QubeMaster Xpress 2
DCP Creation Software

Version 2.0.1.0

User Guide

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Introduction

Thank you for purchasing QubeMaster Xpress 2, the easy-to-use solution for creating standards compliant Digital Cinema Packages (DCPs).

Today, if there are less than a handful of companies across the world that are working to fulfill the exacting needs of DCI, there are fewer still who look beyond. Qube Cinema is committed to creating a seamless world of Digital Cinema with products that are innovative, powerful, reliable and cost-effective.

Qube Cinema has an entire suite of products required for a practical, commercially viable, end-to-end implementation of Digital Cinema. Qube Cinema is a company that has proven expertise in managing complex technology transformations in traditional workflows; a company with a passion for cinema and a thorough understanding of film, video, audio and computer technology as well as the production, post-production and exhibition industries.

It is this passion and deep understanding of this complex domain that reflect in every aspect of our path-breaking products.

Digital Cinema Terms and Concepts

It is useful to understand some of the concepts of Digital Cinema when working with the QubeMaster Xpress software.

The basic unit of content that can be played by a DCI Compliant Digital Cinema Server is the **Track File.** A Track File is either a picture, sound or subtitle file in the JPEG2000 compression format *and* MXF container format. A Track File is analogous to a roll of picture positive or a sound positive in the film environment.

Picture, Sound and Subtitle Track Files are synced together with Start and End Points to form a **Reel** which can be considered equivalent to a Reel of a Film Print.

Multiple Reels in a specific order go to form a **Composition.** A Composition also has additional *meta-data* associated with it and usually consists of a complete feature film, an advertisement commercial, a documentary or other logical unit of programming. In the film environment, a Composition can be considered equivalent to a complete Film Print. One or more Compositions or parts of a Composition can be

made into a **Digital Cinema Package** or DCP that can be ingested or loaded into a Digital Cinema Server.

A DCP created by QubeMaster Xpress is a folder containing a specific set of files created according to the exacting requirements of the DCI Specification and named according to the ISDCF Naming Convention.

- **DCP Folder**
  - *Meta-data Files*
    - Composition Playlist or CPL, an XML file
    - Packing List or PKL, an XML file
    - ASSETMAP, an XML file
    - VOLINDEX, an XML file
  - *Track Files*
    - Picture Track File, an MXF file
    - Sound Track File, an MXF file

QubeMaster Xpress will of course create all these files in the required formats.

Step-by-Step Guide

QubeMaster Xpress (QMX) creates standards compliant Digital Cinema Packages (DCPs) from single or multiple graphic image files or video files in a simple process presented in a wizard-driven user interface.

The basic process is shown here with additional details of the various choices explained later in this document.

- Select the image source file.

- Select the audio source file if the image file does not have embedded audio.

► Specify source file parameters – scanning method for video files, stereoscopic format for 3D source files, colour space and gamma.

► The image can be cropped and scaled as well. By default the image is padded with black to fit the Flat or Scope containers.

► Name the DCP and specify its regional properties.

► Select a data rate for the finished DCP and the number of audio channels required.

► Click the “Go” button to create the DCP.

Source Files for QubeMaster Xpress

You can create a DCP from any of the following compatible source file formats:

- A series of static graphic image files in BMP, TIFF or JPEG formats.
- Video files in AVI, Quicktime, WMV and MPEG and MP4 formats – provided the codecs used to create these files are also installed on the system running QubeMaster Xpress. This is especially true for AVI, Quicktime and MPEG files. To ensure compatibility, please install a codec pack that contains a comprehensive list of common codecs, for example the KLite Codec Pack.
- Audio files, whether embedded in the video file or separate, must have the format and channel mapping in the 5.1 format in the order Left, Right, Centre, LFE, Left Surround & Right Surround.
- QubeMaster Xpress can work with mono, stereo or surround audio files. In the case of mono or stereo audio there is an option to "pad" the remaining channels with silence to create a 6-channel DCP in order to conform to Interop DCP requirements. In the case of 6 channel audio, the channel mapping must be in the 5.1 format and in the order L, R, C, LFE, LS, RS.

Terminology and Advanced Settings

Aspect Ratio and Resolution

Flat and *Scope* are the two commonly accepted aspect ratio formats for digital cinema. In QubeMaster Xport, source image files will automatically be conformed to fit these aspect ratios – depending on your choice of Flat, Scope or both – by resizing them if the image is larger than the specified size and padding them vertically or horizontally with black as required. All source images are therefore fit into one of the following containers:

Flat 2K: 1998 x 1080 (1:1.85)
Flat 4K: 3996 x 2160 (1:1.85)
Scope 2K: 2048 x 858 (1:2.39)
Scope 4K: 4096 x 1716 (1:2.39)

For example, a 1920 x 1080 image (the default size and aspect for HD video) will be padded with 39 pixels of black on either side (*pillar-boxed*) to fit a Flat container. To fit a Scope container, the same 1920 x 1080 source picture will be scaled down to 1520 x 858 and 264 pixels of black added to either side (pillar-boxed) to fit the Scope container.

Colour Space

The colour space of commonly used digital image files is RGB (Rec.709). This is the default selection in QubeMaster Xpress. If however, the source's colour space has been converted to the Digital Cinema requirement of XYZ prior to bringing the files to QubeMaster Xpress, then the selection must be set to DCI XYZ. Such colour space conversion to XYZ is normally only available in colour-grading systems. If the image file looks normal on a computer monitor or a television, then the image is most certainly in the Rec.709 colour space and not XYZ.

Interlaced vs. Progressive

Interlaced images are only relevant in the case of moving picture files – AVI, Quicktime (mov), WMV, MP4, etc. – and are seen only in sources that were captured at TV frame-rates of 25i (PAL) and 29.97i (NTSC). Film frame-rate of 24 and 23.98 are usually progressive and do not employ interlaced scanning. Video files from television cameras captured for broadcast will usually be shot interlaced. Each frame of the image is actually saved as two different halves known as *fields* in interlaced images. Each field contains either only the *odd* lines or *even* lines of an image and both fields are separated by a temporal distance of 1/50th or

1/60th of a second. Combining these two fields does not normally produce a very good image – but must be done as digital cinema exclusively uses progressive images.

Frame-rates

Current digital cinema systems only support a frame rate of 24 fps for 2D DCPs. However, the new SMPTE specifications have added additional frame-rates. If you choose the output DCP format as JPEG2000 Inter-op, QubeMaster Xpress will, by default, convert the source frame-rate to 24 fps if necessary. For 25fps source material, QubeMaster Xpress employs the 4% slow-down method – thereby increasing the duration of the resultant DCP by 4% as well.

Encoding Data Rate

In Advanced Settings, the encoding data rate of the image file can be specified. Though the DCI Specification sets the maximum data rate for picture as 250 Mbits, it does not specify any minimum data rate. While deciding on an encoding data rate, just keep in mind the basic tenet that high data rates result in very good quality images but also result in larger file sizes and vice versa. Since data rate specifications affect the quality of

an image and the resultant file size of a DCP, the choice should be made based on a good balance of quality and file size.

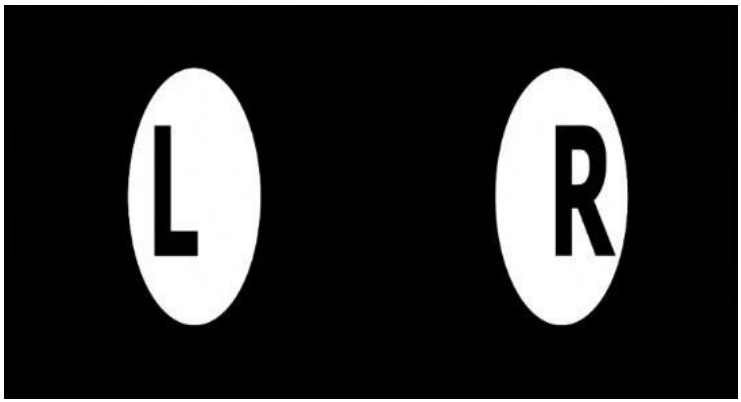
3D Formats

DCI compliant 3D DCPs are always *Frame Sequential*. This means that there is only one MXF file for the picture, and this MXF file will have alternating frames for the left and right eye stream. This also means that the MXF file will be at 48 fps (or 24 fps per eye).

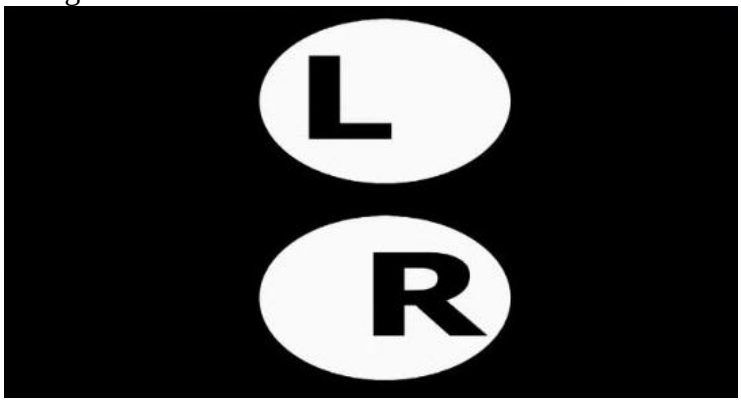
The source file for QubeMaster Xpress however can be in any of the following formats:

- **Sequential:** In frame sequential sources, alternate frames in the movie file are left and right eye respectively. This option requires the frame-rate of the source to be 48 fps (24fps for each eye). If the frame-rate of the source is not 48 fps, the Sequential option will not be available.

- **Side-by-Side:** In Side-by-Side 3D sources, both left and right eye images are included as two vertical halves of a single frame. This is a common format used by non-linear editing applications and 3D TVs.



- **Over-Under:** Over-Under is similar to Side-by-Side except that the left and right frames are combined as two horizontal halves of a single frame.



DCP Distribution to Cinemas

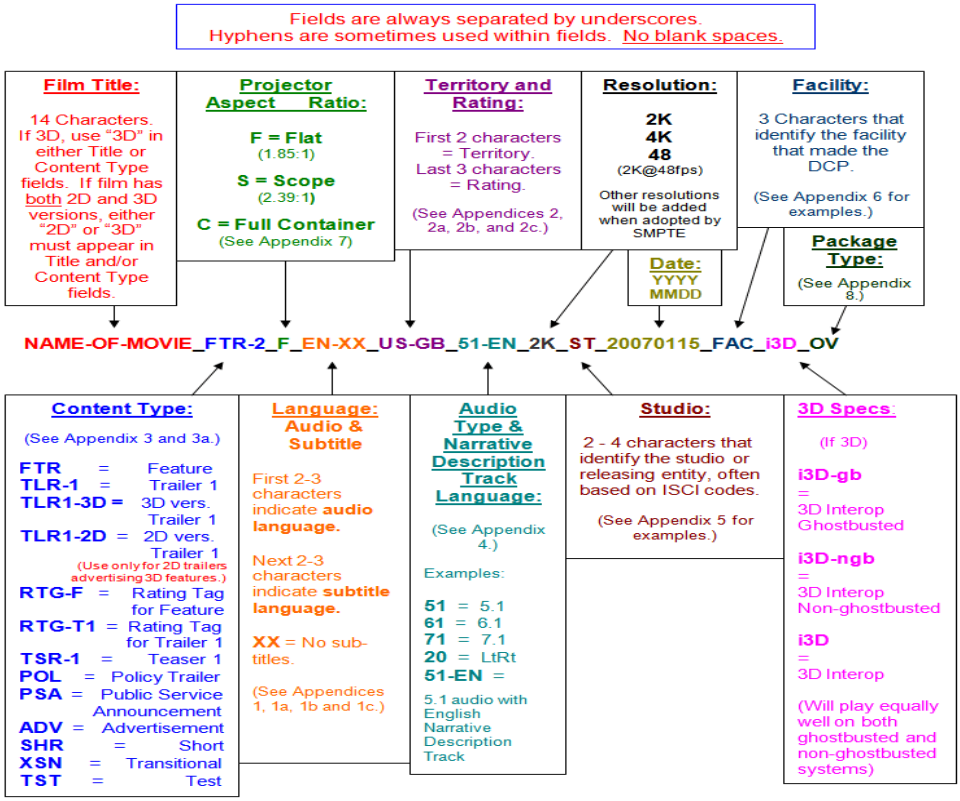
DCP Distribution Drives

The ISDCF specifies that distribution drives should be formatted as EXT2 volumes (with an *inode* size of 128). While many servers will accept FAT32 formatted drives as well, it is best to follow the specification to ensure compatibility with all server types. Drives can be USB (will result in slower ingestions), DVD (will also be slow) or CRU drive carriers – which will be the fastest. Copy all the files created by QubeMaster Xpress, without any changes, to the distribution drive. EXT2 formatted drives may be created using a Linux machine or using EXT2 management applications.

DCP Naming

DCPs should ideally follow the ISDCF Naming Convention and QubeMaster Xpress automatically suggests a default name that conforms to this convention. The name should not exceed 14 characters and no special characters or spaces may be used. It is important that no changes should be made to the names of any files after a DCP is created as this will cause the DCP to fail integrity verification when ingesting into a

digital cinema server. The ISDCF Naming Convention is explained in the diagram below:



ISDCF naming convention illustration courtesy Mark Harrah.

www.isdcf.com

Detailed Workflows

Create a DCP from a single graphic file

- Browse to the location of the source file and select it.
- In the next page attach an audio file. If the slide does not require audio, you must still attach *silent audio to* create a compliant DCP. DCPs without audio may be rejected by some servers.
- Specify the duration of the finished DCP – in other words, specify how long you want the slide to be displayed on the screen.
- You may choose to format your picture to fit a Flat aspect ratio and/or Scope aspect ratio by cropping and scaling the image to fit – using the *Scissor* icons. Please note that the image is padded with black to fit these aspect ratios.
- Dragging the Scissor icon from top-to-bottom will crop the image on the top and bottom. Dragging the Scissor icon from left-to-right will crop the image on both sides.
- Click the *Advanced Settings* icon and select the source file's colour space if you need to change it from the default RGB Rec.709 setting which is the colour space of commonly used digital image files. If however the source's colour space has been converted to the Digital Cinema requirement of DCI XYZ, prior to bringing the files to QubeMaster Xpress, then the colour space selection must be set to DCI XYZ.

- Change the *Gamma* of the source if necessary. Source Gamma for digital images and video files is usually 2.2.
- Click the *Next* icon to go to the final page and specify a name for the DCP.
- Select the Content Type, Country, Ratings, etc. Apart from being incorporated as meta-data within the DCP, these selections are also incorporated into the name of the DCP as per the ISDCF Naming Convention as detailed elsewhere in this User Guide.
- Click the *Advanced Settings* icon to specify the *Encoding Bit Rate* for the picture.
- Check the *Pad Audio* option to pad the audio file with silence to create a 6, 7 or 8 channel audio MXF file in the DCP. This option is available only of there is at least one channel of audio already present. If no audio source file was selected to begin with, then the Pad Audio option will be greyed-out.
- Specify a destination folder to which the DCP should be saved. Ideally each DCP must be saved to an empty folder. Click the *Go* icon to create the DCP. After the successful completion of the DCP creation process, take care not to click the *Go* icon again inadvertently as the creation will begin again and the old files will no longer be useable.
- Copy the DCP to an EXT2 formatted drive.

Create a DCP from a video file

- Browse to the location of the source media file and select it. The file must include both image and sound and audio cannot be added separately.
- You may choose to format your picture to fit a Flat aspect ratio and/or a Scope aspect ratio by cropping and scaling the image to fit – using the *Scissor* icons. Please note that the image is padded with black to fit these aspect ratios.
- Dragging the Scissor icon from top-to-bottom will crop the image on the top and bottom. Dragging the Scissor icon from left-to-right will crop the image on both sides.
- Click the *Advanced Settings* icon and select the source file's properties. Specify if the source video file uses Interlaced or Progressive scanning.
- Select the source file's colour space if you need to change it from the default RGB Rec.709 setting which is the colour space of commonly used digital image files. If however the source's colour space has been converted to the Digital Cinema requirement of DCI XYZ, prior to bringing the files to QubeMaster Xpress, then the colour space selection must be set to DCI XYZ.
- Change the *Gamma* of the source if necessary. Source Gamma for digital images and video files is usually 2.2.

- Click the *Next* icon to go to the final page and specify a name for the DCP.
- Select the Content Type, Country, Ratings, etc. Apart from being incorporated as meta-data within the DCP, these selections are also incorporated into the name of the DCP as per the ISDCF Naming Convention as detailed elsewhere in this User Guide.
- Click the *Advanced Settings* icon to specify the *Encoding Bit Rate* for the picture.
- Check the *Pad Audio* option to pad the audio file with silence to create a 6, 7 or 8 channel audio MXF file in the DCP. This option is available only of there is at least one channel of audio already present. If no audio source file was selected to begin with, then the Pad Audio option will be greyed-out.
- Specify a destination folder to which the DCP should be saved. Ideally each DCP must be saved to an empty folder. Click the *Go* icon to create the DCP. After the successful completion of the DCP creation process, take care not to click the *Go* icon again inadvertently as the creation will begin again and the old files will no longer be useable.
- Copy the DCP to an EXT2 formatted drive.

Create a 3D DCP from a stereoscopic video file

QubeMaster Xpress can create stereoscopic DCPs only from video sources, not from a single image or a sequence of image files. Stereoscopic or 3D video source files must be in one of the following formats:

- Frame Sequential at 48fps
- Side-by-Side at 24fps
- Over-Under at 24fps

In all cases, the audio for the DCP must be in sync with the source image and a part of the same file.

- Browse to the location of the file and select it. A video file must have both image and sound in the same file, audio cannot be added separately.
- You may choose to format your picture to fit a Flat aspect ratio and/or a Scope aspect ratio by cropping and scaling the image to fit – using the *Scissor* icons. Please note that the image is padded with black to fit these aspect ratios.
- Dragging the Scissor icon from top-to-bottom will crop the image on the top and bottom. Dragging the Scissor icon from left-to-right will crop the image on both sides.

- Click the *Advanced Settings* icon and select the source file's properties. Specify if the source video file uses Interlaced or Progressive scanning.
- Select the *Stereoscopic* option and specify the format of the source file as Sequential, Side-by-Side or Over-Under.
- Select the source file's colour space if you need to change it from the default RGB Rec.709 setting which is the colour space of commonly used digital image files. If however the source's colour space has been converted to the Digital Cinema requirement of DCI XYZ, prior to bringing the files to QubeMaster Xpress, then the colour space selection must be set to DCI XYZ.
- Change the *Gamma* of the source if necessary. Source Gamma for digital images and video files is usually 2.2.
- Click the *Next* icon to go to the final page and specify a name for the DCP.
- Select the Content Type, Country, Ratings, etc. Apart from being incorporated as meta-data within the DCP, these selections are also incorporated into the name of the DCP as per the ISDCF Naming Convention as detailed elsewhere in this User Guide.
- Click the *Advanced Settings* icon to specify the *Encoding Bit Rate* for the picture.
- Check the *Pad Audio* option to pad the audio file with silence to create a 6, 7 or 8 channel audio MXF file in the DCP. This option is

available only of there is at least one channel of audio already present. If no audio source file was selected to begin with, then the Pad Audio option will be greyed-out.

- Specify a destination folder to which the DCP should be saved. Ideally each DCP must be saved to an empty folder. Click the *Go* icon to create the DCP. After the successful completion of the DCP creation process, take care not to click the *Go* icon again inadvertently as the creation will begin again and the old files will no longer be useable.
- Copy the DCP to an EXT2 formatted drive.