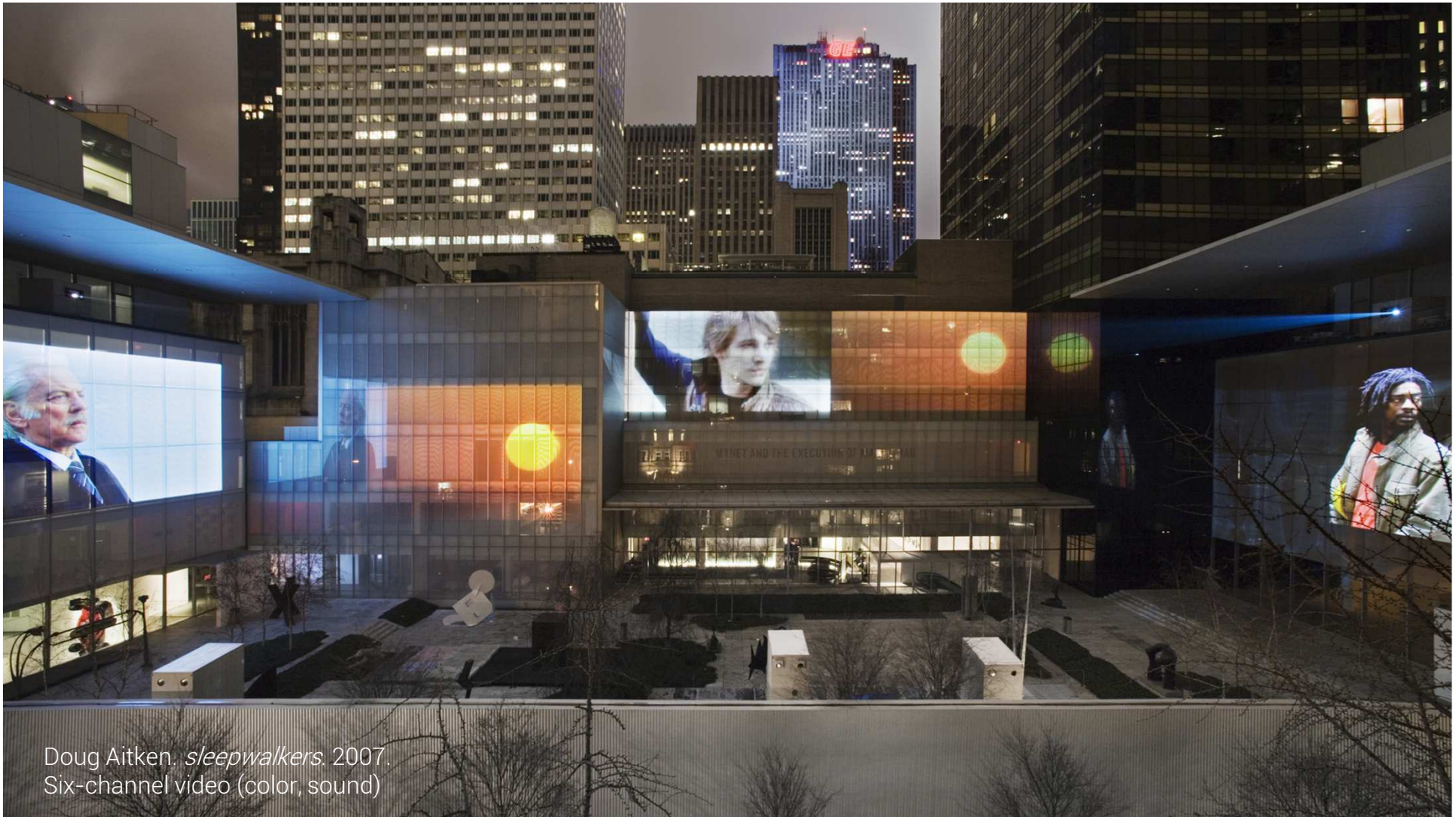


MoMA

Assessing the Preservation of DPX Image
Sequences
within
MoMA's Digital Preservation Ecosystem



Doug Aitken. *sleepwalkers*. 2007.
Six-channel video (color, sound)

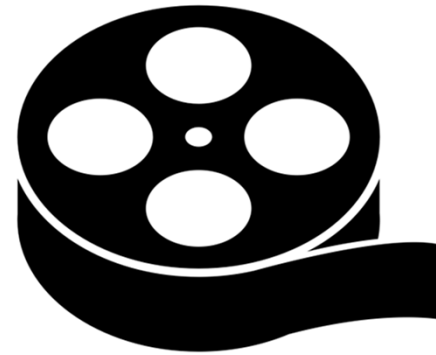
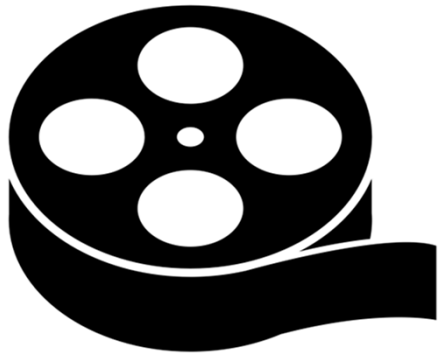








MoMA

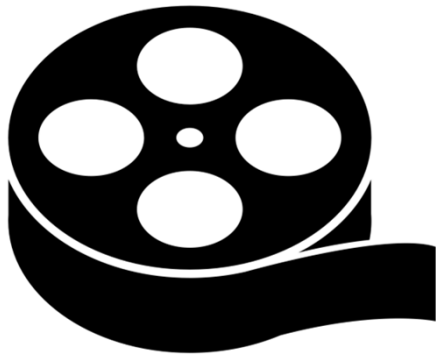


Film by Joe Mortell from the Noun Project

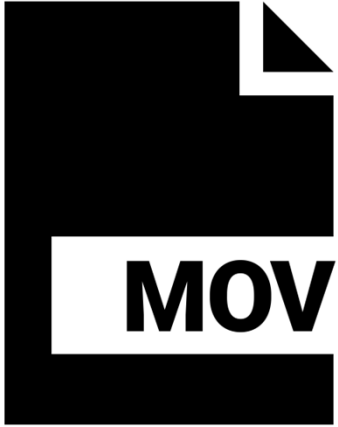
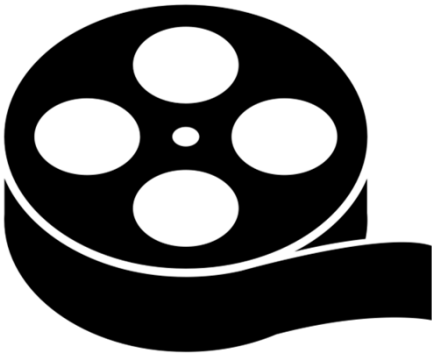
MoMA



MoMA



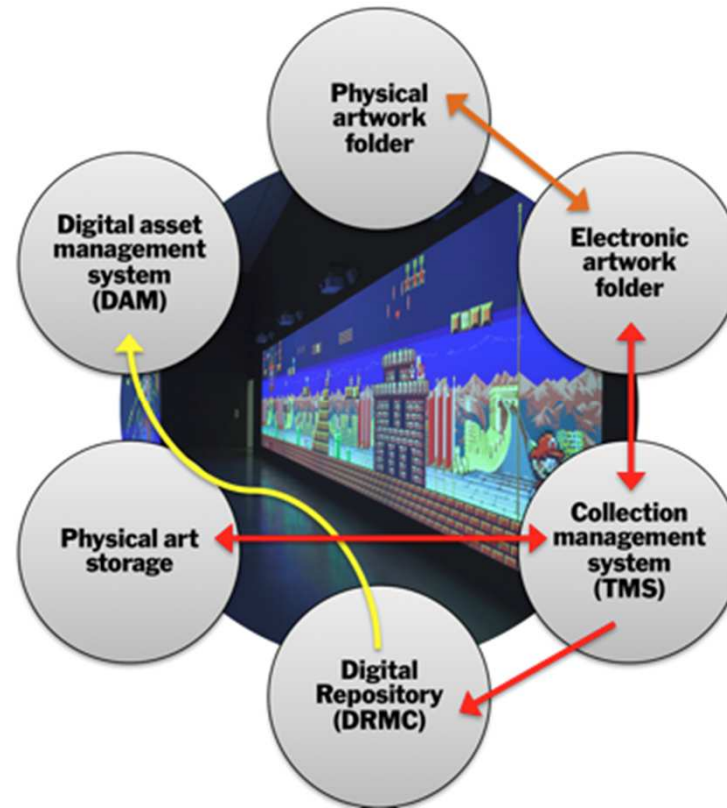
MoMA



MoMA

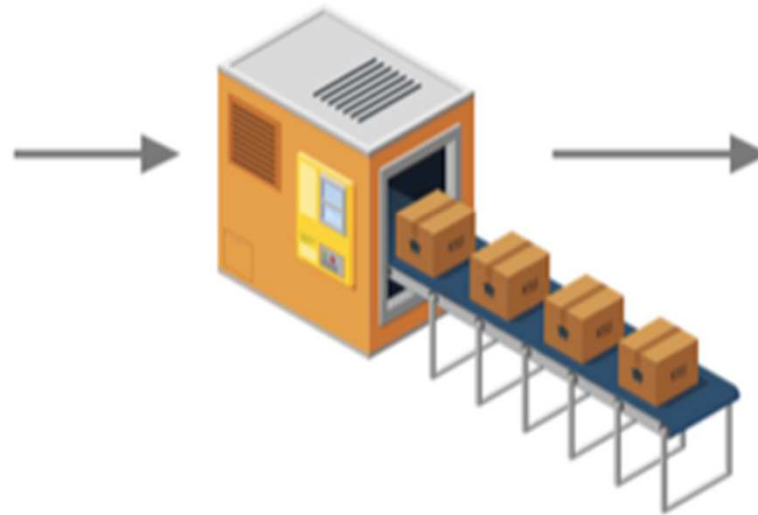
Digital Repository for
Museum Collections
(DRMC)

MoMA



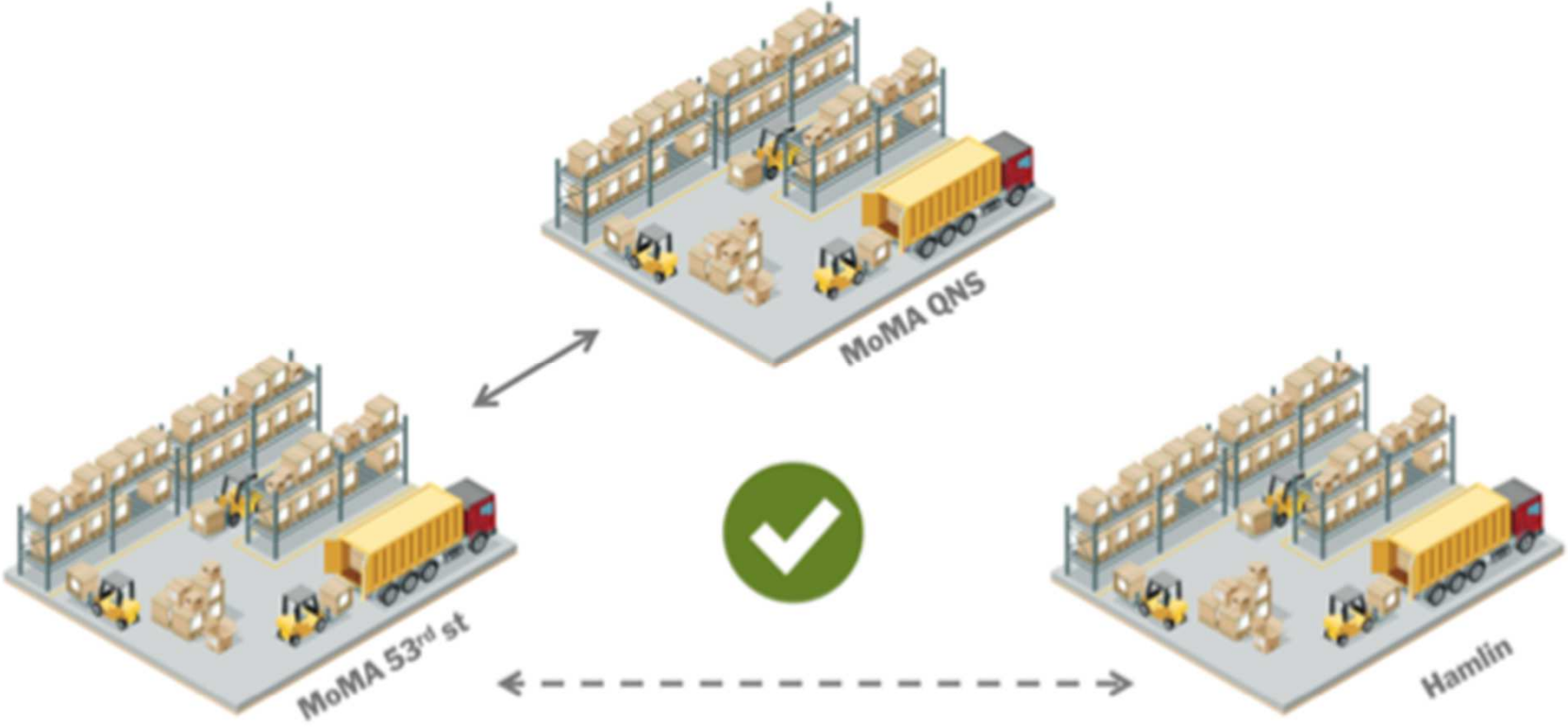
MoMA

01111010
10010001
11111011
10110111
01001010



Dear future,
This string of bytes
represent a **video** file. It is
51 minutes long, and is in
the **MOV** file format. It's
dimensions are **720x1280**
pixels, and it has a color
space of **RGB**.
Sincerely,
Archivematica

MoMA





Lime Kiln Club Field Day
1913/2014

MoMA

The Museum System - MoMA's Collection & Exhibition Management System (TMS) - [Components]

File Query Report Tools Maintenance

Film - Confidential 64 / 64

3799.DG

Lime Kiln Club Field Day
Bert Williams Picnic
 Studio: Biograph Company

1913
 Digital


Component Number	Component Name	Count	Active in TMS	Component Type
3799.AV	.mov ProRes 422 (digital file)	1	<input checked="" type="checkbox"/>	Part of artwork
8660.R1.x1	2K DPX color corrected	1	<input checked="" type="checkbox"/>	Part of artwork
8660.R1.x2	2K DPX	1	<input checked="" type="checkbox"/>	Part of artwork
8660.R2.x1	2K DPX color corrected	1	<input checked="" type="checkbox"/>	Part of artwork
8660.R2.x2	2K DPX	1	<input checked="" type="checkbox"/>	Part of artwork
8660.R3.x1	2K DPX color corrected	1	<input checked="" type="checkbox"/>	Part of artwork
8660.R3.x2	2K DPX	1	<input checked="" type="checkbox"/>	Part of artwork
8660.R4.x1	2K DPX color corrected	1	<input checked="" type="checkbox"/>	Part of artwork
8660.R4.x2	2K DPX	1	<input checked="" type="checkbox"/>	Part of artwork
8660.R5.x1	2K DPX color corrected	1	<input checked="" type="checkbox"/>	Part of artwork
8660.R5.x2	2K DPX	1	<input checked="" type="checkbox"/>	Part of artwork

Show Components
 Component Type
 All Component Types
 Show inactive components

Description Notes Flex Fields Media

Physical Description
 Made in 2014 by Deluxe as 2K raw scans from FGM #8660.

Component Barcode
 95E7E96S90E7Z



Storage Comments

Preparation Comments

Installation Comments

Dimensions

Add Description Delete

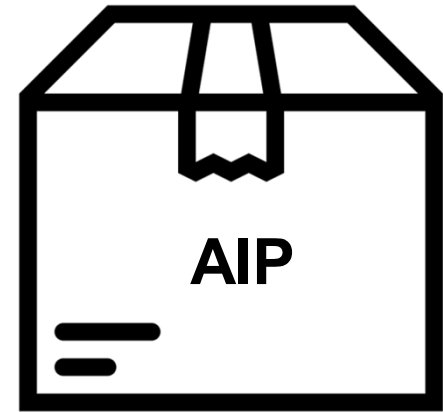
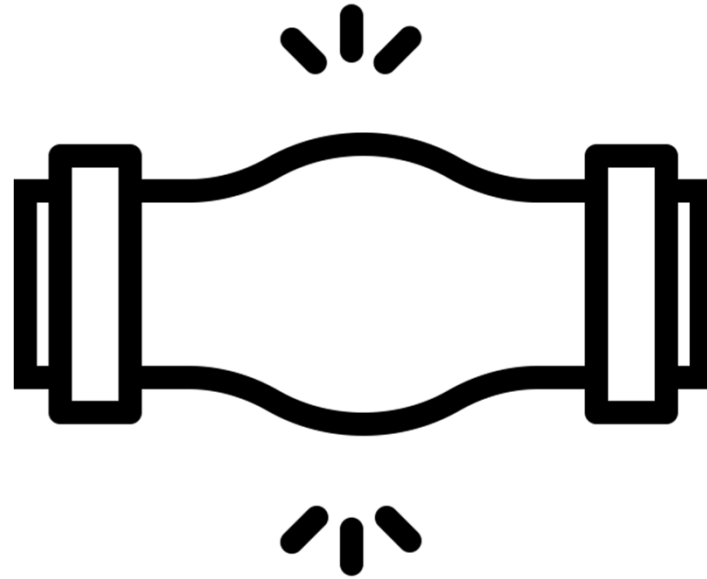


```
Count of video streams : 1
OtherCount : 1
Video_Format_List : DV
Video_Format_WithHint_List : DV
Codec_Video : DV
Video_Language_List : English
Other_Format_List : QuickTime TC
Other_Format_WithHint_List : QuickTime TC
Other_Language_List : English
Complete name : /Volumes/Promise Pegasus/Exhibition_preparation/Devidovitch_Inbox_Dec2016/TR15
466_3_a_x3/data/Taped project.mov
Folder name : /Volumes/Promise Pegasus/Exhibition_preparation/Devidovitch_Inbox_Dec2016/TR15
466_3_a_x3/data
File name : Taped project
File extension : mov
Format : MPEG-4
Format : MPEG-4
Format/Extensions usually used : mp4 m4v m4a m4b m4p 3gp 3gp2 3g2 h3g jpm jpx mqv isav ism f4v
Commercial name : MPEG-4
Format profile : QuickTime
Internet media type : video/mp4
Codec ID : qt
Codec ID/URL : http://www.apple.com/quicktime/download/standalone.html
Codec : MPEG-4
Codec : MPEG-4
Codec/Extensions usually used : mp4 m4v m4a m4b m4p 3gp 3gp2 3g2 h3g jpm jpx mqv isav ism f4v
```

MoMA



MoMA



MoMA

The Museum System - MoMA's Collection & Exhibition Management System (TMS) - [Components]

File Query Report Tools Maintenance

Film - Confidential 3799.DG 64 / 64

Lime Kiln Club Field Day
Bert Williams Picnic
 Studio: Biograph Company


1913
 Digital

Component Number	Component Name	Count	Active in TMS	Component Type
3799.AV	.mov ProRes 422 (digital file)	1	<input checked="" type="checkbox"/>	Part of artwork
8660.R1.x1	2K DPX color corrected	1	<input checked="" type="checkbox"/>	Part of artwork
8660.R1.x2	2K DPX	1	<input checked="" type="checkbox"/>	Part of artwork
8660.R2.x1	2K DPX color corrected	1	<input checked="" type="checkbox"/>	Part of artwork
8660.R2.x2	2K DPX	1	<input checked="" type="checkbox"/>	Part of artwork
8660.R3.x1	2K DPX color corrected	1	<input checked="" type="checkbox"/>	Part of artwork
8660.R3.x2	2K DPX	1	<input checked="" type="checkbox"/>	Part of artwork
8660.R4.x1	2K DPX color corrected	1	<input checked="" type="checkbox"/>	Part of artwork
8660.R4.x2	2K DPX	1	<input checked="" type="checkbox"/>	Part of artwork
8660.R5.x1	2K DPX color corrected	1	<input checked="" type="checkbox"/>	Part of artwork
8660.R5.x2	2K DPX	1	<input checked="" type="checkbox"/>	Part of artwork

Show Components
 Component Type: All Component Types
 Show inactive components

Description Notes Flex Fields Media

Physical Description
 Made in 2014 by Deluxe as 2K raw scans from FGM #8660.

Component Barcode
 95E7E96S90E7Z 

Storage Comments

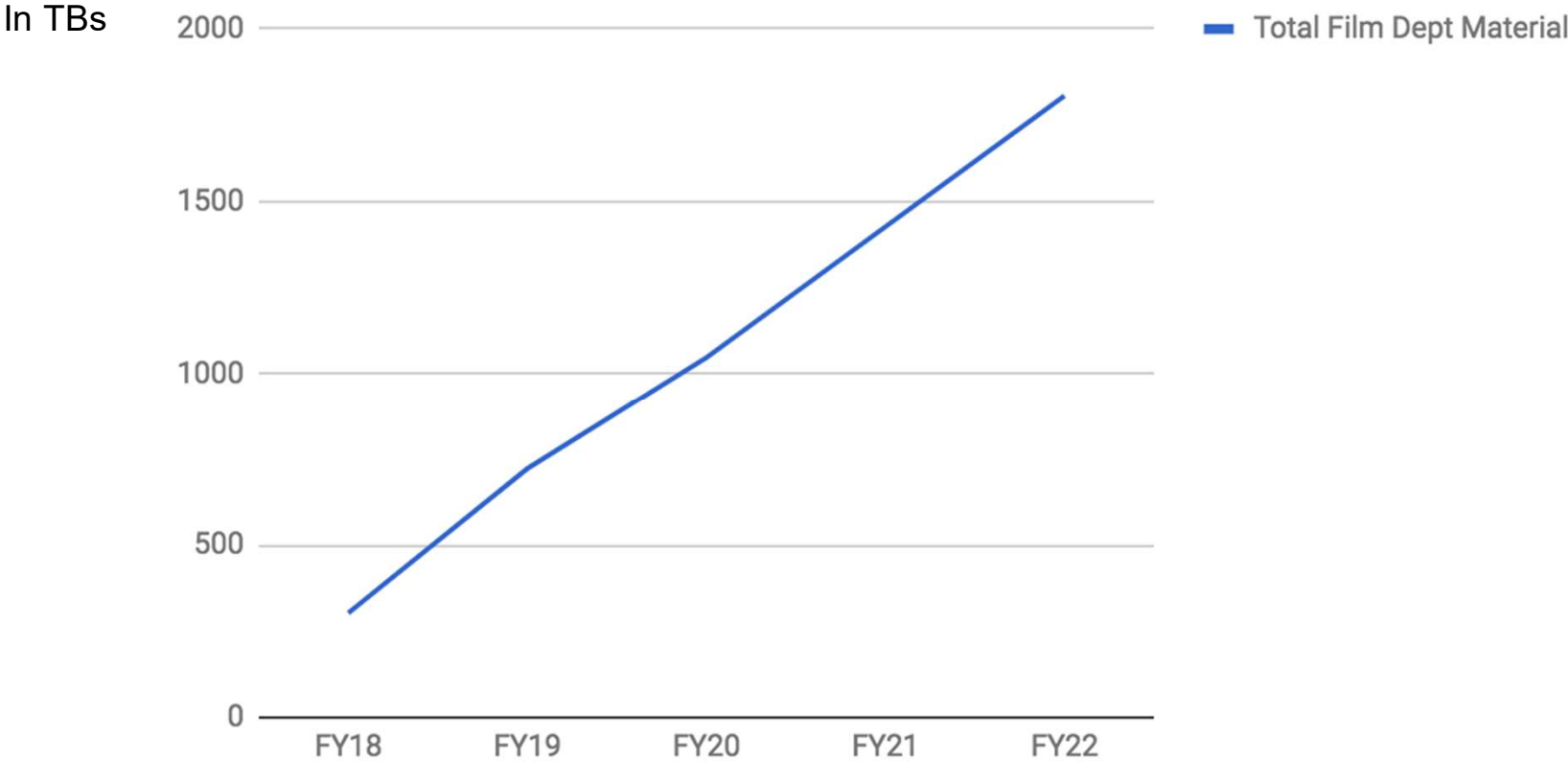
Preparation Comments

Installation Comments

Dimensions

Add Description Delete

MoMA



Diapositive 21

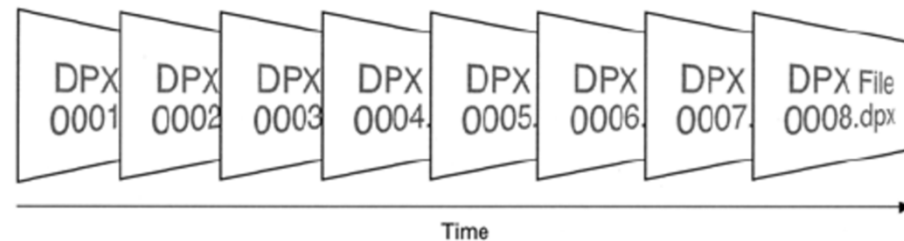
- 1 I'll end it around here or another slide that basically describes the problem we face and you can pick it up with the analysis of DPX and how we're trying to solve the problem. Sound good?

Peter Oleksik; 23/10/2018

MoMA

The challenges of DPX

- Massive quantity of DPX files coming into MoMA's collection
- Complexity of DPX in terms of ingest
- Ingest workflow was designed around single file ingest, not complex multi-file sequences
- How to capture the preservation decision making process
- Adapting our ever-evolving condition assessment and documentation workflows to multi-file sequences
- Bridging knowledge gaps between vendors and conservation department



MoMA

The challenges of DPX

- Lack of consensus amongst the field in terms of the handling and/or preservation of DPX materials
- File format sustainability unknowns
- Curation of material (what to keep and why?)

fetisch_22_20161115_0100896.WAV	Jun 27, 2016, 11:05 AM
fetisch_DPX_export_2048x858_24FPS_rec709-22_20161115_0086280.dpx	Nov 15, 2016, 4:10 AM
fetisch_DPX_export_2048...20161115_0086281.dpx	Nov 15, 2016, 4:10 AM
fetisch_DPX_export_2048...20161115_0086282.dpx	Nov 15, 2016, 4:10 AM
fetisch_DPX_export_2048...20161115_0086283.dpx	Nov 15, 2016, 4:10 AM
fetisch_DPX_export_2048...20161115_0086284.dpx	Nov 15, 2016, 4:10 AM
fetisch_DPX_export_2048...20161115_0086285.dpx	Nov 15, 2016, 4:10 AM
fetisch_DPX_export_2048...20161115_0086286.dpx	Nov 15, 2016, 4:10 AM
fetisch_DPX_export_2048...20161115_0086287.dpx	Nov 15, 2016, 4:10 AM
fetisch_DPX_export_2048...20161115_0086288.dpx	Nov 15, 2016, 4:10 AM
fetisch_DPX_export_2048...20161115_0086289.dpx	Nov 15, 2016, 4:10 AM
fetisch_DPX_export_2048...20161115_0086290.dpx	Nov 15, 2016, 4:10 AM
fetisch_DPX_export_2048...20161115_0086291.dpx	Nov 15, 2016, 4:10 AM
fetisch_DPX_export_2048...20161115_0086292.dpx	Nov 15, 2016, 4:10 AM
fetisch_DPX_export_2048...20161115_0086293.dpx	Nov 15, 2016, 4:10 AM
fetisch_DPX_export_2048...20161115_0086294.dpx	Nov 15, 2016, 4:10 AM
fetisch_DPX_export_2048...20161115_0086295.dpx	Nov 15, 2016, 4:10 AM
fetisch_DPX_export_2048...20161115_0086296.dpx	Nov 15, 2016, 4:10 AM
fetisch_DPX_export_2048...20161115_0086297.dpx	Nov 15, 2016, 4:10 AM
fetisch_DPX_export_2048...20161115_0086298.dpx	Nov 15, 2016, 4:10 AM
fetisch_DPX_export_2048...20161115_0086299.dpx	Nov 15, 2016, 4:10 AM
fetisch_DPX_export_2048...20161115_0086300.dpx	Nov 15, 2016, 4:10 AM
fetisch_DPX_export_2048...20161115_0086301.dpx	Nov 15, 2016, 4:10 AM
fetisch_DPX_export_2048...20161115_0086302.dpx	Nov 15, 2016, 4:10 AM
fetisch_DPX_export_2048...20161115_0086303.dpx	Nov 15, 2016, 4:10 AM
fetisch_DPX_export_2048...20161115_0086304.dpx	Nov 15, 2016, 4:10 AM
fetisch_DPX_export_2048...20161115_0086305.dpx	Nov 15, 2016, 4:10 AM
fetisch_DPX_export_2048...20161115_0086306.dpx	Nov 15, 2016, 4:10 AM
fetisch_DPX_export_2048...20161115_0086307.dpx	Nov 15, 2016, 4:10 AM
fetisch_DPX_export_2048...20161115_0086308.dpx	Nov 15, 2016, 4:10 AM

MoMA

Research into the DPX format

- Researching and examining the DPX file format.
 - What it is?
 - How is it supposed to be rendered or played back?
- Characterization methods, metadata extraction, embedding metadata, tools
- How others are working or managing large quantities of DPX files



MoMA

What we are doing and how we are doing it

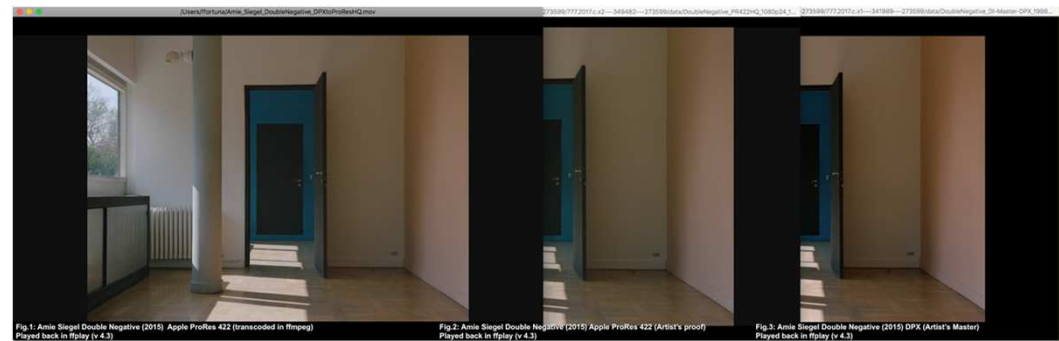
- Establishment and Refinement of Internal Procedures and Workflows (within and across depts) to capture and assess material in an efficient and responsible manner
- Trying to understand the significant properties of DPX
- Strategies to document process history and decision making in the DPX file format itself

```
Error: untested fetisch_DPX_export_2048x858_24FPS_rec709-22_20161115/fetisch_22_20161115_0100896.WAV WAV FormatTag extension.  
Please contact info@mediaarea.net if you want support of such content.  
mac10880mediaconservation4:~ cgil$ █
```

MoMA

Metadata

- Reviewing FADGI guidelines
- Analysis of Tools
 - MediaInfo
 - Exiftool
 - Imagemagick
 - DPX Analytics
 - GraphicsMagick
- Analysis of Terminology
 - how fields are translated
 - From one tool to the next



MoMA

Playback, transcoding, and packaging tools

- Playback
 - ffplay
 - DaVinci Resolve
 - Adobe Premiere
- Looking into lossless transcoding options for efficient storage and preservation
 - MXF/OP1a
 - MXF/JPEG2000
 - FFV1/MKV
- Lossless compression/packaging tools
 - ZIP
 - TAR

MoMA

Preliminary results

1. 2K resolution DPX directory composed of 14,619 files amounted to 103.03 GB transformed into a 70.51 GB MKV using RAWcooked
2. 2K resolution DPX directory composed of 49,003 files, amounting to 616.99 GB transformed into a 210.14 GB MKV using RAWcooked
3. 2K resolution DPX directory composed of 17,525 files amounting to 145.57 GB transformed into a 50.52 GB zip directory

original DPX directory	# Items	size	file after transcode	size after transcode
fetisch_DPX_export_2048x858_24FPS_rec709-22_20161115	14,619	103.03 GB	fetisch_DPX_export_2048x858_24FPS_rec709-22_20161115.mkv	70.51 GB
original DPX directory	# Items	size	file after transcode	size after transcode
Friedman_Heads_Corrected_2K_DPX	49,003	616.99 GB	Friedman_Heads_Corrected_2K_DPX.mkv	210.14 GB
original DPX directory	# Items	size	file after transcode	size after transcode
Friedman_Heads_Raw_2K_DPX	35,420	445.96 GB	Friedman_Heads_Raw_2K_DPX.mkv	84.59 GB
original DPX directory	# Items	size	file after transcode	size after transcode
galerie_hd_dpx_out	17,525	145.57 GB	galerie_hd_dpx_out.zip	50.52 GB
original DPX directory	# Items	size	file after transcode	size after transcode
galerie_hd_dpx_out	17,525	145.57 GB	Bratescu-OP1A-test.mxf	32.38 GB
original DPX directory	# Items	size	file after transcode	size after transcode
NYNY	26	1.91 GB	dpx_tar_test.tar.gz	1.55 GB

MoMA

Archivematica

1. ~5 hours to process a valid bag of FFV1/MKV in Archivematica
2. Research into 'store AIP' failures
3. Working with Artefactual to create a separate archivematica (v 1.8) pipeline exclusively for processing DPX

Type	Status	Started
Store the AIP	Failed	2018-10-22 21:56:20
	Completed	2018-10-22

MoMA

Next steps

- More testing including escrow retrieval
- Deep analysis of our research results
- Develop a methodology for the condition assessment of DPX files
- Attending #NTTW3
- Starting robust dialogue with colleagues and peers including a convening for a peer forum in November to see and discuss what others in the field are doing

MoMA

Questions?