifier, etc.

Current NARA Transfer Guidance for Digital Video

Bulletin 2014-04

- Preferred:
  - AV1 Image File Format (AVIF) version 1 and 1.1

- Acceptable:
  - Audio Video Interleaved Format (AVI) with Uncompressed 4:2:2 Picture
  - QuickTime File Format (MOV) with Uncompressed 4:2:2 Picture
  - Windows Media Video 9 File Format (WMV) with VC-1 Codec
  - Advanced Video Coding (MPEG 4) with H.264 Video
  - MPEG-2 Video (MPEG2)
  - Material Exchange Format (MXF) with Lossless JPEG 2000

Current NARA Format(s) for Public Access and Reference for Digital Video

Formats for Public Access are those made available online through the National Archives Catalog. Formats for Reference are defined as those made available to researchers upon direct requests for digital copies.

Formats Available for Public Access: AVI, MOV, MP4, MPG, WMV. Other file formats may be present depending on when they were added to the Catalog.

Format(s) Available for Reference: MPEG 4 (H.264)

Current NARA Internal Products and Services for Digital Video

NARA creates a wide variety of audio, video and motion picture products from NARA records in response to reference requests as well as for planned preservation projects and internal staff use. These specifications and standards are written for use by NARA's Moving Image and Sound Preservation Labs. They do not necessarily reflect industry standards, and are not intended as universal guidance or recommendations.

- NARA Internal Products and Services
- Additional Video Guidance

Comments and Notes

The following are accepted guidance for how to create, archive, and reformat Digital Video:

- FADGI - Digital File Formats for Videotape Reformatting
  http://www.digitizationguidelines.gov/guidelines/FADGI_VideoReFormatCompare_pt5_20141202.pdf

- FADGI - Creating and Archiving Born Digital Video
  http://www.digitizationguidelines.gov/guidelines/FADGI_BDV_p3_20141202.pdf

- FADGI - Detailed Matrixes Digital File Formats for Reformatting videotape
  http://www.digitizationguidelines.gov/guidelines/video_reformatting_compare.html

- FADGI - Significant Properties for Digital Video
  https://www.digitizationguidelines.gov/guidelines/FADGI-SignificantPropertiesDigitalVideo2024.pdf