ISDCF-Doc3 – Disk Drive Recommendations
Update proposed 03 November 2009
Revised 21 November 2009
Added Mixed Interop/SMPTE DCP packages, name change 06 September 2012

For review, the following ISDCF recommendations have existed for some time now, but should be restated for confirmation and reference. These previous recommendations have been slightly expanded for clarity and specificity.

Existing Recommendations

1. Distribution media devices, playback servers, and theater-based library servers should support the USB2 data interface presently and for the near future, at least until existing systems are retired.

2. Future distribution media devices, playback servers, and library servers should include eSATA support where practical, but only to extend, not to replace USB2 support.

3. The storage partition format should be EXT3.

4. Optical media such as DVD or CD may be used where appropriate. If DVD format is used, the disks should be single-sided, single-layered, 4.7 GB data format. The storage partition format should be UDF.

5. Playout servers and library servers should include means of reading CDs and DVDs as specified above. External USB reader units may be used if internal readers are impractical.

New Recommendations

1. Allow EXT2 for storage format partitions. EXT2 is EXT3 without a journal, and a journaled file system is of questionable value for a distribution format.

2. Devices whose function is to read distribution media should mount the media in read-only mode where practical. This should reduce the possibility of file system damage when the media is removed from the system without a clean unmount operation performed. While preventing unclean unmounts is physically impossible with USB drives, if distribution drives are mounted read/write, every effort should be made to perform a clean unmount operation before the device is disconnected.

3. Distribution disks shall contain a standard “MBR” partition table. This is meant to specifically exclude “GPT”, “BSD”, and other partition table types. The MBR partition table shall contain one and only one partition record. The single partition record shall be the first Primary partition record. The partition identifier shall be 0x83, indicating a Linux native partition.

4. The distribution media partition shall be formatted in either the EXT2 or the EXT3 format. When the file system is formatted, the inode size shall be set to 128 bytes.

5. Per SMPTE 429-9-2007, the storage volume (partition) shall contain exactly one Asset Map.

6. If a USB “Thumb Drive” is to be used for any purpose in a digital cinema system, it should be reformatted to a clean state prior to use. (This is intended to prevent the spread of virus code that has been detected on commercial “thumb drive” products.)

7. When distribution devices are mass-duplicated, care should be taken to assure that the target drives are as large or larger than the master drive in order to prevent illegal partitions from being created by the duplication system.

8. Distribution service providers should recognize that the current deployed base of player and library systems in the field may already be several years old, and are expected to have an extended lifetime relative to typical computer system installations. Thus the temptation to upgrade to the latest and greatest new operating system software for mastering and duplication should be resisted, and new systems should be thoroughly vetted for backward compatibility prior to deployment.

9. Theater operators should maintain, at each location, spare USB cables, and power supply cables, and “power bricks” to account for the possibility of defective pieces that may be supplied with distribution devices.

10. When files and directories are written to a distribution media partition, the permissions shall include the following settings: Files shall allow “read” permission for “Other” users. Directories shall allow “read” and “execute” for “Other” users.

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Mixed Distribution Package ISDCF Recommendation

June 17, 2010

Introduction

As SMPTE DCP's start becoming available, there will be a strong need to allow the distribution of media containing a mixture of Interop DCP's and SMPTE DCP's. For example, when the first SMPTE DCP trailer is released, there may be a need to distribute it on a single hard drive along with several Interop DCP's. The duration during which this functionality will be needed will be a minimum of several months and may be several years.

The final goal of the ISDCF Mixed Distribution Package subcommittee was to propose a recommended practice that all vendors can follow in order to reliably use content on media with both SMPTE and Interop DCP's. The target audience of this document includes those that master DCP's, content distributors, player manufacturers, and theater management system manufacturers.

This subcommittee reviewed several methods for accomplishing this goal and decided on the method identified as Multiple Top-level Directories.

Multiple Top-level Directories

Advantages:

The ability to allow multiple asset maps on a single disk has often been requested by to make it easier to combine content from multiple sources.

This method avoids the need to merge asset map files which can introduce errors into the distribution package.

Many systems already support this method.

Disadvantages:

This would require a revision to the SMPTE standard 429-9.

This adds the requirement of scanning multiple directories. However, this additional step is only necessary if there is not an asset map in the root. Additionally, a modern operating system caches disk access and should not be perceptibly slowed down by this.2

Description:

In this method, the current Interop and SMPTE standards would be extended to also allow ASSETMAP or ASSETMAP.xml files in directories immediately below the root directory.

Example Directory Listing:

\MyInteropTrailer1\

- ASSETMAP
- VOLINDEX
- PKL1.xml
- CPL1.xml
- Video1.mxf
- Audio1.mxf

\MySMPTETrailer1\

- ASSETMAP.xml
- VOLINDEX.xml
- PKL1.xml
- CPL1.xml
- Video1.mxf
- Audio1.mxf

\MyInteropTrailers2and3\

- ASSETMAP
- VOLINDEX
- PKL2.xml
- CPL2.xml
- Video2.mxf
- Audio2.mxf
- PKL3.xml
- CPL3.xml
- Video3.mxf
- Audio3.mxf

Media without an asset map in the root but with top-level directories shall be treated as if each top-level directory were a different drive.

Only the root and the directories immediately within the root directory (top-level directories) need to be checked for asset maps. Directories within top-level directories do not need to be checked for asset maps, although they may contain assets referenced by an asset map. If an asset map exists in the root, no other directories must be searched for other asset maps. DCP's in top-level directories shall not refer to assets in other top-level directories.

Note that when asset maps are in subdirectories, referenced asset file names are relative to the directory containing the asset map file, not the root directory.3

This directory structure can be used on media containing only SMPTE content, only Interop content, or any mixture of SMPTE and Interop content. Additionally, it can be used on media containing one or more DCP's.

As this directory structure has benefits beyond mixing Interop and SMPTE content on the same media, it is recommended that all Digital Cinema systems support this directory structure permanently and not just during the Interop to SMPTE transition period.

The pseudo-code to identify the content on media is recommended to be as follows:

1. If ASSETMAP.xml exists in the root, then parse it according to SMPTE standards and stop looking for additional asset maps on the media.

2. If ASSETMAP exists in the root, then parse it according to Interop standards and stop looking for additional asset maps on the media.

3. For all top-level directories in the root, perform the steps below.a. If the directory name is exactly lost+found or RECYCLER, then ignore the directory and process the next directory.

b. If ASSETMAP.xml exists, then parse it according to SMPTE standards and process the next directory.

c. If ASSETMAP exists, then parse it according to Interop standards and process the next directory.

d. Otherwise (no asset map found), ignore the directory and process the next directory.

Different algorithms for parsing media for content are allowed provided that all correctly structured content is identified.