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Required Decisions when Digitizing Film or Video

In this article, I am going to talk about three areas of digitization that must be considered when undertaking a preservation or access project for moving images. These topics include video window size (or the native size the video will display in when played back), data rate and a formula to use to estimate storage needed if you know the data rate of the digital video file.

There are several benefits to creating digital copies of film and video in your collection. One of the main benefits is because digitizing allows easier access to your content. If the content is digitized, it can be viewed easier on a computer with an internet connection. Digital content can be accessed and used without playing the original, meaning less wear and tear on your films or videotapes. This allows the originals to be truly preserved in proper storage conditions, while the content is easily accessible.

But, digitizing your content requires you to think like your end user. In order to provide the best user experience to the people who will be accessing your content, you need to understand how they will access the content and how it will be used in the future.

The purpose of this article is not to argue which digital format is better for preservation or for access. The truth is, at this point, there is no perfect preservation format for video. A discussion about this could take up many pages, discussing the pros and cons of each type of digital file. My intent is to provide some basic information about video digitizing to help archivists make a decision about what to create after a decision has been made about the format.

I am also not going to get too much into the 16x9 aspect ratio. This is a high-definition aspect ratio. Most archives are not digitizing high-definition footage yet and it doesn't make sense to convert standard definition video or 16mm film to 16x9 as this was not its native aspect ratio. This article will deal with a standard aspect ratio of 4 x 3.

Video window size:

This is something you might not think about. Most of us are used to seeing video displayed on a television monitor. This would be considered full screen video. What we refer to as full screen video is really 720 x 486 pixels. This is also known as D-1 resolution. But, once you move into computer displays, resolutions change. For many years, full screen on a computer monitor was 640x480 pixels. And quarter screen was 320x240 pixels.

If you are making digital files as preservation copies of your videotapes, the question of video window size is easy...make a digital file at 720x486. This is the highest resolution achievable from standard definition video. However, if you are making access files, the question becomes a little more difficult. The reason is because access files are typically created at lower data rates (see below for an explanation

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of data rate). If you make the data rate low enough to stream the video efficiently, it often makes sense to make the video window smaller. The typical size of this smaller video is 320x240. This smaller video window will make the video appear clearer and will show less artifacts. 640x480 is not used as much as in the past and would only be used if the primary way of viewing the videos is on a computer screen.

As a general rule, if your video files are for preservation or if the video will be displayed on a television screen or projected, create a digital video at 720 x 480. If the video will be streamed, and you are unsure of the bandwidth available for streaming, create a video at 320x240.

Data Rate:

Data Rate is another consideration. A “data rate” in terms of digital video files is a measure of how much information is captured per time segment. Time is usually measured in seconds and data is either measured in megabits or kilobits. As a general rule, the higher the data rate, the better the quality of the video, especially if you are comparing two different data rates for the same type of compression format.

To provide an idea of data rates, a typical video DVD is created using MPEG 2 video at a data rate between 4 Mbps and 8 Mbps (the DVD specification actually allows the data rate to go as high as 9 Mbps, but overhead must be allowed for audio and graphics). DV video, such as is captured in a DV camera is usually 25 Mbps. This means that about 3-5 times more data is captured per second when creating a DV tape than when creating a video DVD. Uncompressed standard definition video requires a data rate of about 270 Mbps.

In contrast to this, streaming files are usually captured using very low data rates, comparatively speaking. For example, most video streaming files are captured at between 300 and 800 Kbps. Note that this is measured in kilobits per second compared to megabits per second...there are 1000 kilobits in a megabit.

Generally speaking, if your intent is preservation, use the highest data rate you can and capture at 720x480. If you are streaming, create your digital files at 320x240 using a data rate between 300 and 800 Kbps.

Video file size:

I am commonly asked a question about video file size. In other words, if you capture an hour of video using a certain data rate, how much storage will be required? Here is a simple mathematical formula to use to estimate file size:

Step 1: Know what the data rate is in either Kilobits or Megabits per second.

Step 2: Convert bits to bytes (to do this, divide by 8, because there are 8 bits in a byte). This

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gives you kilobytes or megabytes per second.

Step 3: Convert hours (or minutes) of video to seconds. Multiple the second of video by the answer from step 2.

To put this in practical terms, see below:

Let's assume you have 100 hours of video and you are capturing at 300 Kbps, the following is the math:

300 kilobits divided by 8 = 37.5 kilobytes per second.

100 hours x 60 = 6000 minutes

6,000 minutes x 60 = 360,000 seconds

360,000 x 37.5 = 13,500,000 kilobytes. This is equivalent to 13,500 Megabytes, or 13.5 GB.

Another way to do this is to do the math for 1 hour. This might be easier to work with, since the number is lower.

300 Kbps = 37.5 KBps (Note that kilobits is abbreviated Kb, whereas Kilobytes is abbreviated KB).

1 hour = 60 minutes = 3,600 seconds

3,600 seconds x 37.5KB = 135,000 KB (kilobytes), or 135 MB per hour

135 MB per hour x 100 hours = 13,500 MB, or 13.5 GB.

When you use higher data rates you will require more storage. Often more than one file type is created, so you have to do the math for both file types to estimate total storage required.

There are many decisions that need to be made when digitizing your content. This article only touches on a few of them. Future articles will deal with other aspects of digitizing as well as a range of topics of interest to archivists who are dealing with media based collections. For more information or if you have specific questions, please contact **Paul Calardo**, Sales Manager at 800-978-3445.

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