

QUBE CINEMA

QubeMaster Pro

User Guide

November 2013



QubeMaster Pro

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Digital Cinema Packages

Creating an industry standard inter-operable Digital Cinema Package (DCP) in Qube Master Pro involves a simple, step-by-step process:

- Create **Track** files for each of the source image, audio and subtitle components individually.
- Create **Reels** by combining these track files.
- Create a **Composition** by combining Reels.
- **Encode** the source composition into the Jpeg2000 mxf format (encryption may also be performed at this stage)
- **Package** the encoded composition into a DCP.
- **Generate KDMs** for the composition if it is encrypted

The QubeMaster Pro UI is designed with the above workflow in mind.

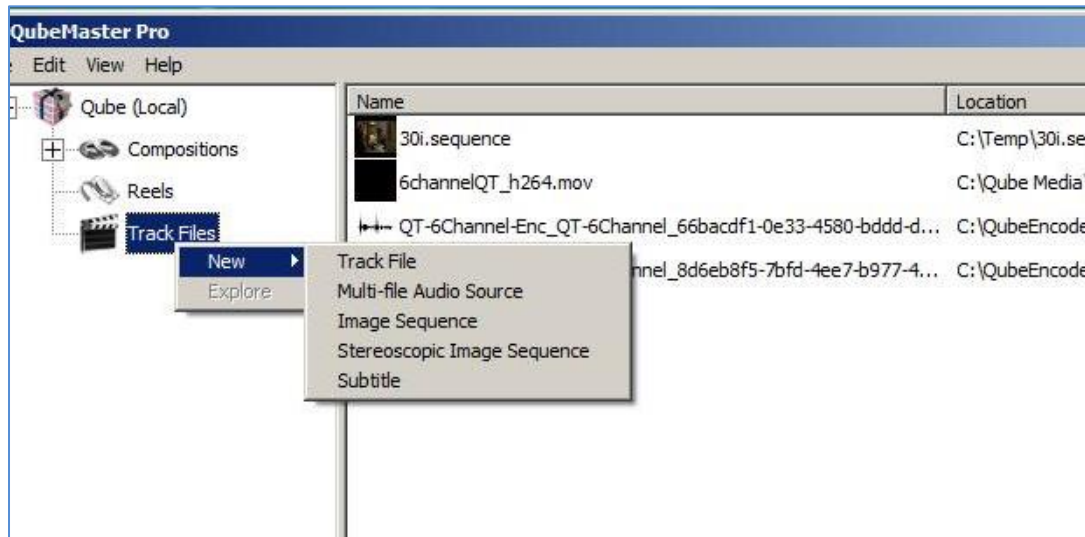
Recommendations to minimize compatibility issues with various server models:

- ▶ Picture compression format, aspect ratio, and frame rate should be identical for all reels
 - a. Aspect Ratio
 - i. 2048x858 or 1998x1080 for 2K
 - ii. 4096x1716 or 3996x2160 for 4K
 - b. Frame-rate (Progressive only)
 - i. INTER-OP DCPs - 24fps for 2D and 48fps for 3D
 - ii. SMPTE – 25, 25, 30, 60 fps
- ▶ Sound bit-depth, sample rate and channels should be identical for all reels
 - i. Channel configuration (stereo, 6 channel, Dolby Atmos etc. should be identical for all audio assets in a composition)
 - ii. Bit-depth should be 24-bit,
 - iii. Sample-rate should be 48KHz or 96KHz
- ▶ All reels should have picture and sound
 - i. No silent reels
 - ii. No sound only reels
 - iii. Even silent cards should have silent sound tracks of the same track count, sample rate and bit depth as other audio tracks in the Composition
 - iv. It is also recommended that if there are subtitles in any reel, then all reels should have subtitles, (even if some are empty subtitle files)
- ▶ All assets should be either homogenously encrypted or unencrypted.
- ▶ Naming Conventions
 - i. No spaces in any file names (No spaces in any Track File, Reel, Composition or Package names)

Creating a DCP from Image Sequences

Create Track Files

Individual Track files must be created for Image (video), audio and subtitle files



- ▶ Tip:
- ▶ Source files can also be dragged-and-dropped into QubeMaster Pro.
- ▶ For image sequences, select only the first and last files of the

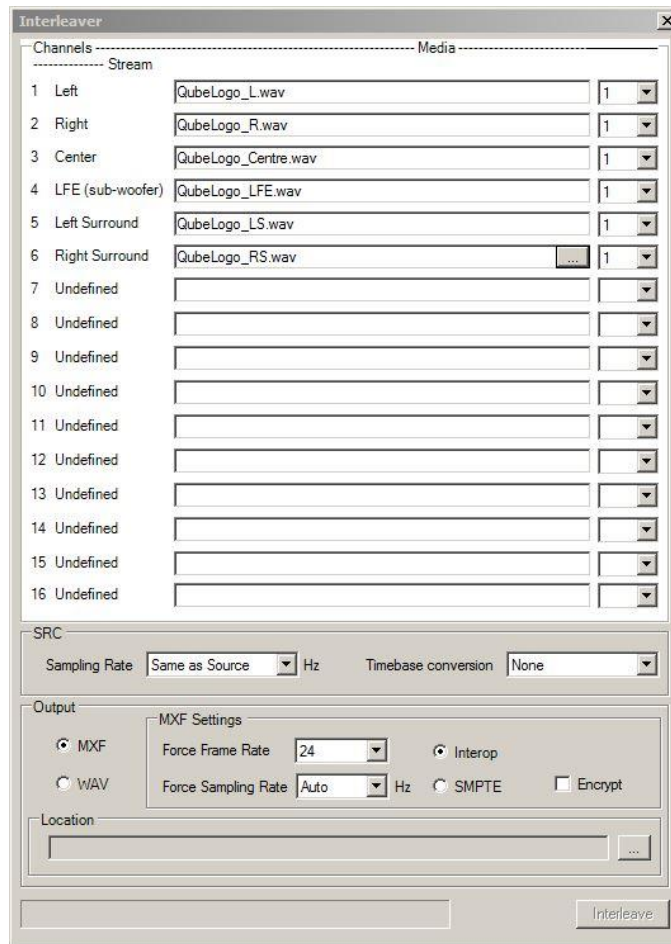
Image/Video Track Files

- ▶ To create a Track file from an **Image Sequence** of dpx/Tiff/Tga/BMP/J2C files - choose the “New Image Sequence” option.
- ▶ In the window that opens, select the first and last files of the image sequence.
- ▶ Specify the location to which this new sequence file is going to be saved. This “sequence” file is only a link to the actual image sequence and is, as such, only a few KB in size (no image files are copied or created at this stage)
- ▶ Specify the frame-rate of the sequence – supported frame-rates are 24, 25, 30, 48, 50, 60, 96, 100, 120. (Please note that while QubeMaster Pro can create DCPs in all these frame-rates – servers are not required to support all the above. Playback servers must compulsorily only support 24 and 48 FPS, the others are

optional. Therefore it is highly recommended that specifications of playback servers are confirmed before DCPs in varied frame-rates are dispatched.

Audio Track Files

- For multiple mono files
 - Create a track file using the “multi file audio source” option
 - Multiple mono audio files can be interleaved into the required multi-channel mxr using the “Interleaver” window which opens.



- Specify the audio file for each channel and also specify the “stream numbering” from 1 to 6.
- Select a destination folder for the resultant mxr file.
- Click “Interleave” to create the audio mxr file.
- Digital Cinema supports 16 channels of audio. Channel mapping for additional audio formats - 8 channel audio, channel specifications for Visually

impaired and hearing impaired audio, D-box audio etc., are described in Appendix B

- ▶ For multi-channel interleaved audio files with the correct channel mapping
 - Create a track file using the “New Track File” option
- ▶ For multi-channel interleaved audio files with incorrect channel mapping
 - Create a track file using the “New Mult-file audio Source” option
 - Select the same audio file for all channels
 - Re-map the channels by specifying the “Stream numbers” so if the Left Channel is currently on Stream 5, specify 5 next to the Left

Subtitle Track Files

- ▶ For DCI compliant Cine-canvas xml or mxf files use the “New track file” option
- ▶ To CONVERT a .txt/asc file (in the prescribed format) into a Cine-canvas xml in QubeMaster Pro, use the “New Subtitle” option.

This method is discussed in detail in Appendix C of the user manual.

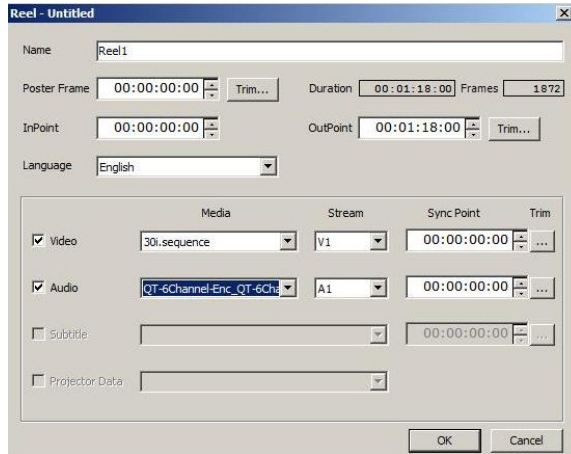
Create Reels

Combine relevant Video, Audio and subtitle track files together to create reels.

- ▶ Right-click and select “New Reel”



- ▶ Select the individual Image, sound and subtitle assets using the drop-down menu.



- ▶ Tip:
- ▶ Alternatively, select all the Track-file assets and then drag-and-drop them into the REELS pane.
- ▶ A new reel will be automatically created with these assets chosen.

- ▶ Name the Reel.
- ▶ Use the “InPoint” and “OutPoint” points to trim the reel if required.
- ▶ Use the “Sync point” options to individually trim only image or sound (for example, to remove leaders)
- ▶ Sync points should not be added for subtitles – except to check for sync, after which sync points removed from the Trim window and individual subtitles should be edited in the subtitling software
- ▶ Create single or multiple reels as required.

Create Compositions

- ▶ Right-click on Composition and select “New Composition”.

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- Combine multiple reels to create a composition (to encode all the reels together) or create a single reel composition (to encode each reel individually).

Tip:

Alternatively, select all the Reels associated with a composition and then drag-and-drop them into the Composition pane. A new Composition will be automatically created with these assets

- Select the composition parameters and specify:

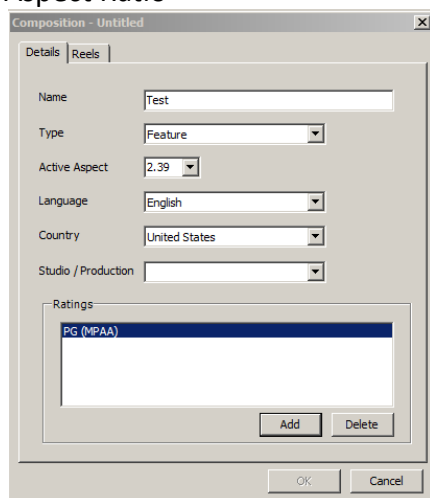
Composition Type

Language

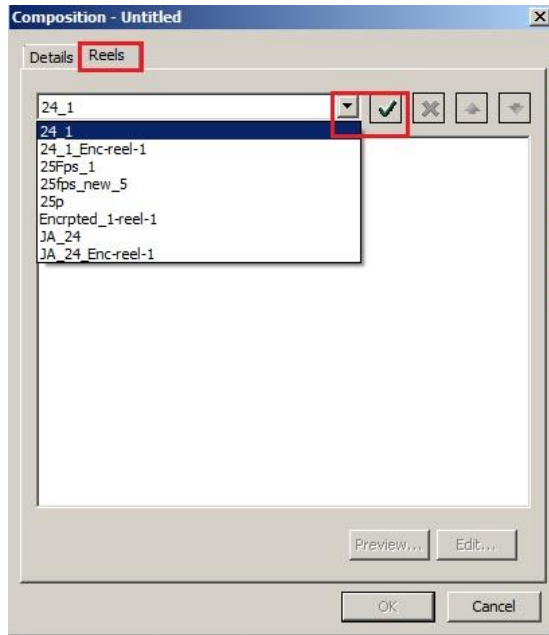
Studio

Rating

Aspect Ratio



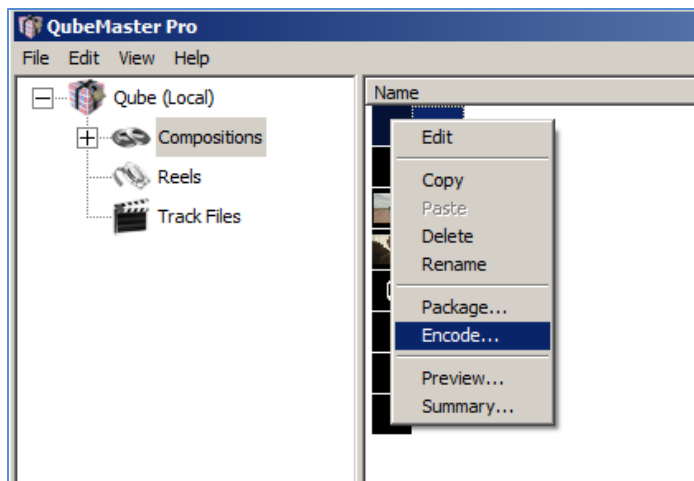
- Click on the Reels tab and select all the reels for this composition.



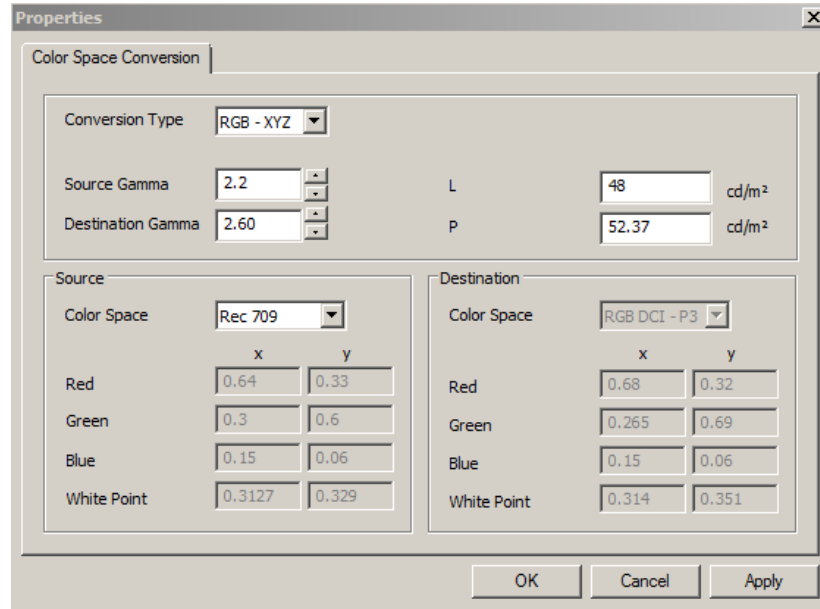
Encode compositions

Encoding converts the source file into a DCI compliant Jpeg2000 mxf file. Before you begin encoding, it is important to know whether you require an INTER-OP DCP or a SMPTE DCP.

- Right-click the source composition and select the “Encode” option.

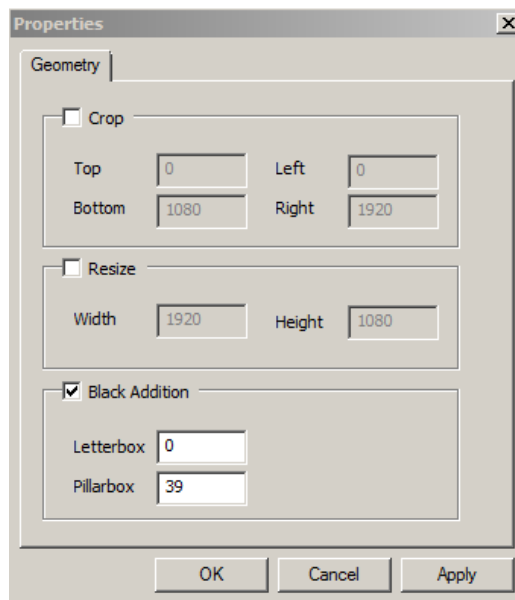


- ▶ In the Encoder window, enter a name for the new encoded composition. This name will be retained in the final DCP, so ensure that the naming is succinct.
- ▶ Select a destination folder for the encoded files (this will also be the folder for the final DCP, so ensure that there is sufficient space on the drive)
- ▶ The “Process Media” is by default set to only encode those regions within the Inpoint and Outpoints specified in the Reel Trim window.
 - “Process With Handles” encodes a few additional seconds or frames (as specified) before the inpoint and after the outpoint (“handles”).
 - “Process Entire Media” will result in the all the frames being encoded, even those outside the “trim” selections. It is to be used in cases where the entire source media file needs to be encoded irrespective of the in and out points specified.
- ▶ By default the “Compress” option is selected and set to DCI Jpeg2000, to convert the source file format into the Jpeg2000 mxf format.
- ▶ If the image needs colour-space conversion and/or aspect ratio conversion, select the appropriate filters from the “Pre-Process” drop-down menu.
 - **Colour-space conversion**
 - Digital Cinema Packages need to be in the XYZ colour-space
If the source is RGB then apply the ColourSpace Conversion filter to convert it to XYZ:
 - To convert RGB sources to XYZ
 - Select RGB-XYZ
 - Select Source Colour-space as RGB Rec709
 - Source Gamma for RGB is normally 2.2
 - Destination gamma is 2.6
 - For a full description of each of the colour-correction pre-processor filters please see the section on Pre-processing filters.

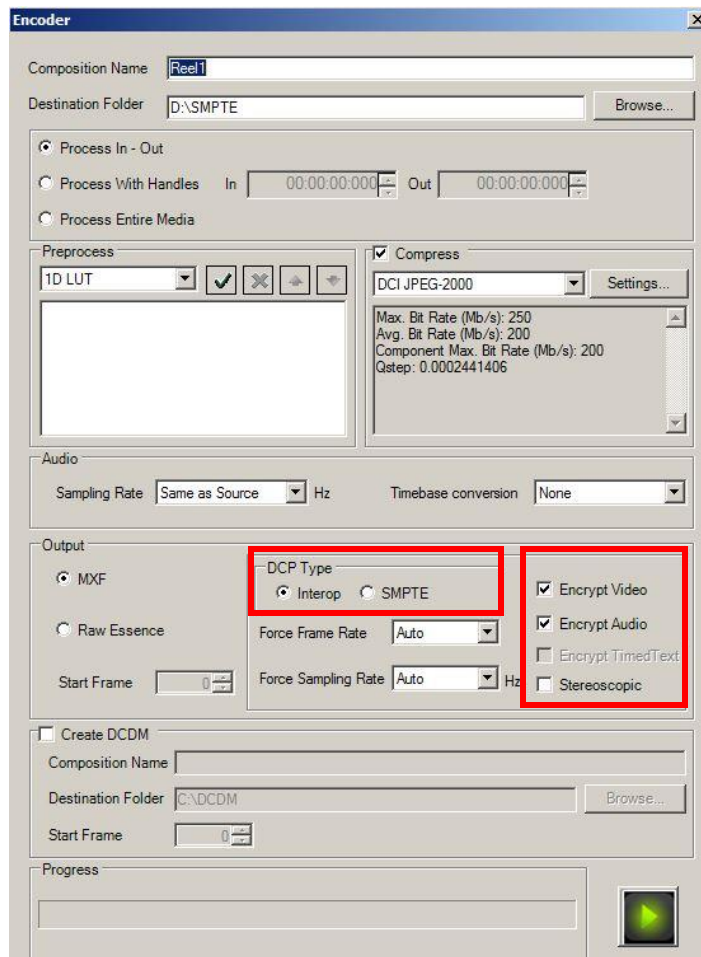


- **Geometry**

- ▶ Digital Cinema Packages should be in the following Aspect Ratios
 - 2K - 2048x858 (Scope) OR 1998x1080 (Flat)
 - 4K - 4096x1716 (Scope) OR 3996x2160 (Flat)
- ▶ Use the options in the Geometry filter to change the aspect ratio
 - PAD - to pad black as Pillarbox or Letterbox
 - RESIZE - to scale
 - CROP - to Crop
- ▶ For HD source at 1920x1080
 - Convert to FLAT – 1998x1080
 - By Padding 39 pixels of Black in Pillarbox



- For a full description of each of the Geometry pre-processor filter please see the section on Pre-processing filters.
- **After** applying the necessary filters, click on “Settings” to set the data-rate for the specific Encode:
 - For J2K set the data-rate to:
 - between 150 and 180 for low quality
 - Between 180 and 200Mbps for medium quality
 - Between 200 and 250 for good (250Mbps is the maximum bit-rate supported for DCI compliant playback devices)
 - Higher bit-rates can be chosen for archival purposes.
 - Check to see if the aspect ratio displayed here is correct – else make changes to the Geometry filter to achieve the correct aspect.
- By default the “Encrypt” option is selected, to perform the encryption in the same step as encoding. This can be deselected if Encryption is to be done as a separate step later.



- **INTER-OP and SMPTE DCP Formats**

Digital cinema standards have evolved over time and as a consequence the specifications for a DCI COMPLIANT DCP have changed from the first “Mpeg MXF INTER-OP” to the current “JPEG2000 MXF INTER-OP” and now to the specifications of the new SMPTE standard which is being implemented.

QubeMaster Pro can create DCPs in the older Jpeg2000 MXF INTER-OP standard (referred to, in short as INTER-OP DCPS) and in the new SMPTE Standard (referred to as SMPTE DCPs).

According to DCI specifications all Jpeg2000 DCPs INTER-OP and SMPTE DCPs should conform to the following:

- ▶ Aspect Ratio:
 - 2K - 2048x858 (Scope) OR 1998x1080 (Flat)
 - 4K - 4096x1716 (Scope) OR 3996x2160 (Flat)
- ▶ Colour-space
XYZ colour
- ▶ Frame-rate
 - 24 fps or 48 (for 3D), Progressive for Jpeg2000 Inter-op DCPs
 - 24, 25, 48, 50 or 60 or 120fps for SMPTE DCPs.

One big difference between INTER-OP and SMPTE DCPs is the support for different frame-rates (including High Frame Rate – HFR DCPs). Frame-rates above 48fps are referred to as **HFR** or High Frame Rate.

However, not all servers support all the above frame-rates. Please check with the server manufacturer’s specification before dispatching DCPs at frame-rates other than 24 and 48.
- ▶ Audio
 - 6 channel audio - mapped in the order L, R, C, Lfe, Ls, Rs
Additional channel configurations are currently not possible in QubeMaster Pro
 - 48Khz or 96Khz audio sample rate
 - 24bit
- ▶ It is recommended that all reels in a composition must be “technically” identical.
 - Bit depth and sample rate and stereo/surround must match for all the audio in a composition.
 - Aspect ratio must match for all video content
 - Compression data-rate must be the same
 - It is recommended that all reels have the SAME contents – meaning that if one reel has subtitles then all reels should include subtitles – even if it is Blank. Similarly it is best that all reels must have audio – even blank audio.

- All of the above parameters must be set correctly during the encoding process using the various pre-processing filters in QMPro.
- ▶ If reels were being encoded separately, combine multiple reels together to create the FINAL composition.
- ▶ Frame-rate conversions from 24 to 25 or 25 to 24 or 23.98 to 24 can be performed using the “Force Frame-rate” option.
- ▶ If image frame-rate are being converted, then similar adjustments need to be performed on the audio as well – using the Sample-rate and Timebase conversion options.
- ▶ A DCDM (tiff sequence) can be additionally created for archival purposes
- ▶ J2C sequences, without the mxf wrapper, can also be generated by selecting the “Raw essence” option.

Package a Composition to create a DCP

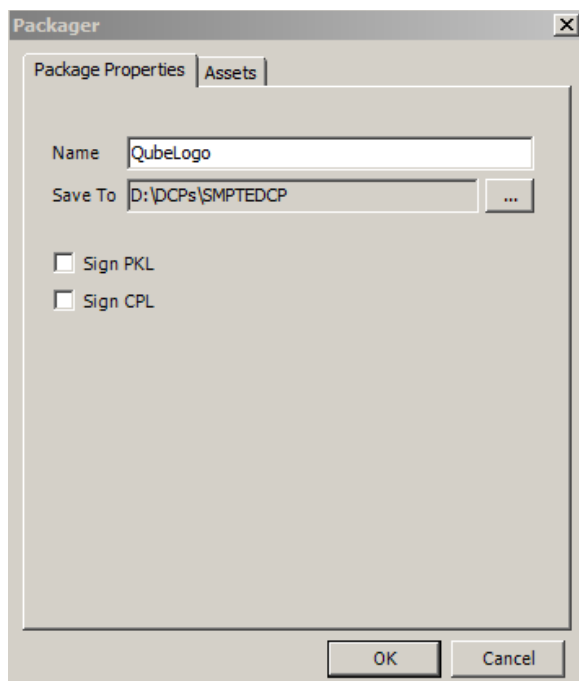
During the Packaging process a Digital Cinema Package is created which contains all of the encoded track files (in the mxf format) along with five metadata files

- **Cpl – composition play list (.xml file).** The Composition Playlist (CPL) defines the sequence in which the reels in a movie are played. It also refers the “in” frame and the duration of frames to be played within a track file as specified in the TRIM window.
The CPL also contains information about the number of reels, aspect ratio, duration, sync info etc. The CPL is signed and has a “hash” which is the same as that in the pkl so it must not be edited.
 - **Asset map (xml file) – List of assets that are part of the DCP.** uuid for each track file and its path
 - **Pkl – packaging list (.xml)** The Packing List defines all elements/files within a DCP.
 - **Volindex (xml file)** – identifies the HDD vol. if assets are spread across multiple drives.
 - Image, audio and subtitle mxfs (for SMPTE DCPs)
 - For INTER-OP DCPs, subtitles (if any) are placed in a separate folder along with the font file (one folder for each reel) during packaging.
- ▶ Right-click on the Encoded Composition and select “Package.”

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- Multiple Compositions can be packaged into a single DCP by “SHIFT-SELECTING” the different compositions and then choosing “Package”. DCPs with multiple compositions will contain only a single PKL but will have multiple CPLs (depending on the number of compositions chosen)

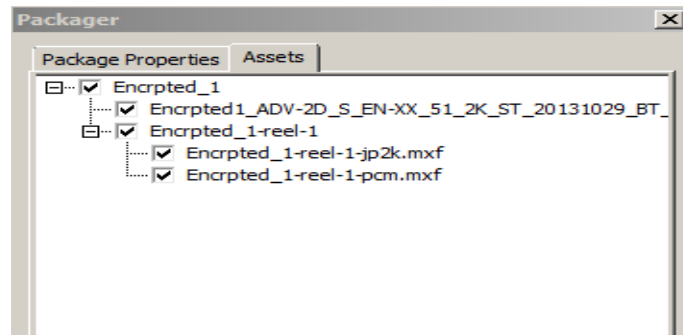


- Select a folder to which the DCP will be saved.
 - The SAME folder that contains the mxf files can be chosen.
If the destination folder is on the same drive as the encoded files, a “HARDLINK” will be created instead of an actual file copy

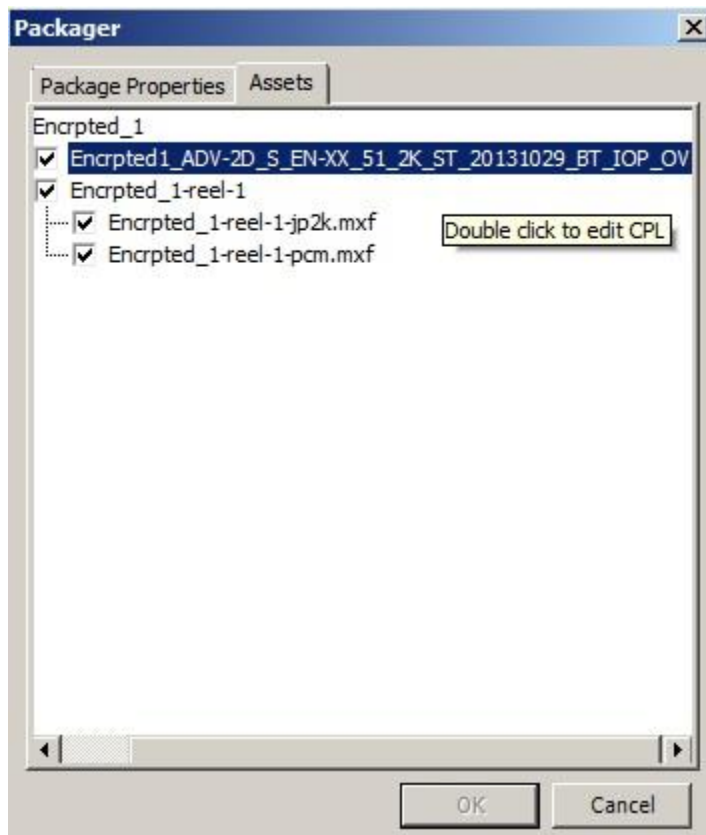
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In both these cases, the copying process is much faster.

- ▶ Sign the PKL and CPL files only if the composition is Encrypted – else it is not imperative to select the “Sign CPL/PKL option”
- ▶ All the files for the DCP will be created in the specified location
- ▶ Click the “Assets” tab and expand the to check if the correct assets are being packaged.



- ▶ The CPL file is named following the DCI naming convention – but can be manually edited if necessary by double-clicking the CPL name.

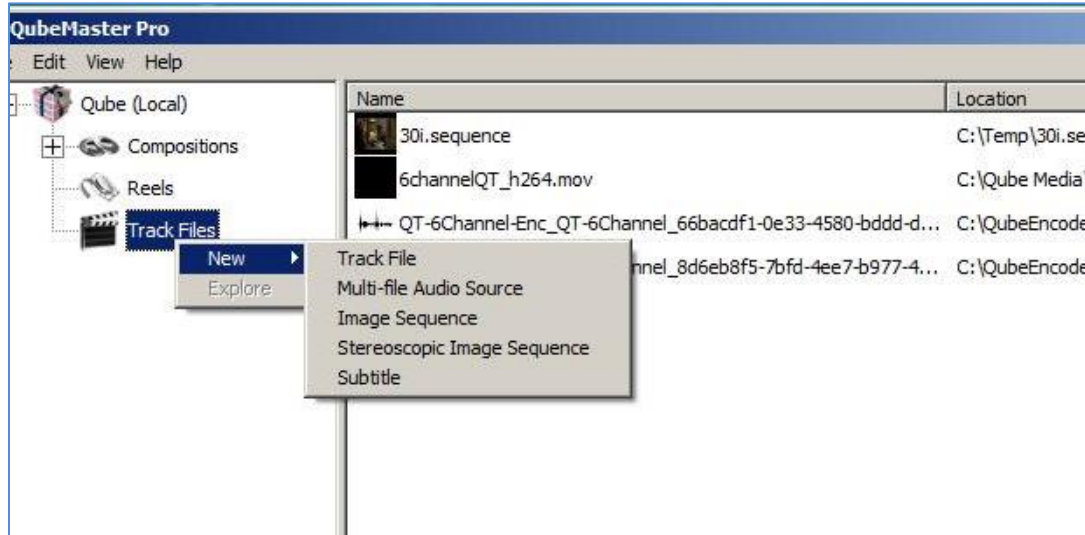


- Click “OK” to package. Packaging will take some time the first time a composition is packaged, since the “HASHES” for all files have to be calculated and stored. Subsequent packaging (if necessary) will be much faster.
In any case, no files will be re-copied, only a HARD-LINKS will be created whenever a package is created onto the SAME DRIVE as the encoded files.

Creating a DCP from Video Files

Create track files

Individual Track files must be created for Image (video), audio and subtitle files



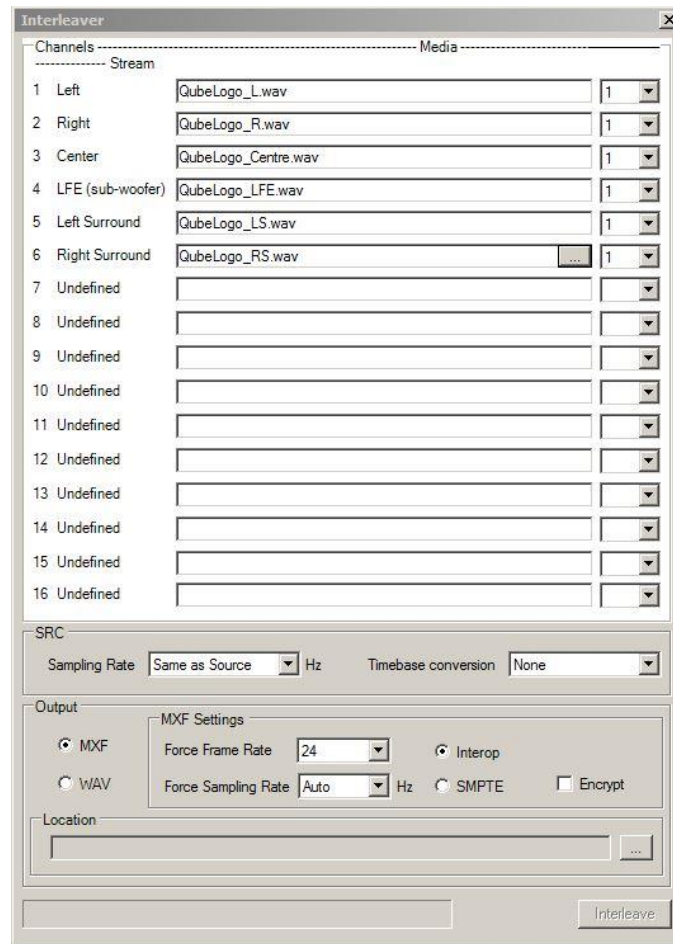
- ▶ Tip:
- ▶ Source files can also be dragged-and-dropped into QubeMaster Pro.

Image/Video Track Files

- ▶ To create Track Files from avi/mov/mpeg files sources.
- ▶ Use the “New Track File” option
- ▶ Browse to the location of the video file
- ▶ The frame-rate is automatically detected
- ▶ Supported frame-rates are 24, 25, 30, 48, 50, 60, 96, 100, 120. (Please note that while QubeMaster Pro can create DCPs in all these frame-rates – servers are not required to support all the above. Playback servers must compulsorily only support 24 and 48 FPS, the others are optional. Therefore it is highly recommended that specifications of playback servers are confirmed before DCPs in varied frame-rates are dispatched.

Audio Track Files

- ▶ If audio is interleaved with the video file, it need not be imported separately.
- ▶ For audio as separate multiple mono files
 - Create a track file using the “multi file audio source” option
 - Multiple mono audio files can be interleaved into the required multi-channel mxm using the “Interleaver” window which opens.



- Specify the audio file for each channel and also specify the “stream numbering” from 1 to 6.
 - Select a destination folder for the resultant mxm file.
 - Click “Interleave” to create the audio mxm file.
- ▶ Digital Cinema supports 16 channels of audio. Channel mapping for additional audio formats - 8 channel audio, channel specifications for Visually impaired and hearing impaired audio, D-box audio etc., are described in Appendix B
 - ▶ For multi-channel interleaved audio files with incorrect channel mapping

- Create a track file using the “New Multi-file audio Source” option
- Select the same audio file for all channels
- Re-map the channels by specifying the “Stream numbers”. For example, if the Left Channel is currently on Stream 5, select 5 from the “stream” drop-down menu for the Left channel.

Create Subtitle Track Files

- ▶ For DCI compliant Cine-canvas xml or mxf files use the “New track file” option
- ▶ To CONVERT a .txt/asc file (in the prescribed format) into a Cine-canvas xml in QubeMaster Pro, use the “New Subtitle” option.

This method is discussed in detail in Appendix C of the user manual.

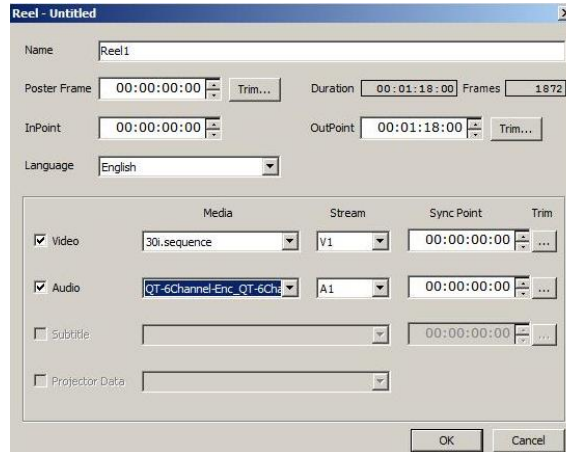
Create Reels

Combine relevant Video, Audio and subtitle track files together to create reels.

- ▶ Right-click and select “New Reel”



- ▶ Select the individual Image, sound and subtitle assets using the drop-down menu.



Tip:

Alternatively, select all the Track-file assets and then drag-and-drop them into the REELS pane.

A new reel will be automatically created with these assets chosen.

- ▶ Name the Reel.
- ▶ Use the “InPoint” and “OutPoint” points to trim the reel.
- ▶ Use the “Sync point” options to individually trim only image or sound (for example, to remove leaders)
Sync points should not be added for subtitles – except to check for sync, after which sync points removed from the Trim window and individual subtitles should be edited in the subtitling software
- ▶ Create multiple reels as required.

Create Compositions

Combine multiple reels to create a composition (to encode all the reels together) or create a single reel composition (to encode each reel individually).

- ▶ Right-click on Composition and select “New Composition”.

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Tip:

Alternatively, select all the Reels associated with a composition and then drag-and-drop them into the Composition pane.

A new Composition will be automatically created with these assets chosen.

► Select the composition parameters and specify:

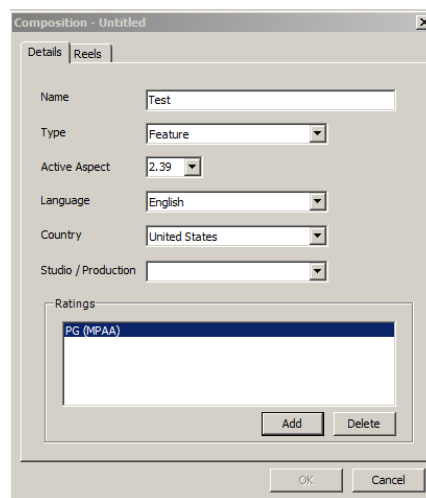
Composition Type

Language

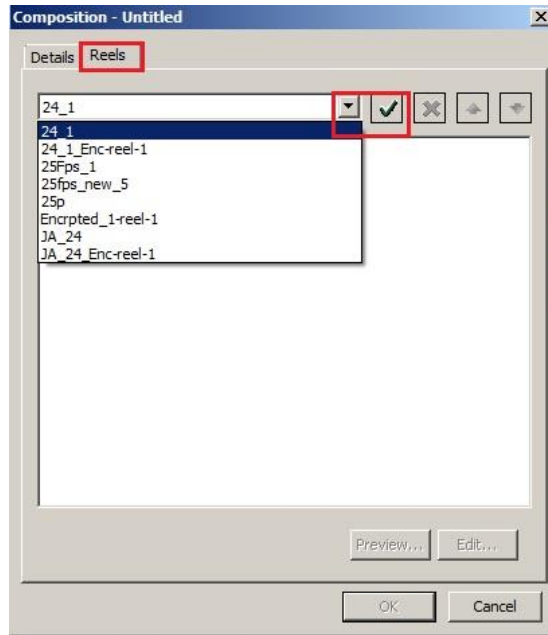
Studio

Rating

Aspect Ratio



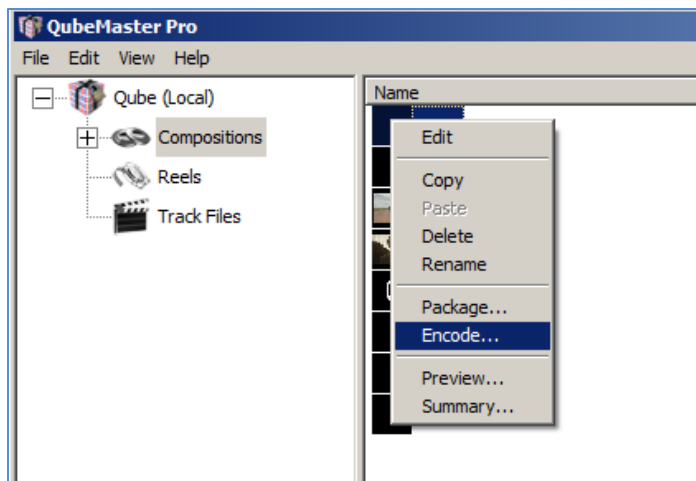
- Click on the Reels tab and select all the reels for this composition.



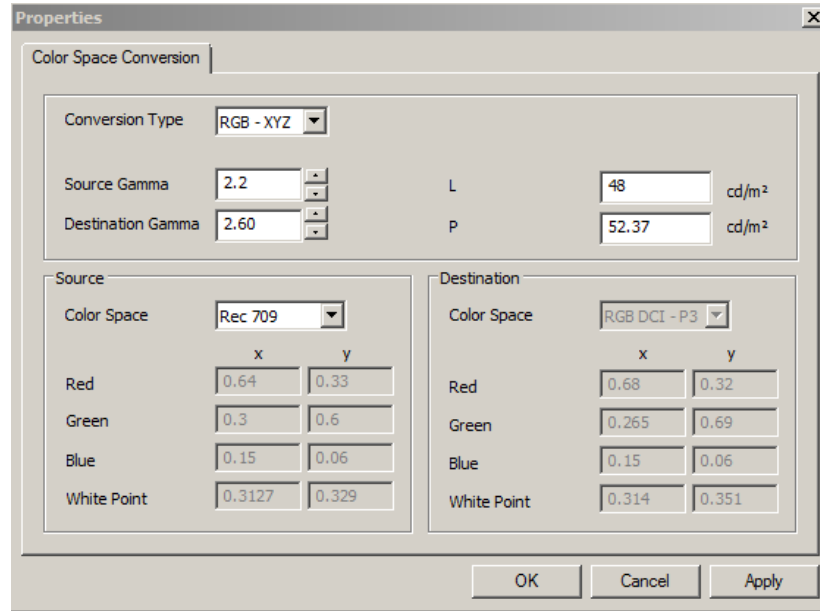
Encode compositions

Encoding converts the source file into a DCI compliant Jpeg2000 mxf file. Before you begin encoding, it is important to know whether you require an INTER-OP DCP or a SMPTE DCP. Please read Appendix A to know more about these formats.

- Right-click the source composition and select the “Encode” option.

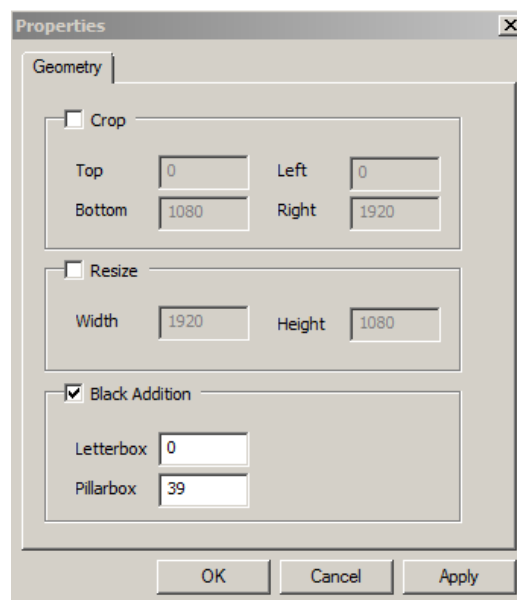


- ▶ In the Encoder window, enter a name for the new encoded composition. This name will be retained in the final DCP, so ensure that the naming is succinct.
- ▶ Select a destination folder for the encoded files (this will also be the folder for the final DCP, so ensure that there is sufficient space on the drive)
- ▶ The “Process Media” is by default set to only encode those regions within the Inpoint and Outpoints specified in the Reel Trim window.
 - “Process With Handles” encodes a few additional seconds or frames (as specified) before the inpoint and after the outpoint (“handles”).
 - “Process Entire Media” will result in the all the frames being encoded, even those outside the “trim” selections. It is to be used in cases where the entire source media file needs to be encoded irrespective of the in and out points specified.
- ▶ By default the “Compress” option is selected and set to DCI Jpeg2000 to convert the source file format into the Jpeg2000 mxf format.
- ▶ If the image needs colour-space conversion and/or aspect ratio conversion, select the appropriate filters from the “Pre-Process” drop-down menu.
 - **Colour-space conversion**
 - Digital Cinema Packages need to be in the XYZ colour-space
If the source is RGB then apply the ColourSpace Conversion filter to convert it to XYZ:
 - To convert RGB sources to XYZ
 - Select RGB-XYZ
 - Select Source Colour-space as RGB Rec709
 - Source Gamma for RGB is normally 2.2
 - Destination gamma is 2.6
 - For a full description of each of the colour-correction pre-processor filters please see the section on Pre-processing filters.

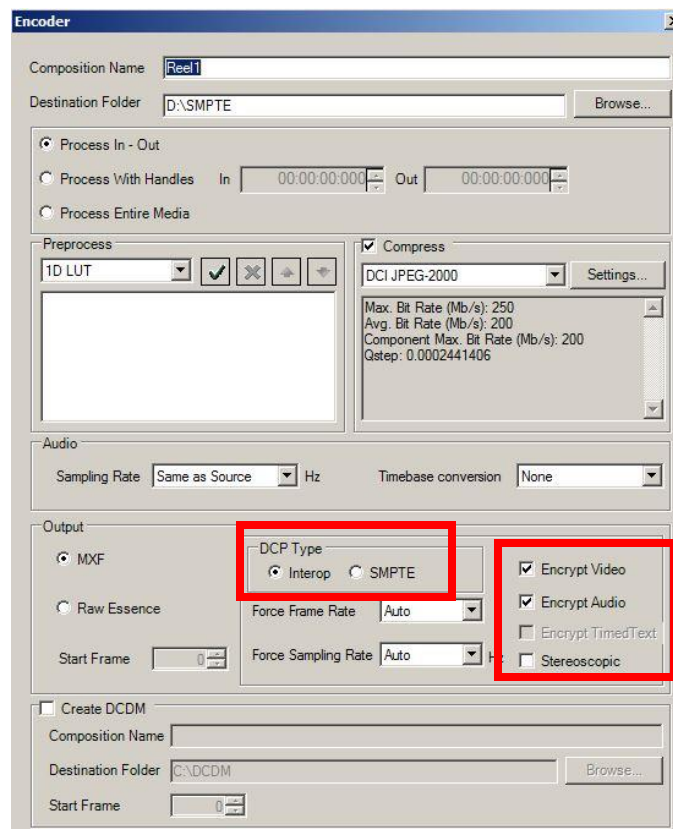


- **Geometry**

- ▶ Digital Cinema Packages should be in the following Aspect Ratios
 - 2K - 2048x858 (Scope) OR 1998x1080 (Flat)
 - 4K - 4096x1716 (Scope) OR 3996x2160 (Flat)
- ▶ Use the options in the Geometry filter to change the aspect ratio
 - PAD - to pad black as Pillarbox or Letterbox
 - RESIZE - to scale
 - CROP - to Crop
- ▶ For HD source at 1920x1080
 - Convert to FLAT – 1998x1080
 - By Padding 39 pixels of Black in Pillarbox



- For a full description of each of the Geometry pre-processor filter please see the section on Pre-processing filters.
- **After** applying the necessary filters, click on “Settings” to set the data-rate for the specific Encode:
 - For J2K set the data-rate to:
 - between 150 and 180 for low quality
 - Between 180 and 200Mbps for medium quality
 - Between 200 and 250 for good (250Mbps is the maximum bit-rate supported for DCI compliant playback devices)
 - Higher bit-rates can be chosen for archival purposes.
 - Check to see if the aspect ratio displayed here is correct – else make changes to the Geometry filter to achieve the correct aspect.
- By default the “Encrypt” option is selected, to perform the encryption in the same step as encoding. This can be deselected if Encryption is to be done as a separate step later.



- ▶ If the image needs pre-processing filters to adjust colour-space and aspect ratio, the appropriate filters can be selected from the “Pre-Process” drop-down menu and adjustments made accordingly.

For a full description of each of the pre-processor filters please see Appendix D.

- **INTER-OP and SMPTE DCP Formats**

Digital cinema standards have evolved over time and as a consequence the specifications for a DCI COMPLIANT DCP have changed from the first “Mpeg MXF INTER-OP” to the current “JPEG2000 MXF INTER-OP” and now to the specifications of the new SMPTE standard which is being implemented.

QubeMaster Pro can create DCPs in the older Jpeg2000 MXF INTER-OP standard (referred to, in short as INTER-OP DCPS) and in the new SMPTE Standard (referred to as SMPTE DCPs).

According to DCI specifications all Jpeg2000 DCPs INTER-OP and SMPTE DCPs should conform to the following:

- ▶ Aspect Ratio:
 - 2K - 2048x858 (Scope) OR 1998x1080 (Flat)
 - 4K - 4096x1716 (Scope) OR 3996x2160 (Flat)
- ▶ Colour-space
XYZ colour
- ▶ Frame-rate
 - 24 fps or 48 (for 3D), Progressive for Jpeg2000 Inter-op DCPs
 - 24, 25, 48, 50 or 60 or 120fps for SMPTE DCPs.

One big difference between INTER-OP and SMPTE DCPs is the support for different frame-rates (including High Frame Rate – HFR DCPs). Frame-rates above 48fps are referred to as **HFR** or High Frame Rate.

However, not all servers support all the above frame-rates. Please check with the server manufacturer’s specification before dispatching DCPs at frame-rates other than 24 and 48.
- ▶ Audio
 - 6 channel audio - mapped in the order L, R, C, Lfe, Ls, Rs
Additional channel configurations are currently not possible in QubeMaster Pro
 - 48Khz or 96Khz audio sample rate
 - 24bit
- ▶ It is recommended that all reels in a composition must be “technically” identical.
 - Bit depth and sample rate and stereo/surround must match for all the audio in a composition.
 - Aspect ratio must match for all video content
 - Compression data-rate must be the same

- It is recommended that all reels have the SAME contents – meaning that if one reel has subtitles then all reels should include subtitles – even if it is Blank. Similarly it is best that all reels must have audio – even blank audio.
 - All of the above parameters must be set correctly during the encoding process using the various pre-processing filters in QMPro.
-
- ▶ If reels were being encoded separately, combine multiple reels together to create the FINAL composition.
 - ▶ Frame-rate conversions from 24 to 25 or 25 to 24 or 23.98 to 24 can be performed using the “Force Frame-rate” option.
 - ▶ If image frame-rate are being converted, then similar adjustments need to be performed on the audio as well – using the Sample-rate and Timebase conversion options.
 - ▶ A DCDM (tiff sequence) can be additionally created for archival purposes
 - ▶ J2C sequences, without the mxf wrapper, can also be generated by selecting the Raw essence option.

Package a Composition to create a DCP

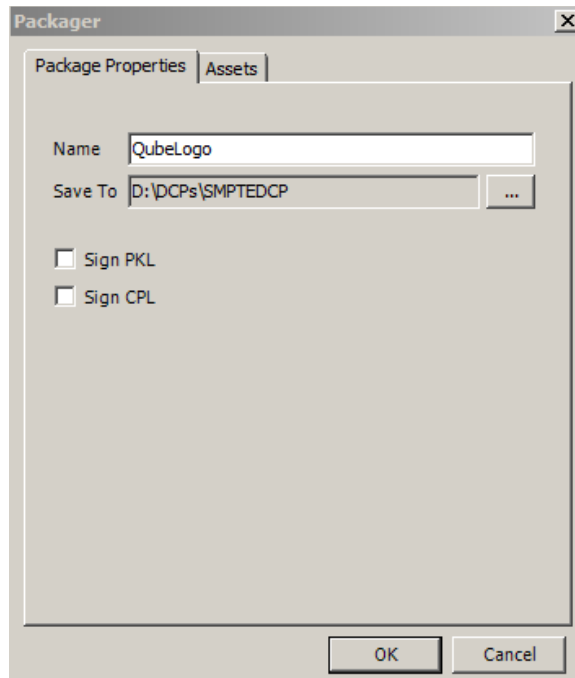
During the Packaging process a Digital Cinema Package is created which contains all of the encoded track files (in the mxf format) along with five metadata files

- **Cpl – composition play list (.xml file).** The Composition Playlist (CPL) defines the sequence in which the reels in a movie are played. It also refers the “in” frame and the duration of frames to be played within a track file as specified in the TRIM window.
The CPL also contains information about the number of reels, aspect ratio, duration, sync info etc. The CPL is signed and has a “hash” which is the same as that in the pkl so it must not be edited.
 - **Asset map (xml file) – List of assets that are part of the DCP.** uuid for each track file and its path
 - **Pkl – packaging list (.xml)** The Packing List defines all elements/files within a DCP.
 - **Volindex (xml file)** – identifies the HDD vol. if assets are spread across multiple drives.
 - Image, audio and subtitle mxfs (for SMPTE DCPs)
 - For INTER-OP DCPs, subtitles (if any) are in a separate folder along with the font file (one folder for each reel).
-
- ▶ Right-click on the Encoded Composition and select “Package.”

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- Multiple Compositions can be packaged into a single DCP by “SHIFT-SELECTING” the different compositions and then choosing “Package”. DCPs with multiple compositions will contain only a single PKL but will have multiple CPLs (depending on the number of compositions chosen)

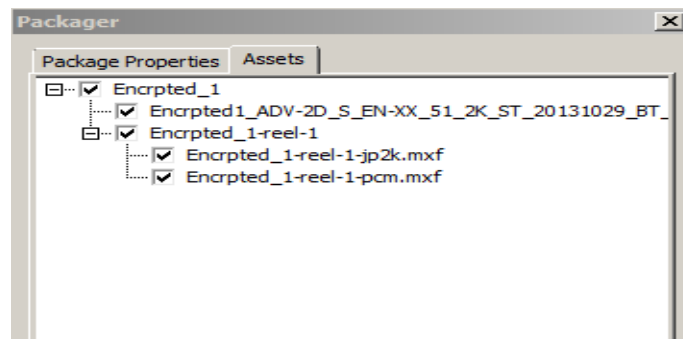


- Select a folder to which the DCP will be saved.
 - The SAME folder that contains the mxr files can be chosen.

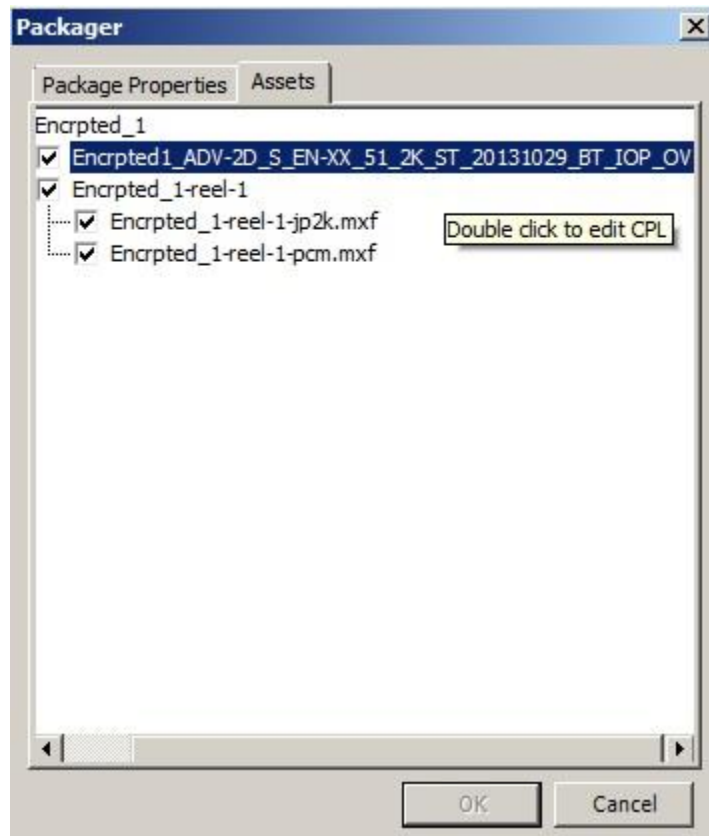
QubeMaster Pro

If the destination folder is on the same drive as the encoded files, a “HARDLINK” will be created instead of an actual file copy
In both these cases, the copying process is much faster.

- ▶ Sign the PKL and CPL files only if the composition is Encrypted – else it is not imperative to select the “Sign CPL/PKL option”
- ▶ All the files for the DCP will be created in the specified location
- ▶ Click the “Assets” tab and expand the to check if the correct assets are being packaged.



- ▶ The CPL file is named following the DCI naming convention – but can be manually edited if necessary by double-clicking the CPL name.



- Click "OK" to package. Packaging will take some time the first time a composition is packaged, since the "HASHES" for all files have to be calculated and stored. Subsequent packaging (if necessary) will be much faster. In any case, no files will be re-copied, only a HARD-LINKS will be created whenever a package is created onto the SAME DRIVE as the encoded files.

3D Stereoscopic DCPs

Creating Track files from Stereoscopic Image Sequences

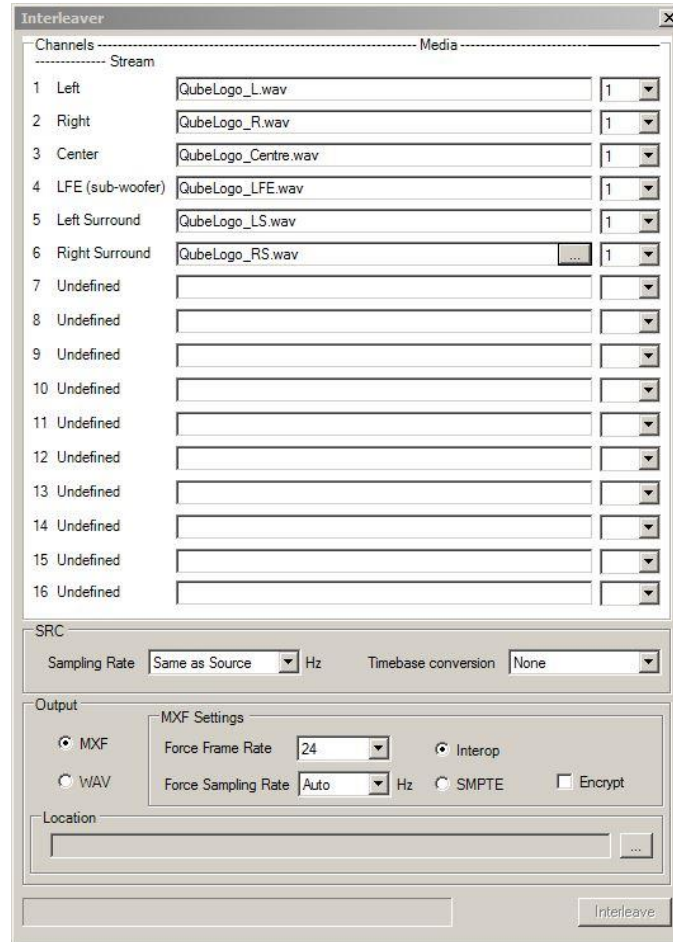
- ▶ Left Eye and Right Eye image sequences in separate folders
 - Use the new “Stereoscopic Image Sequence” option
 - Point to the first and last files of the Left and Right eye image sequence
- ▶ Left Eye and Right Eye image sequences in a single folder
 - Use the new “Image Sequence” option
 - Point to the first and last files of the combined image sequence
 - Specify the frame-rate as 48fps

Creating Track files from Stereoscopic Video Files

- ▶ 3D Interleaved video file at 48fps (Left Eye and Right Eye interleaved)
 - Use the “New Track file” option.
- ▶ Two separate video files (Left Eye and Right Eye separate)
 - First “break-up” each individual mov file into a sequence of “j2c” files using the “raw essence” option in the encoder window. Be sure to set the bit-rate as 125Mbps (discussed in the ENCODING section).
 - After the mov files have been converted to sequences of “j2c” files, use the new “stereoscopic image sequence” option to select each eye’s image sequence separately.
 - Wrap this into an mxf without re-compressing by deselecting the “Compress” option in the encoder window.

Audio Track Files

- ▶ For multiple mono files
 - Create a track file using the “multi file audio source” option
 - Multiple mono audio files can be interleaved into the required multi-channel mxf using the “Interleaver” window which opens.



- Specify the audio file for each channel and also specify the “stream numbering” from 1 to 6.
 - Select a destination folder for the resultant mxf file.
 - Click “Interleave” to create the audio mxf file.
 - Digital Cinema supports 16 channels of audio. Channel mapping for additional audio formats - 8 channel audio, channel specifications for Visually impaired and hearing impaired audio, D-box audio etc., are described in Appendix B
- For multi-channel interleaved audio files with the correct channel mapping
- Create a track file using the “New Track File” option
- For multi-channel interleaved audio files with incorrect channel mapping
- Create a track file using the “New Multi-file audio Source” option
 - Select the same audio file for all channels
 - Re-map the channels by specifying the “Stream numbers” so if the Left Channel is currently on Stream 5, specify 5 next to the Left

Create Subtitle Track Files

- ▶ For DCI compliant Cine-canvas xml or mxf files use the “New track file” option
 - ▶ To CONVERT a .txt/asc file (in the prescribed format) into a Cine-canvas xml in QubeMaster Pro, use the “New Subtitle” option.
- This method is discussed in detail in Appendix C of the user manual.

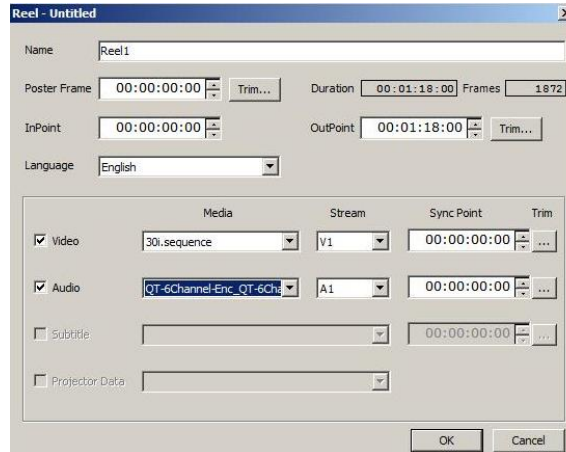
Create Reels

Combine relevant Video, Audio and subtitle track files together to create reels.

- ▶ Right-click and select “New Reel”



- ▶ Select the individual Image, sound and subtitle assets using the drop-down menu.



Tip:

Alternatively the image, audio and subtitle track files may be selected together and dragged into the Reels pane.

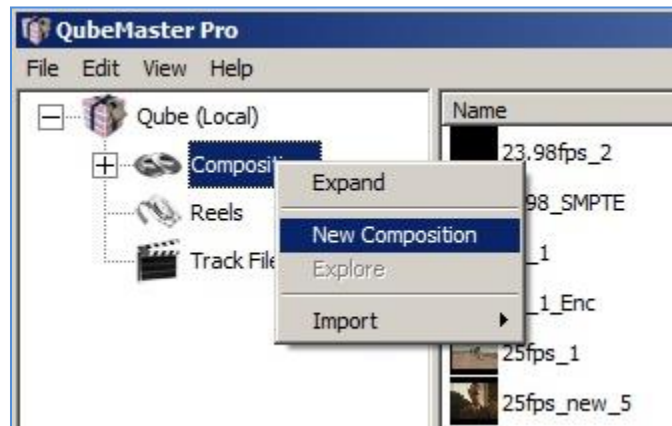
The Reel window will be opened with these assets automatically selected

- ▶ Name the Reel.
- ▶ Use the “InPoint” and “OutPoint” points to trim the reel.
- ▶ Use the “Sync point” options to individually trim only image or sound (for example, to remove leaders)
- ▶ **IMPORTANT**
While trimming a 3D file, care must be taken to ensure that L and R frames are trimmed together, so for every one frame that needs to be removed, 2 physical frames (L and R) will be trimmed.
WMPPro ensures that trimming is always performed starting with the L frame only.
- ▶ Sync points should not be added for subtitles – except to check for sync, after which sync points removed from the Trim window and individual subtitles should be edited in the subtitling software
- ▶ Create single or multiple reels as required.

Create Compositions

Combine multiple reels to create a composition (to encode all the reels together) or create a single reel composition (to encode each reel individually).

- Right-click on Composition and select “New Composition”.



Tip:

Alternatively, select all the Reels associated with a composition and then drag-and-drop them into the Composition pane.

A new Composition will be automatically created with

- Select the composition parameters and specify:

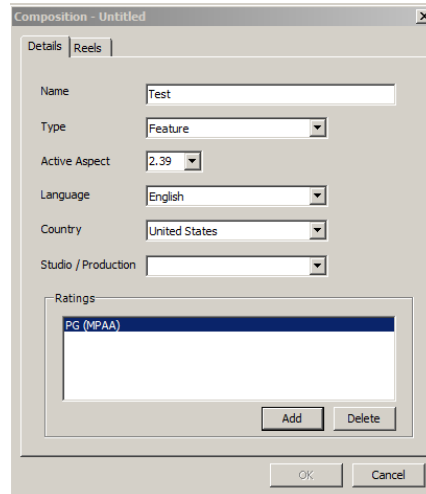
Composition Type

Language

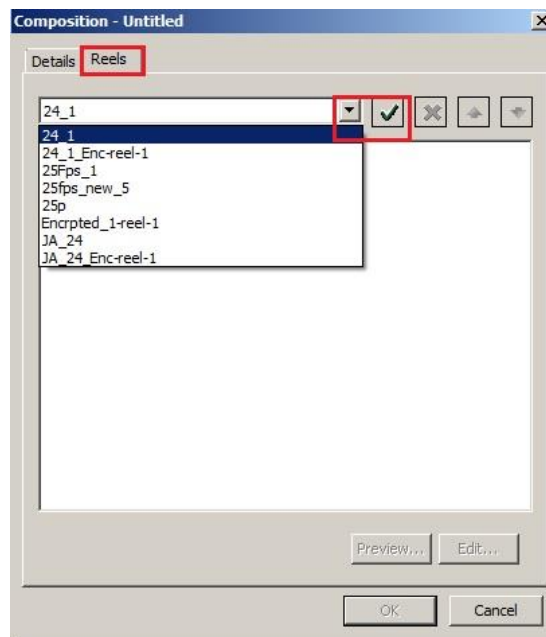
Studio

Rating

Aspect Ratio



- Click on the Reels tab and select all the reels for this composition.

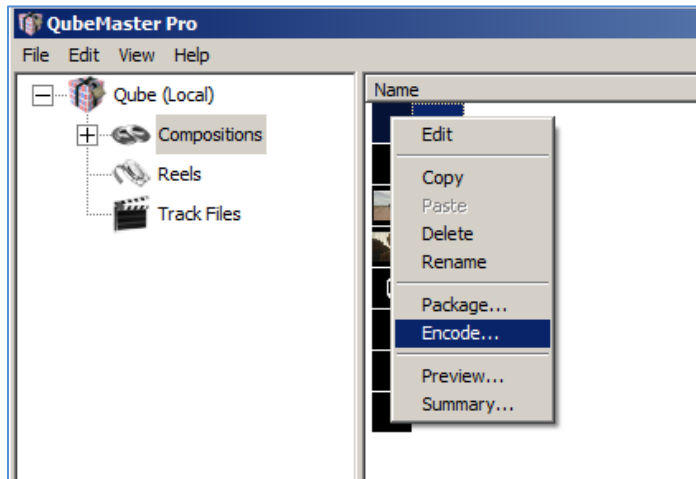


Encode compositions

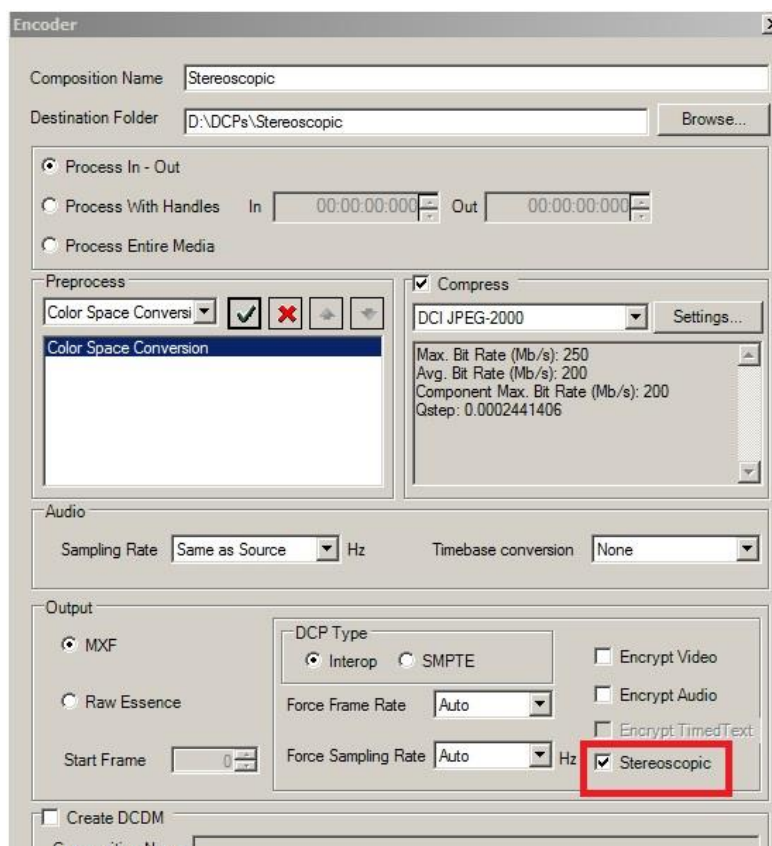
Encoding converts the source file into a DCI compliant Jpeg2000 mxf file. Before you begin encoding, it is important to know whether you require an INTER-OP DCP or a SMPTE DCP. Please read Appendix A to know more about these formats.

- Right-click the source composition and select the “Encode” option.

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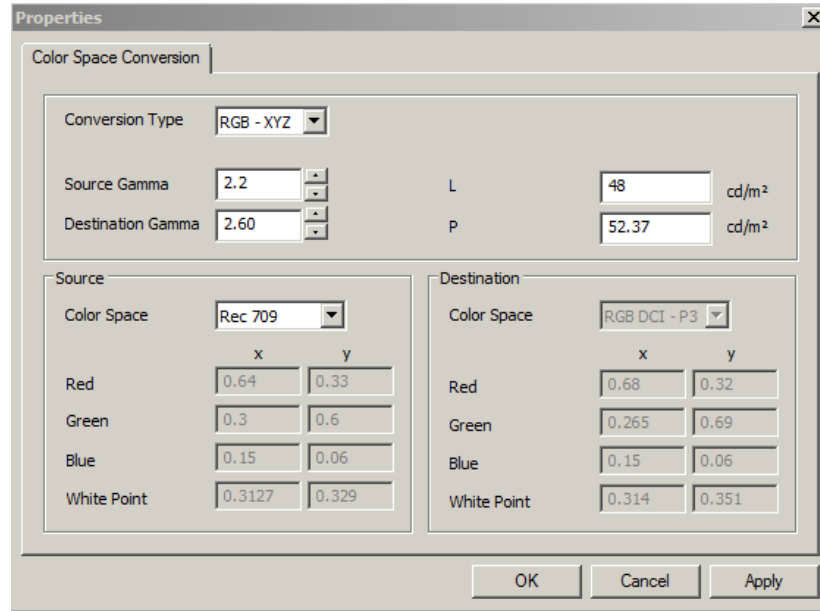


- Select the “STEREOSCOPIC” option in the Encoder window. This is VERY IMPORTANT for Stereoscopic DCPs.

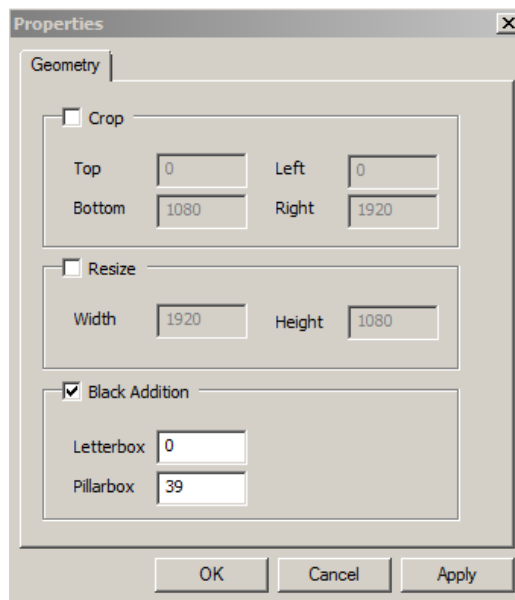


- In the Encoder window, enter a name for the new encoded composition. This name will be retained in the final DCP, so ensure that the naming is succinct.

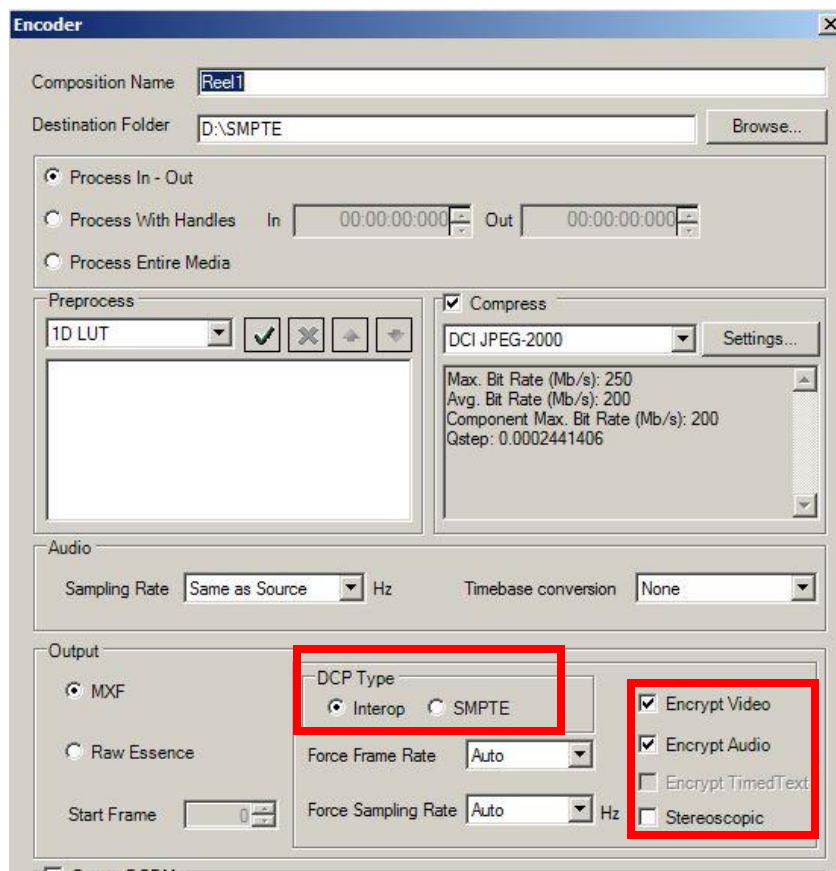
- ▶ Select a destination folder for the encoded files (this will also be the folder for the final DCP, so ensure that there is sufficient space on the drive)
- ▶ The “Process Media” is by default set to only encode those regions within the Inpoint and Outpoints specified in the Reel Trim window.
 - “Process With Handles” encodes a few additional seconds or frames (as specified) before the inpoint and after the outpoint (“handles”).
 - “Process Entire Media” will result in the all the frames being encoded, even those outside the “trim” selections. It is to be used in cases where the entire source media file needs to be encoded irrespective of the in and out points specified.
- ▶ By default the “Compress” option is selected and set to DCI Jpeg2000 to convert the source file format into the Jpeg2000 mxf format.
- ▶ If the image needs colour-space conversion and/or aspect ratio conversion, select the appropriate filters from the “Pre-Process” drop-down menu.
 - **Colour-space conversion**
 - Digital Cinema Packages need to be in the XYZ colour-space
If the source is RGB then apply the ColourSpace Conversion filter to convert it to XYZ:
 - To convert RGB sources to XYZ
 - Select RGB-XYZ
 - Select Source Colour-space as RGB Rec709
 - Source Gamma for RGB is normally 2.2
 - Destination gamma is 2.6
 - For a full description of each of the colour-correction pre-processor filters please see the section on Pre-processing filters.



- **Geometry**
 - ▶ Digital Cinema Packages should be in the following Aspect Ratios
 - 2K - 2048x858 (Scope) OR 1998x1080 (Flat)
 - 4K - 4096x1716 (Scope) OR 3996x2160 (Flat)
 - ▶ Use the options in the Geometry filter to change the aspect ratio
 - PAD - to pad black as Pillarbox or Letterbox
 - RESIZE - to scale
 - CROP - to Crop
 - ▶ For HD source at 1920x1080
 - Convert to FLAT – 1998x1080
 - By Padding 39 pixels of Black in Pillarbox



- For a full description of each of the Geometry pre-processor filter please see the section on Pre-processing filters.
- **After** applying the necessary filters, click on “Settings” to set the data-rate for the specific Encode:
 - Set the data-rate to:
 - Between 150 and 180 Mbits for low quality
 - Between 180 and 200 Mbits for medium quality
 - Between 200 and 250 Mbits for good quality
 - 250Mbits is the maximum bit-rate supported for playback on DCI compliant playback devices
 - Higher bit-rates can be chosen for archival purposes.
 - Check to see if the aspect ratio displayed here is correct – else make changes to the Geometry filter to achieve the correct aspect.
- By default the “Encrypt” option is selected, to perform the encryption in the same step as encoding. This can be deselected if Encryption is to be done as a separate step later.



- **INTER-OP and SMPTE DCP Formats**

Digital cinema standards have evolved over time and as a consequence the specifications for a DCI COMPLIANT DCP have changed from the first “Mpeg MXF INTER-OP” to the current “JPEG2000 MXF INTER-OP” and now to the specifications of the new SMPTE standard which is being implemented.

QubeMaster Pro can create DCPs in the older Jpeg2000 MXF INTER-OP standard (referred to, in short as INTER-OP DCPS) and in the new SMPTE Standard (referred to as SMPTE DCPs).

According to DCI specifications all Jpeg2000 DCPs INTER-OP and SMPTE DCPs should conform to the following:

- ▶ Aspect Ratio:
 - 2K - 2048x858 (Scope) OR 1998x1080 (Flat)
 - 4K - 4096x1716 (Scope) OR 3996x2160 (Flat)
- ▶ Colour-space
XYZ colour
- ▶ Frame-rate for 3D DCPs
 - 48 (24fps per eye) for Jpeg2000 Inter-op DCPs
 - 48 (24fps per eye), 96 (48fps per eye) or 120fps (60fps per eye) for **3D** SMPTE DCPs.

One big difference between INTER-OP and SMPTE DCPs is the support for different frame-rates (including High Frame Rate – HFR DCPs). Frame-rates above 48fps are referred to as **HFR** or High Frame Rate.

However, not all servers support all the above frame-rates. Please check with the server manufacturer’s specification before dispatching DCPs at frame-rates other than 48fps 3D.
- ▶ Audio
 - 6 channel audio - mapped in the order L, R, C, Lfe, Ls, Rs
Additional channel configurations are currently not possible in QubeMaster Pro
 - 48Khz or 96Khz audio sample rate
 - 24bit
- ▶ It is recommended that all reels in a composition must be “technically” identical.
 - Bit depth and sample rate and stereo/surround must match for all the audio in a composition.
 - Aspect ratio must match for all video content
 - Compression data-rate must be the same
 - It is recommended that all reels have the SAME contents – meaning that if one reel has subtitles then all reels should include subtitles – even if it is Blank. Similarly it is best that all reels must have audio – even blank audio.

- All of the above parameters must be set correctly during the encoding process using the various pre-processing filters in QMPro.
-
- ▶ If reels were being encoded separately, combine multiple reels together to create the FINAL composition.
 - ▶ Frame-rate conversions from 24 to 25 or 25 to 24 or 23.98 to 24 can be performed using the “Force Frame-rate” option.
 - ▶ If image frame-rate are being converted, then similar adjustments need to be performed on the audio as well – using the Sample-rate and Timebase conversion options.
 - ▶ A DCDM (tiff sequence) can be additionally created for archival purposes
 - ▶ J2C sequences, without the mxf wrapper, can also be generated by selecting the Raw essence option.

Package a Composition to create a DCP

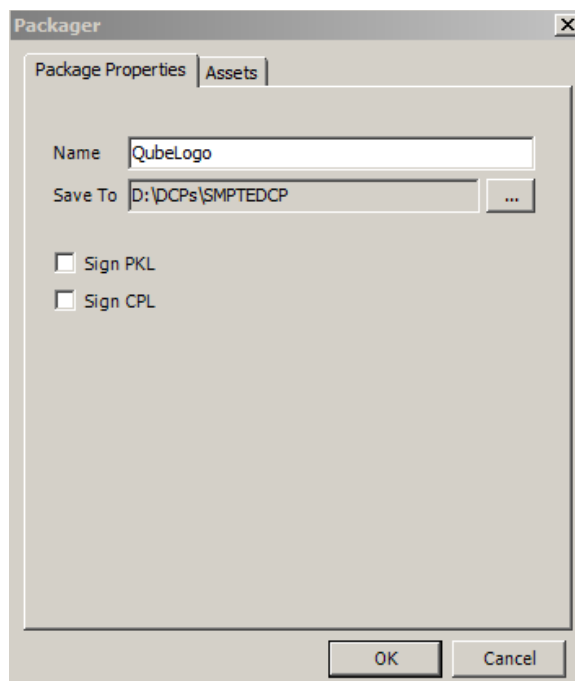
During the Packaging process a Digital Cinema Package is created which contains all of the encoded track files (in the mxf format) along with five metadata files

- **Cpl – composition play list (.xml file).** The Composition Playlist (CPL) defines the sequence in which the reels in a movie are played. It also refers the “in” frame and the duration of frames to be played within a track file as specified in the TRIM window.
The CPL also contains information about the number of reels, aspect ratio, duration, sync info etc. The CPL is signed and has a “hash” which is the same as that in the pkl so it must not be edited.
 - **Asset map(xml) – List of assets that are part of the DCP.** uuid for each track file and its path
 - **Pkl – packaging list (.xml)** The Packing List defines all elements/files within a DCP.
 - **Volindex (xml) –** identifies the HDD vol. if assets are spread across multiple drives.
 - Image, audio and subtitle mxfs (for SMPTE DCPs)
 - For INTER-OP DCPs, subtitles (if any) are in a separate folder along with the font file (one folder for each reel).
-
- ▶ Right-click on the Encoded Composition and select “Package.

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- Multiple Compositions can be packaged into a single DCP by “SHIFT-SELECTING” the different compositions and then choosing “Package”. DCPs with multiple compositions will contain only a single PKL but will have multiple CPLs (depending on the number of compositions chosen)

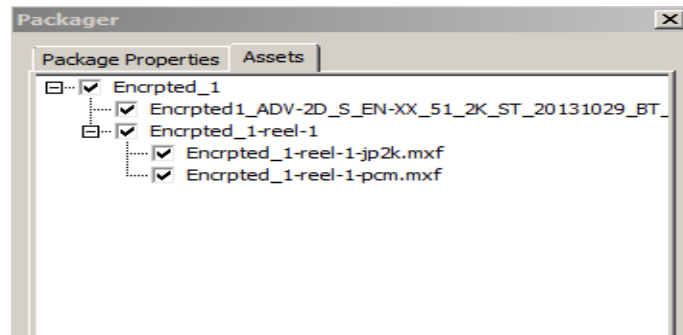


- Select a folder to which the DCP will be saved.
 - The SAME folder that contains the mxf files can be chosen.
If the destination folder is on the same drive as the encoded files, a “HARDLINK” will be created instead of an actual file copy

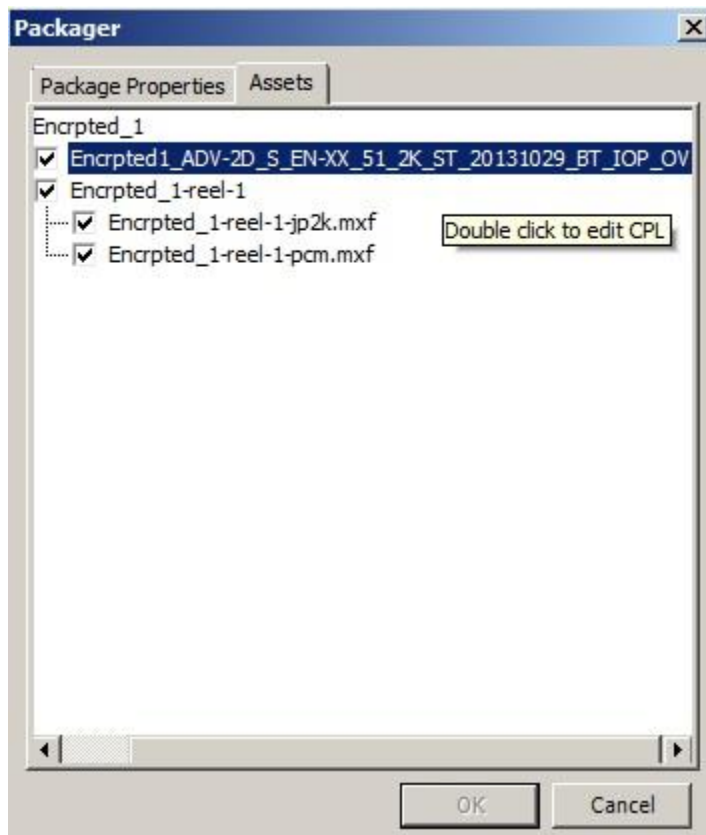
QubeMaster Pro

In both these cases, the copying process is much faster.

- ▶ Sign the PKL and CPL files only if the composition is Encrypted – else it is not imperative to select the “Sign CPL/PKL option”
- ▶ All the files for the DCP will be created in the specified location
- ▶ Click the “Assets” tab and expand the to check if the correct assets are being packaged.



- ▶ The CPL file is named following the DCI naming convention – but can be manually edited if necessary by double-clicking the CPL name.



- Click “OK” to package. Packaging will take some time the first time a composition is packaged, since the “HASHES” for all files have to be calculated and stored. Subsequent packaging (if necessary) will be much faster.
In any case, no files will be re-copied, only a HARD-LINKS will be created whenever a package is created onto the SAME DRIVE as the encoded files.

GENERATE KDMs

If a Composition is Encrypted, the media assets will be locked and require decryption keys to unlock them. Each encrypted mxf file has a separate key.

To playback an encrypted DCP on any playback device or server, these decryption keys need to be sent to the device via a KDM (Key Delivery Message) carrying these keys.

IMPORTANT NOTE:

- The KDM is specific for a composition.
- Two compositions cannot share a KDM even if they contain the SAME mxf files.
- KDMs can be generated only after a Composition has been PACKAGED.
- If a Composition has been packaged twice - Each packaged composition must have a separate KDM which contains the CPL UUID and will unlock the assets only for that composition.

- Before generating a KDM the following are necessary:
 - The digital certificate for the server. This is also called a “receiver certificate”, and is unique for each playback device.
 - The Certificate chain (Root and Intermediate certificates) for the server model must be available in the windows Certificate Manager.
 - If an error appears stating “Signer certificate does not terminate in a Root Certificate”, this indicates that the certificate chain is not installed.
 - To install a certificate chain please refer the section “Installing Certificate Chains”

- ▶ To generate a KDM, right-click the ENCRYPTED/PACKAGED composition
 - *(Note: if the composition is not encrypted and/or packaged, the “Generate KDM” option will not be available).*

- ▶ KDMs can be generated either for one certificate at a time or for multiple certificates placed within a folder (one level of subfolders)

- ▶ Validity period for a KDM can be specified in hours, days. Months and years.

- ▶ There is an option to disable or enable Watermarking. This is done by deselecting the watermarking options. In this case a flag is sent in the KDM requesting the playback device to disable the watermark on playback.
 - Watermarking must be disabled only on the specific request of the content producer.

- ▶ The status of the KDM generation process is updated in the “Status” window.

Generate KDM

Time Window

Start Time

Wed, 30 Oct 2013 1:00:19 PM

Stop Time

Fri , 29 Nov 2013 1:00:19 PM

Package Name

10/24/2013 5:12:42 PM : 2

Recipient Certificate (DER/PEM)

☒ Create a KDM

☐ Create multiple KDMs

QXI-00082-12-12(SHA256)

Output Folder

D:\KDM

...

Kdm Status

Watermark Flags

☒ Watermark Picture

☒ Watermark Sound

Generate

Close

Installing Certificate Chains

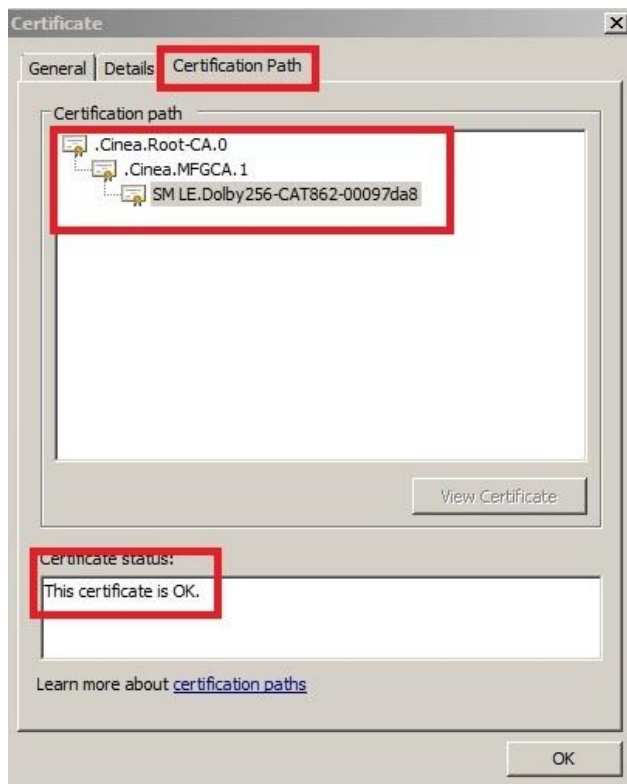
KDMs are generated for a server's "leaf" or "receiver" certificate. The "leaf" or receiver certificate is part of a CHAIN which contains a ROOT certificate, one or more INTERMEDIATE certificates and a Leaf certificate.

The root and intermediate certificates are common to all servers from a specific manufacturer for a specific server version and type, so this process of importing root and intermediate certificates needs be performed only once for a specific server type.

Some manufacturer's certificate chains have already been added to the host system's certificate store during the installation of QMPro version 2.5, but chains for new server models will need to be imported to continuously update the certificate store.

How to Identify if a Chain Has Been Installed

- ▶ Rename the file **extension** for the receiver certificate from ".pem" to ".crt".
- ▶ Double-click and open the certificate file.
- ▶ Click on "Certification Path" tab. If the certificate chain is installed correctly, the certificates in the chain will be visible (as below):



- If the chain is not installed there will be a warning symbol next to the certificate (as below):



- In this case, the manufacturer's Certificate chains containing the – root, intermediate and leaf certificates need to be procured from individual manufacturers and then installed in windows certificate manager.

UNCHAINING CERTIFICATE CHAINS

If a new certificate chain needs to be installed - the certificate chain must first be “unchained”, the root and intermediate certificates identified and then imported installed in the Windows certificate store.

- There are two ways to unchain a certificate chain
 - Using Notepad
 - Using the tool “Unchain.exe”

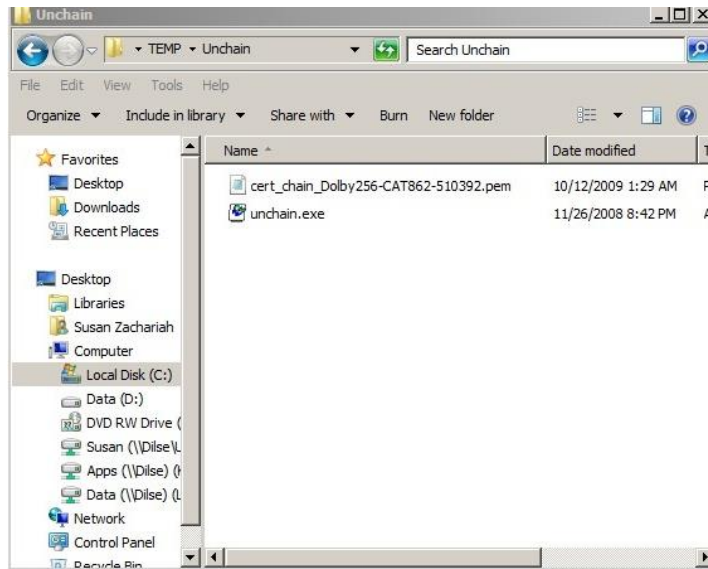
- **Unchaining Using Notepad**

- Open the certificate chain in Notepad.
- Enable “Word Wrap”
- If it is indeed a chain, it must display three or more “paragraphs” beginning with the text “BEGIN CERTIFICATE” preceded by 5 hyphens and “END CERTIFICATE” followed by 5 hyphens.
- Copy paste each of these paragraphs (INCLUDING the hyphens) into a new note-pad file Name each notepad file (use any name - it does not matter)
- Rename the “.txt” extension to “.crt”.
- The chain is now ready to be installed

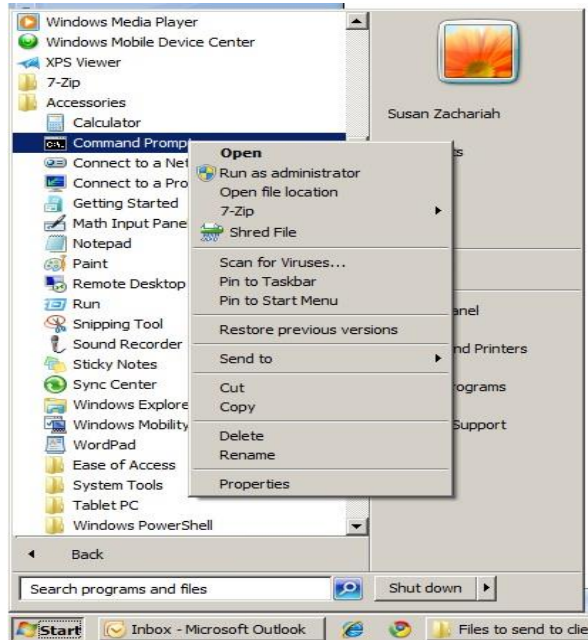
- **USING UNCHAIN.EXE**

“Unchain.exe” is included in the utilities folder of the QubeMaster pro installer.

- Copy “Unchain.exe” and the certificate chain to a folder. Say c:\temp\unchain.



- Run “Unchain.exe” from the COMMAND prompt.
 - Click on the START menu, select “All Programs>Accessories” folder.
 - RIGHT-CLICK on the Command Prompt icon and choose **“RUN AS ADMINISTRATOR”**)



- In the command prompt type the path where you have saved “unchain.exe”. In this example you will type: **Cd c:\temp\unchain** and hit “Enter” on the keyboard.
- Now type “unchain.exe” followed by the path where the chain is and the path where you want to save the certificates to after unchaining.

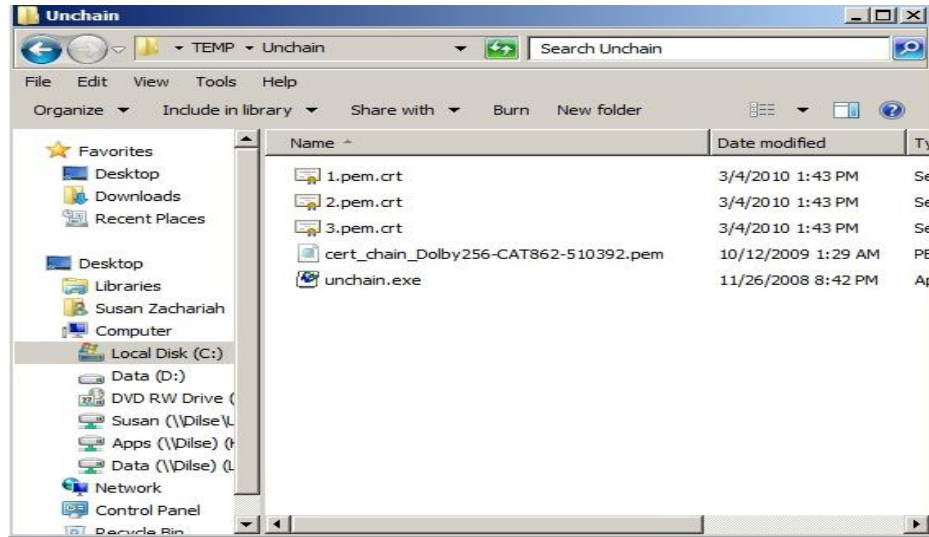
```
Administrator: Command Prompt
Microsoft Windows [Version 6.1.7600]
Copyright (c) 2009 Microsoft Corporation. All rights reserved.

C:\Windows\system32>cd c:\temp\Unchain

c:\TEMP\Unchain>unchain.exe c:\TEMP\Unchain\cert_chain_Dolby256-CAT862-510392.pem
c:\TEMP\Unchain_
```

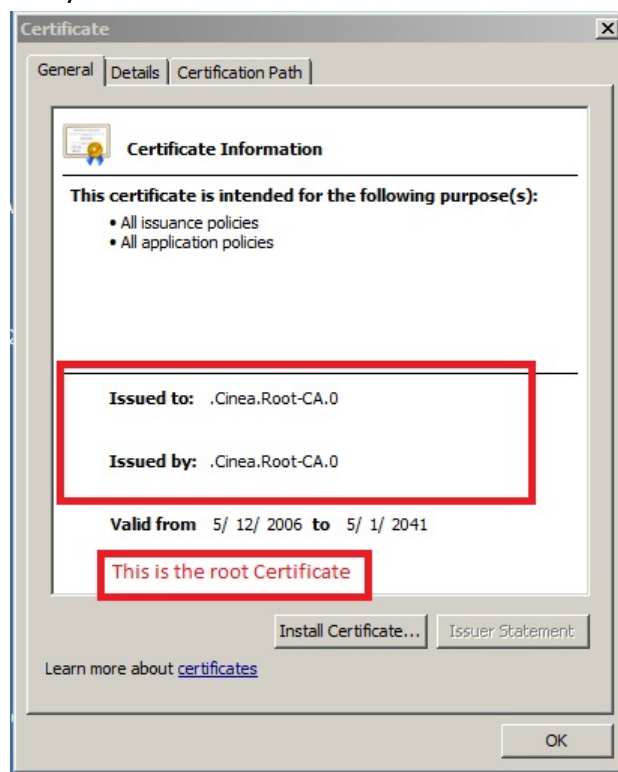
- In the above example **c:\temp\unchain\cert_chain_Dolby256.....pem** is the path pointing to the certificate chain and **c:\temp\unchain** is the path specified for saving the resultant certificates.
- “ENTER” on the keyboard. The tool will execute the “unchain” function and the individual certificates will now be available in the

path specified... (in this case c:\temp\unchain). They will be numbered 1, 2, 3 etc.



IDENTIFYING ROOT AND INTERMEDIATE CERTIFICATES

- ▶ Identify the root and intermediate certificates by following the examples below:
 - A root certificate will normally have the same information in the “Issued to” and “Issued by” fields.

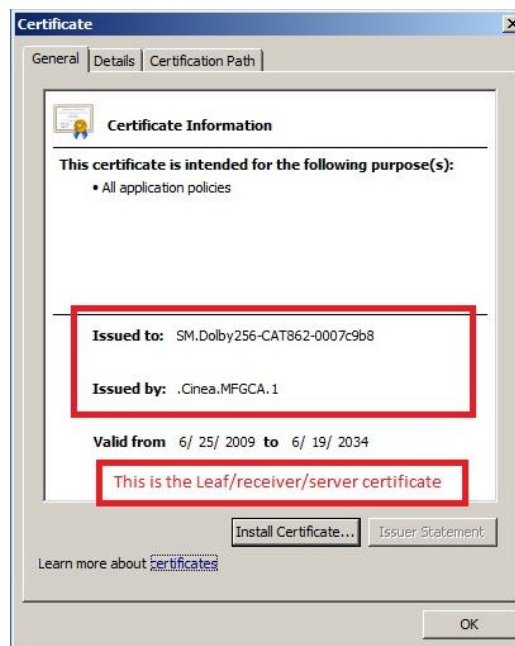


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- An Intermediate certificate will have the Root certificate as the “Issued by” but will have a different “Issued to”



- The “leaf” certificate will have the Intermediate certificate as the “Issued by”

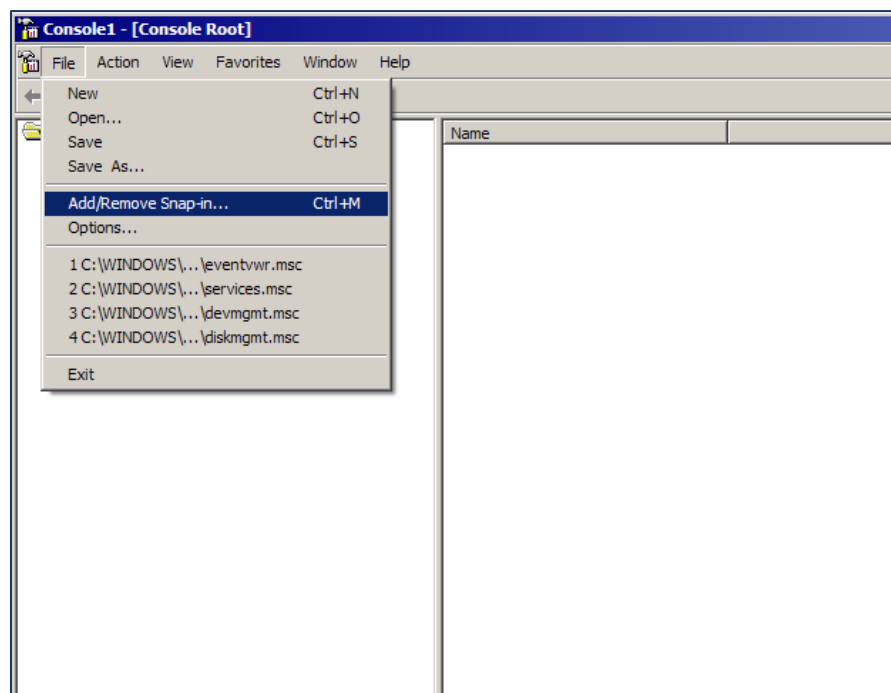


Installing Root and Intermediate Certificates

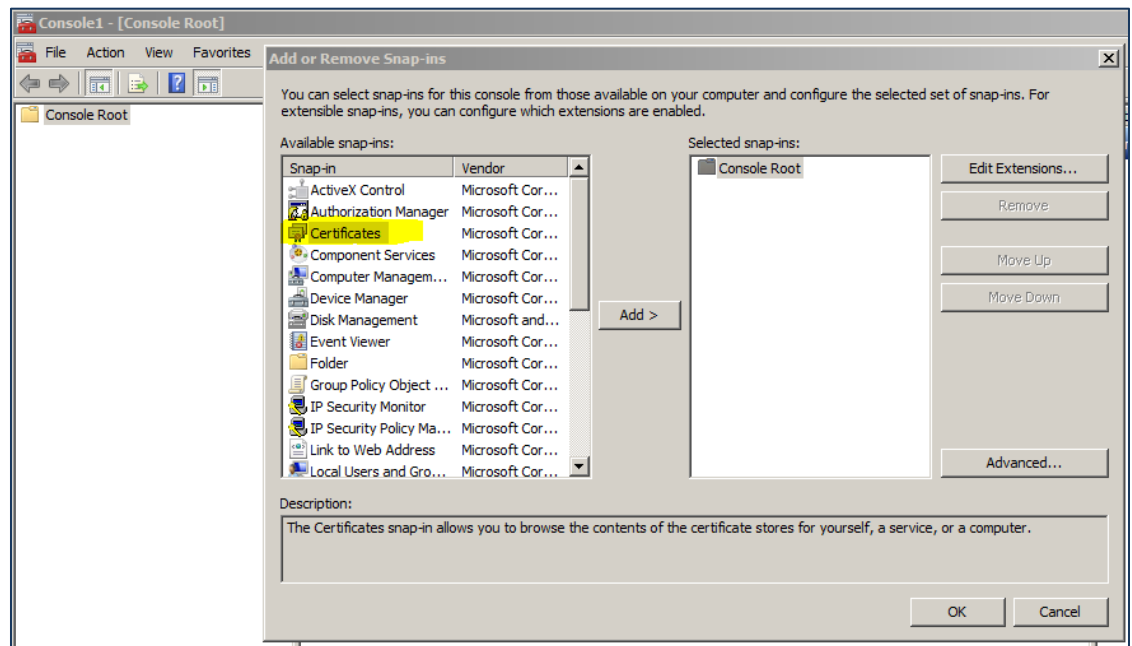
- ▶ Be sure your login has administrator rights.
- ▶ Launch QMPro
- ▶ From the FILE menu, select “Import Certificate Chain”
- ▶ Point to the folder containing the Root and Intermediate certificates and Import them
- ▶ If the QubeMaster Pro system is on a domain network and/or if you are logged-in using network credentials, it is possible that certain security implementations prevent the certificates from being imported correctly.

In this case the chains have to be installed manually:

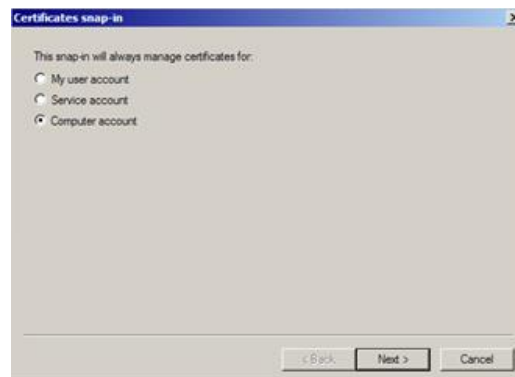
- Click START and in the “search programs” box at the bottom of the pop-up window, type “mmc” and enter.
- A pop-up user account control window will seek additional permission to run the program “Management Console”. Select “Yes”
- In the Console window that opens, Select Add/Remove Snap-in... option from File menu.



- Select “Certificates” from the List and click the ADD button:

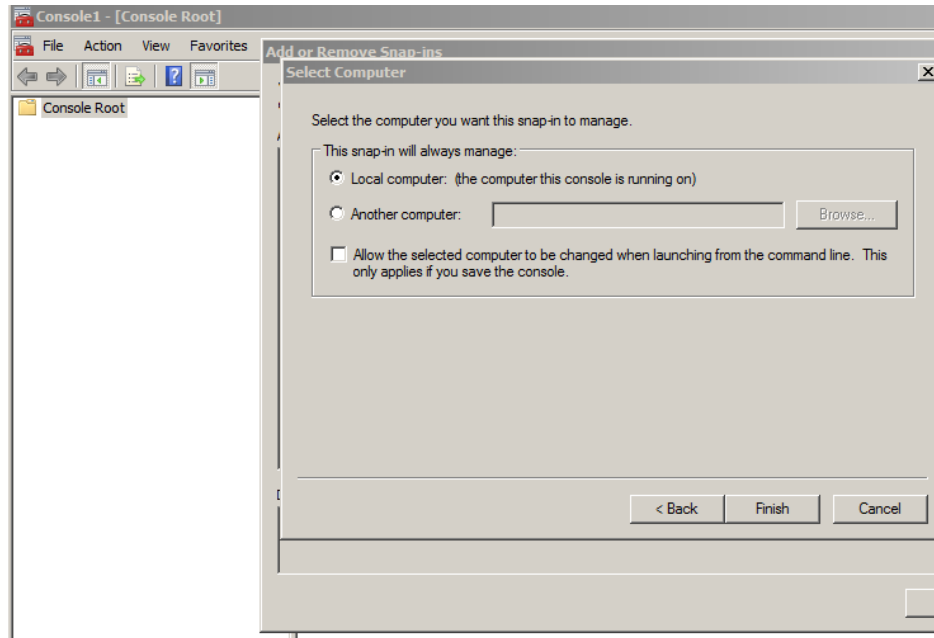


- In the pop-up select “Computer Account”

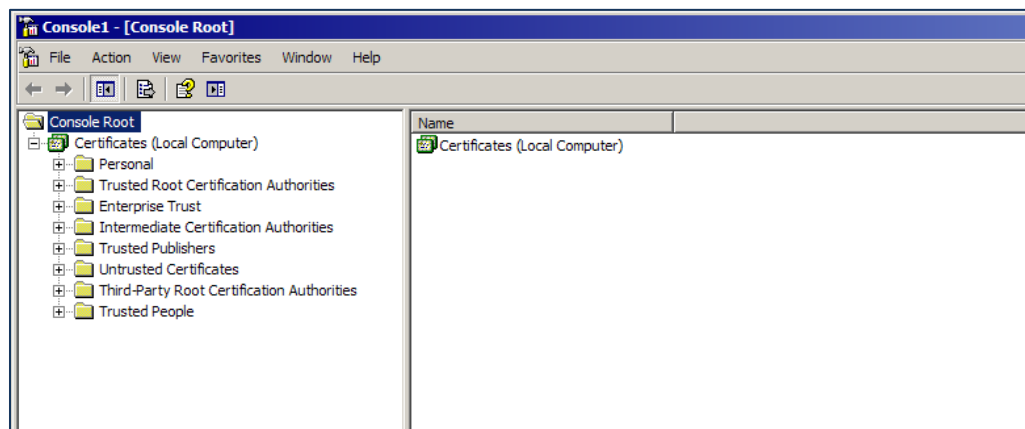
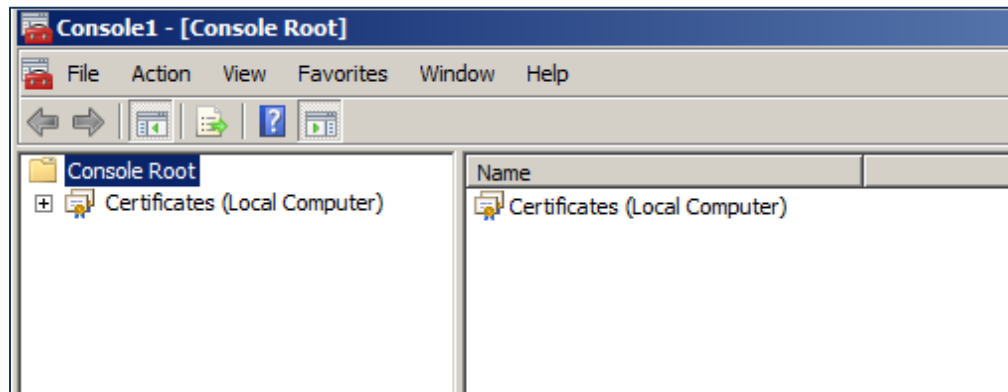


- Select Local computer and click Finish button and “OK” in the page that comes up.

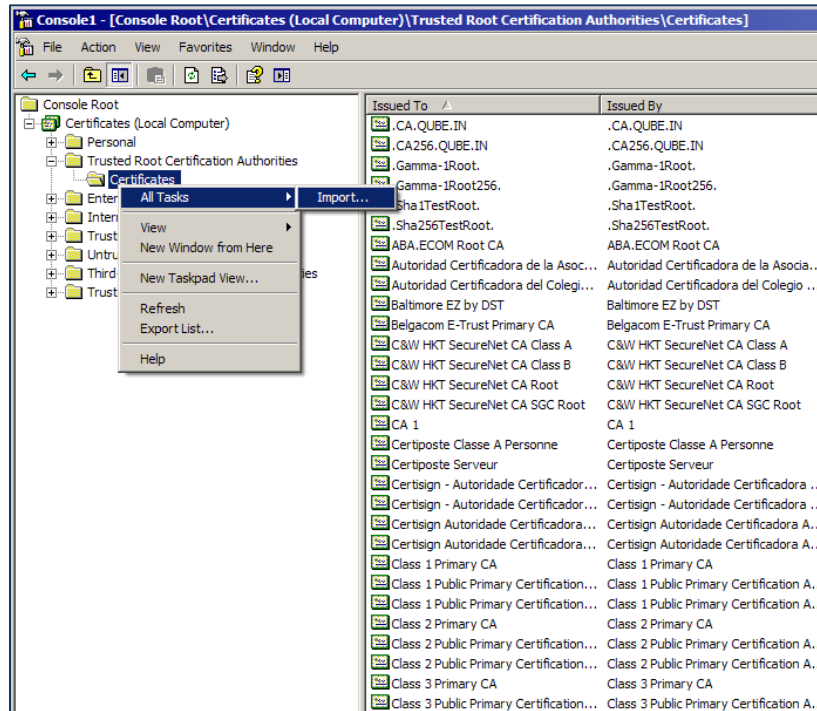
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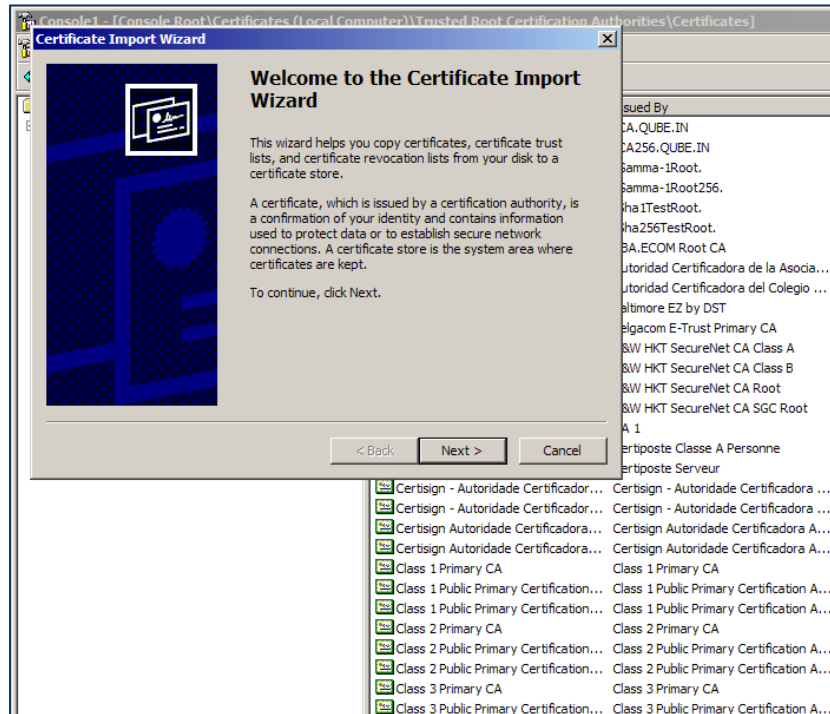
- Now Certificate Manager will be visible as below, expand the list by clicking on the “plus” sign:



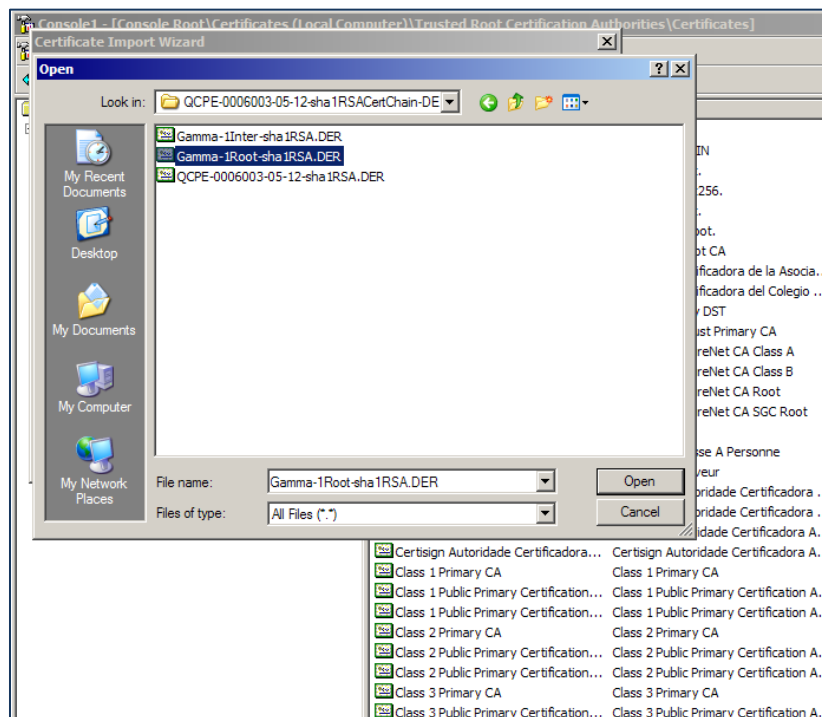
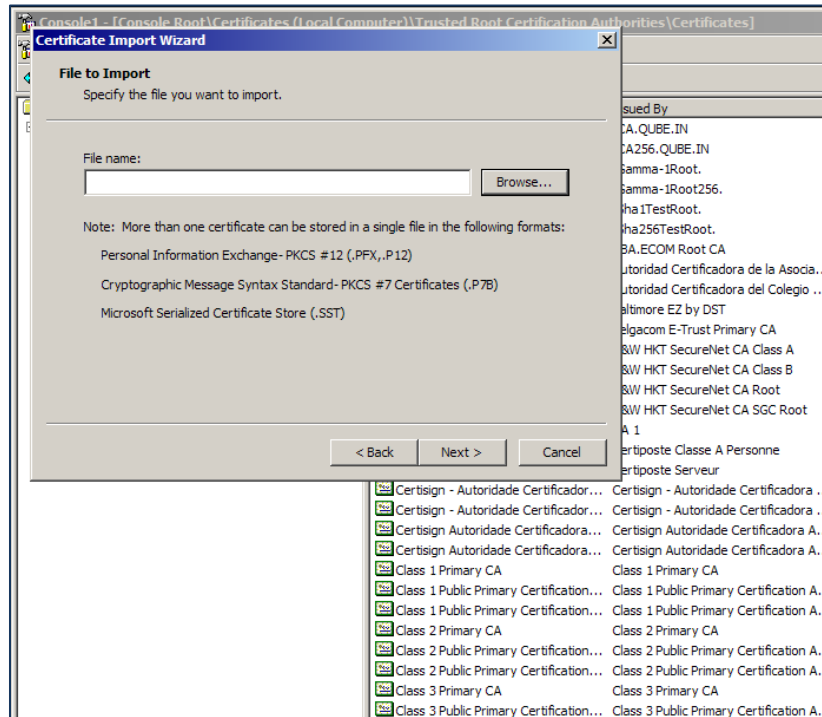
- Select Trusted Root Certification Authorities->Certificates->All Tasks->Import...



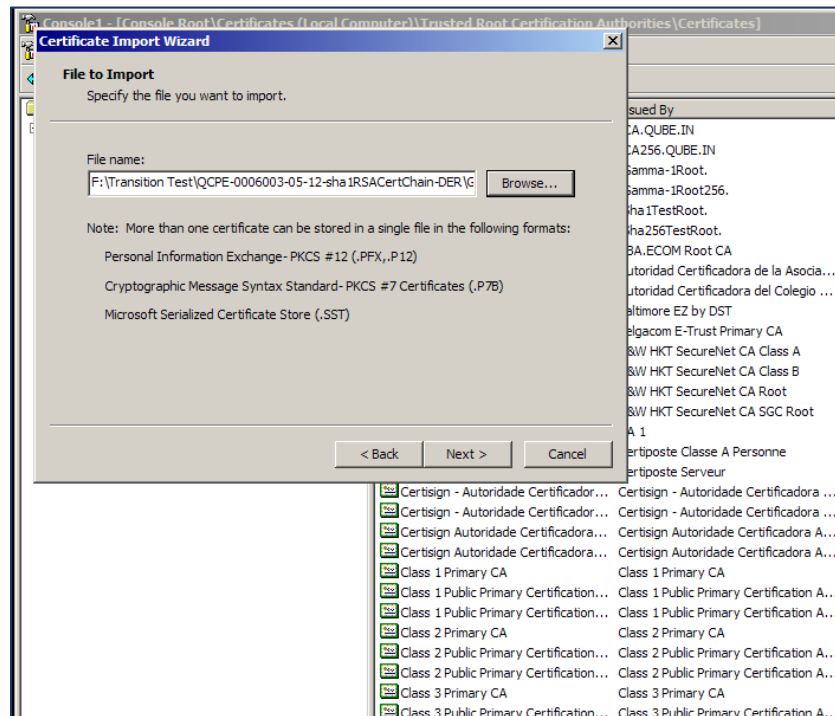
- Click Next button.



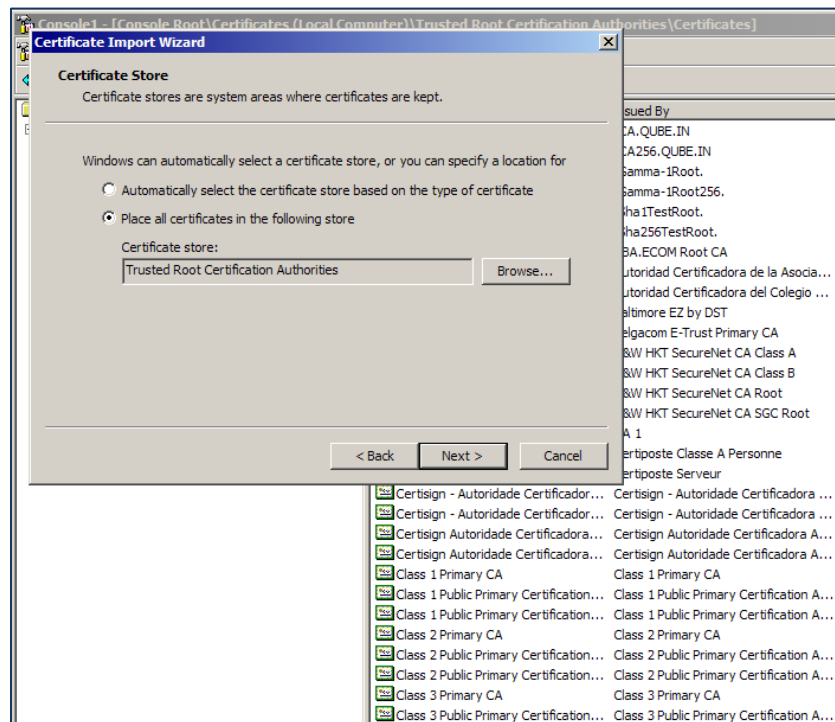
- Browse the path of the Root certificate.



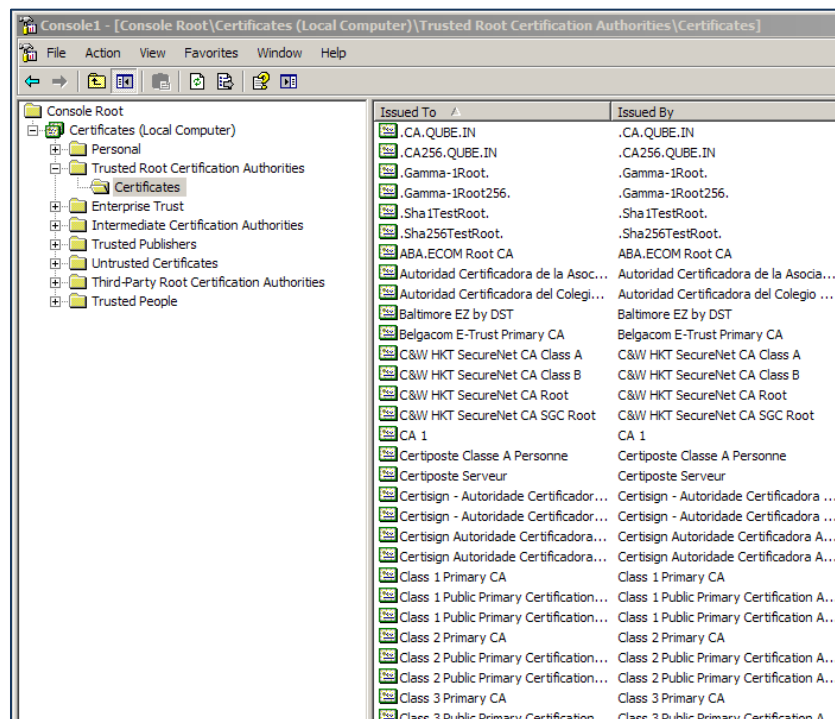
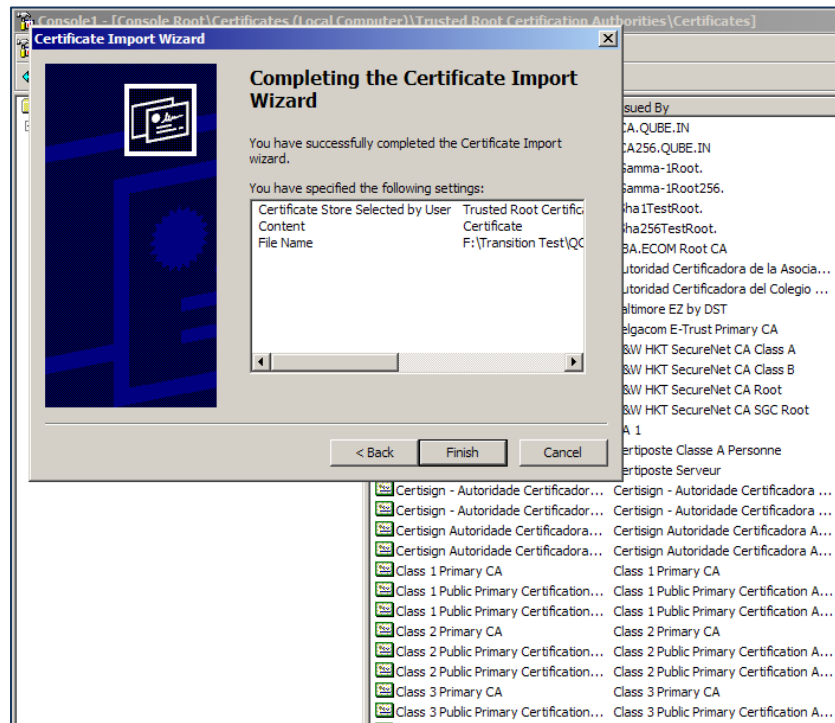
- Click Next button.



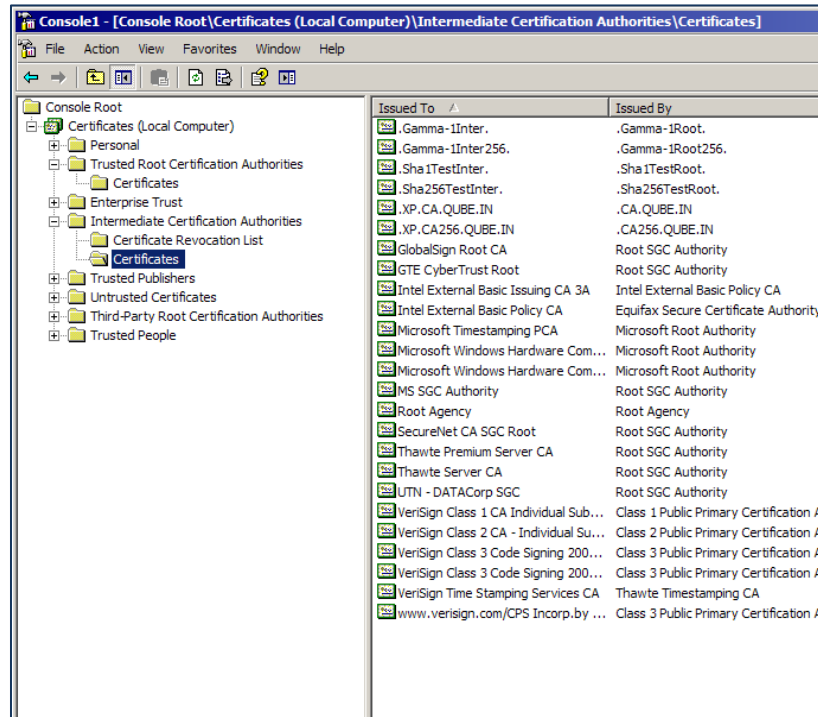
- Click the "Next" button.



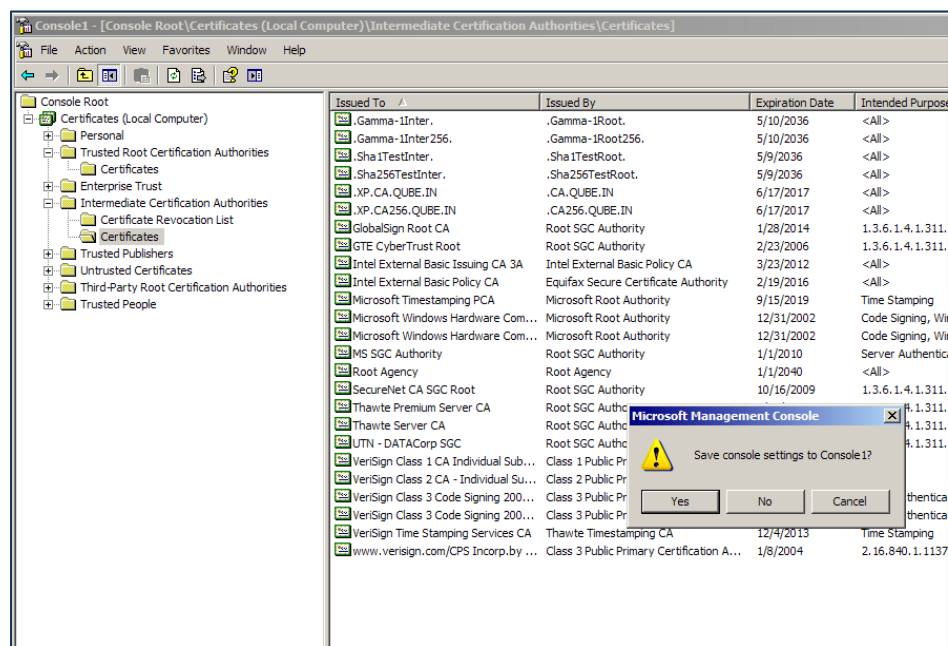
- Click the “Finish” button.



- Repeat steps to upload the intermediate certificate. In the “INTERMEDIATE CERTIFICATES” folder



- Close the Certificate store window, click No button.



Types of Certificates

There are two broad categories of certificates – SHA1 and SHA256.

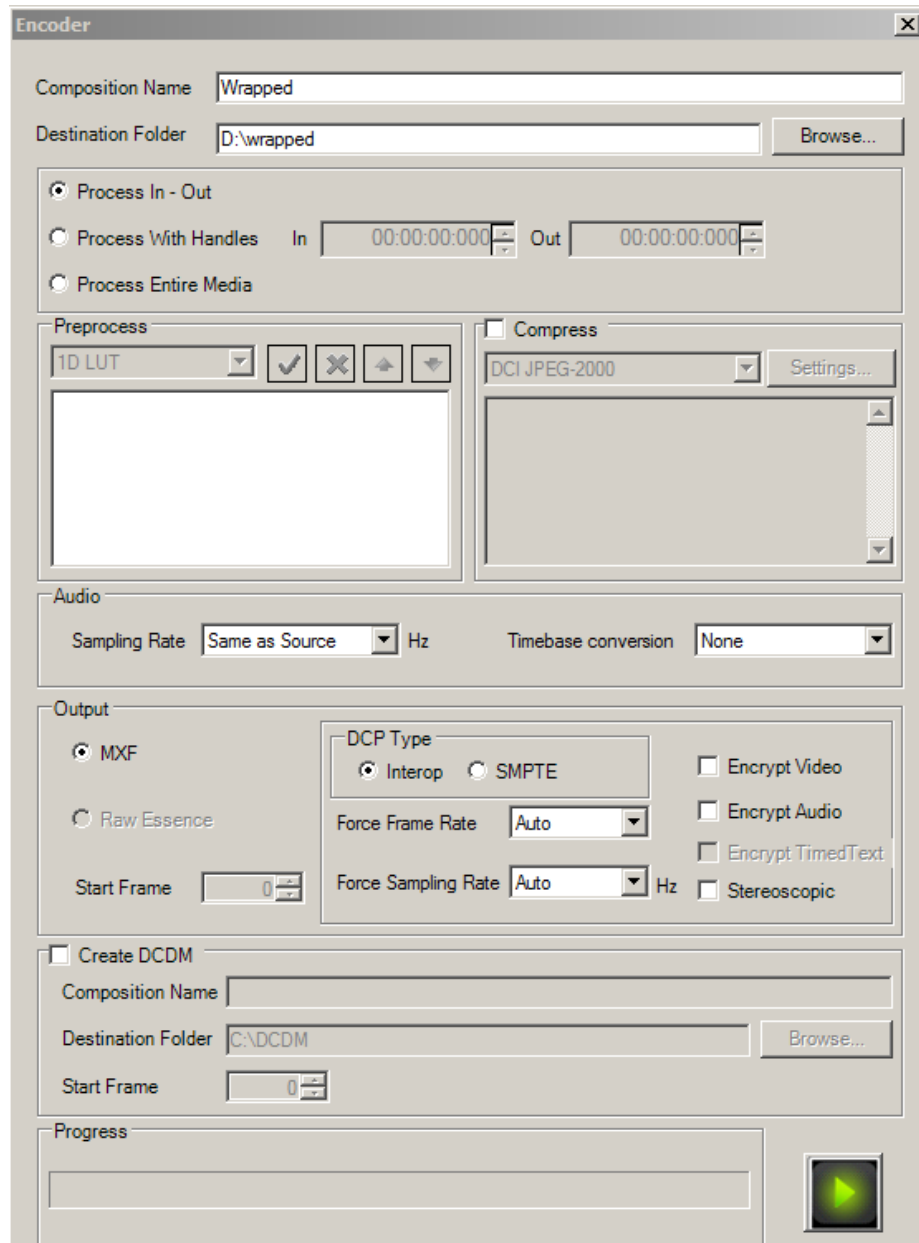
- ▶ SHA1 certificates are the older format certificates and normally only used to generate KDMs for the older format MPEG-Interop DCPs.
- ▶ SHA256 certificates are the new version and are currently used for all Digital Cinema operations including KDM generation for DCI Jpeg2000 DCPs.
- ▶ SMPTE KDMS must use only Sha256 certificates

There are separate chains for Sha1 and Sha256.

WRAPPING

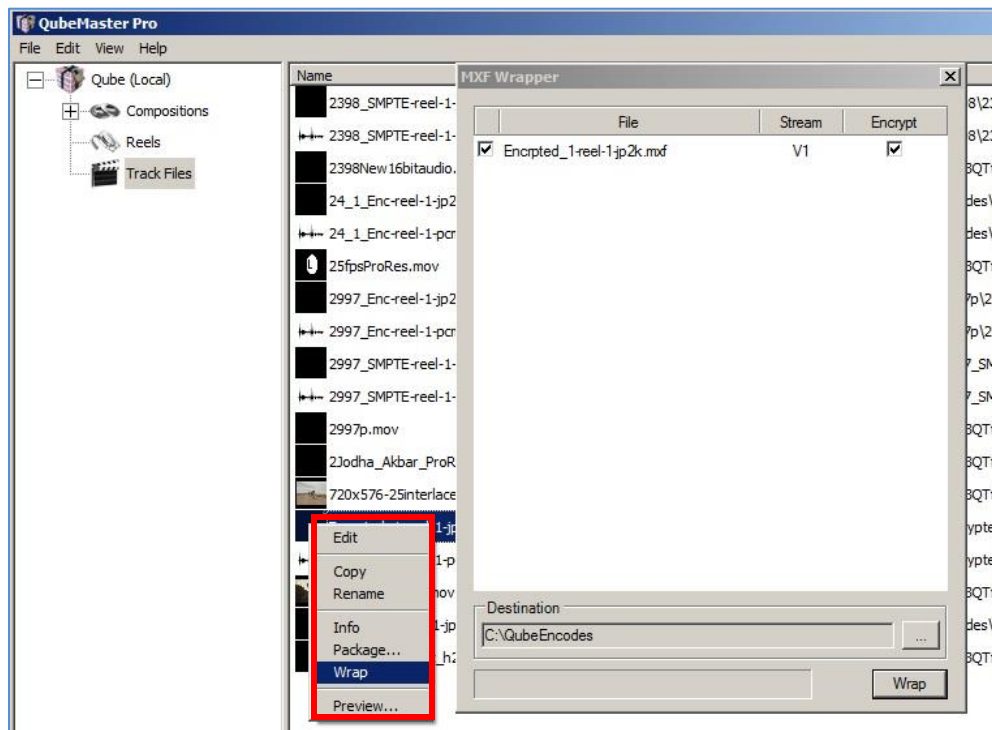
If files are already in the Jpeg2000 format (either as mxfs or as sequences of “j2c” files) then they do not need to be re-encoded (compressed), they only need to be wrapped with a new mxf wrapper.

- ▶ Create track file, reel and composition with the jpeg2000 source
 - ▶ In the Encoder window, deselect the “compress” option.
- The file will be just wrapped and encrypted (not re-encoded).

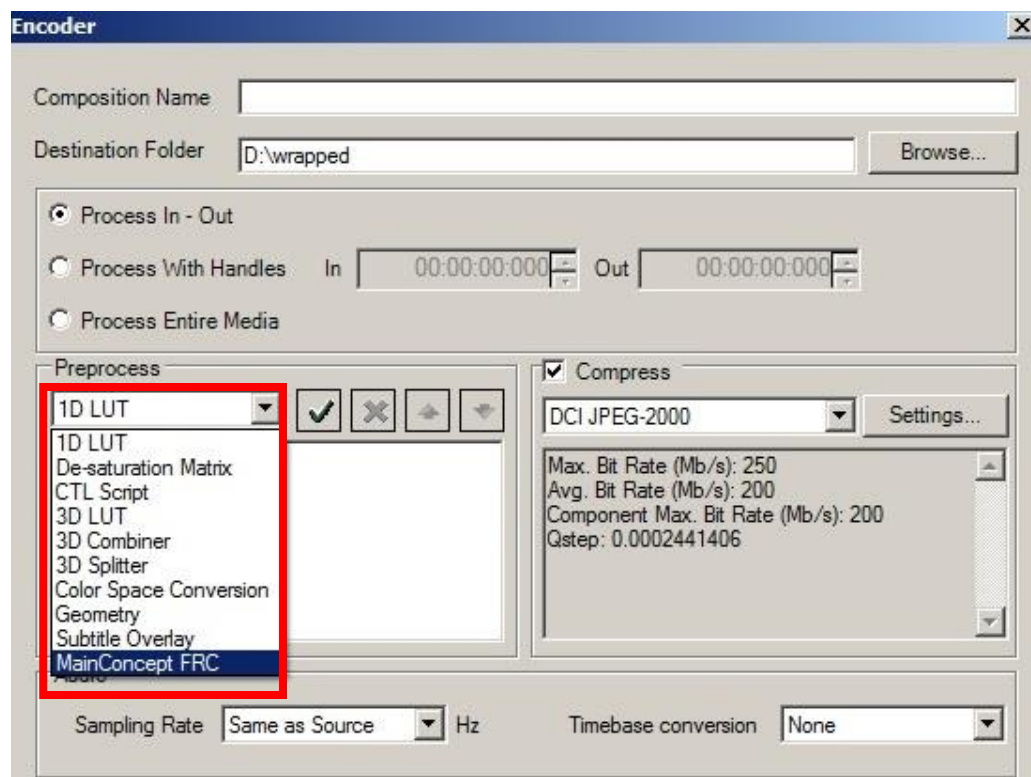


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- Wrapping and Encrypting can ALSO be done at the TRACK level itself, by right-clicking an encoded track file and choosing “Wrap”.



Pre-processing filters



Colour Space Conversion Filters

DCI compliant Jpeg2000 DCPs must be created in the XYZ colour space.

Apply the correct colour-space-conversion (CSC filter)

Or

Apply the correct 3D LUT

When viewing completed DCPs and/or encoded mxfs in the preview and trim windows

Apply the correct “View LUT” to convert the XYZ content into the RGB colour space of the monitor, for viewing.

Colour conversion filters available in QubeMaster Pro:

► **1D LUT** (Look Up Table)

- Converts files in the “Log” colour-space to “Linear”
- Typically used for dpx files from DI – where the original source is film

► **Desaturation Matrix**

- To be used AFTER 1DLUT, if a 1D LUT is applied

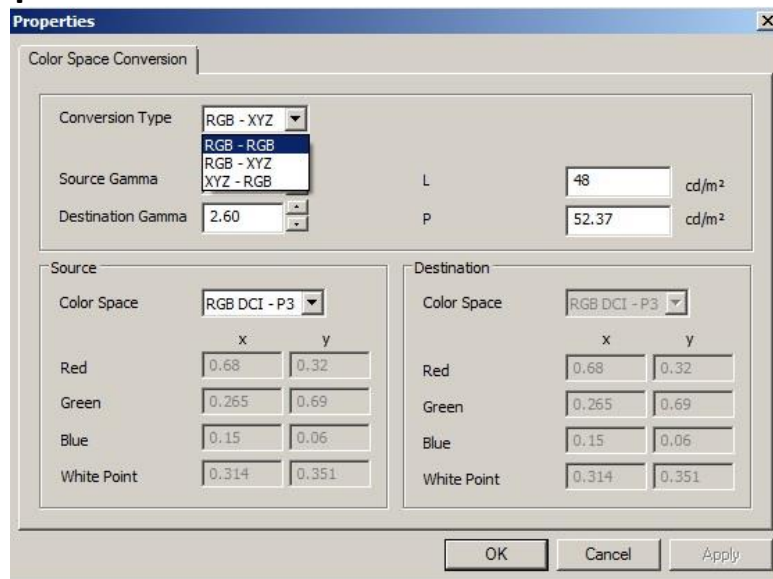
► 3-D LUT (Look Up Table)

- 3D LUTs are used to ensure that colours viewed during the film post-production phase are accurately carried forward to the digital print.
- A few Sample LUTs
 - PrintP3-XYZ
 - Converts from film print colour to XYZ color
 - Assumes that the source is DI LOG
 - PrintP3-709
 - Converts from film print colour to RGB 709
 - Assumes that source is DI LOG
 - XYZ-Rec709
 - Convert from XYZ to RGB Rec 709
 - Can be used as a View LUT in the Preview/Trim window

► CTL script

- To be used if a CTL is being used to perform a 3D LUT manipulation.

► Colour Space Conversion



- RGB-RGB
 - To convert sources in one RGB colourspace to another
 - For example RGB REC709 to RGB DCI P3
- RGB-XYZ
 - To convert RGB sources to XYZ
 - Source can be RGB Rec709
 - Source can be DCI P3
 - Source can be Custom RGB

- Source Gamma for RGB is normally 2.2 and destination gamma is 2.6
- XYZ-RGB
 - To convert from XYZ to RGB

3D Format Converters

To convert different formats of 3D files from one to another:

► **3D combiner**

- To convert a sequence of frame-sequential 3D files into a sequence of side-by-side or over-under format 3D images.
- To create consumer-level low resolution 3D files from the digital cinema format.

► **3D splitter**

- To convert a sequence of side-by-side or over-under format 3D image into a frame-sequential 3D sequence
- Used to convert consumer-level 3D files into the format required for digital cinema.

Geometry Filter

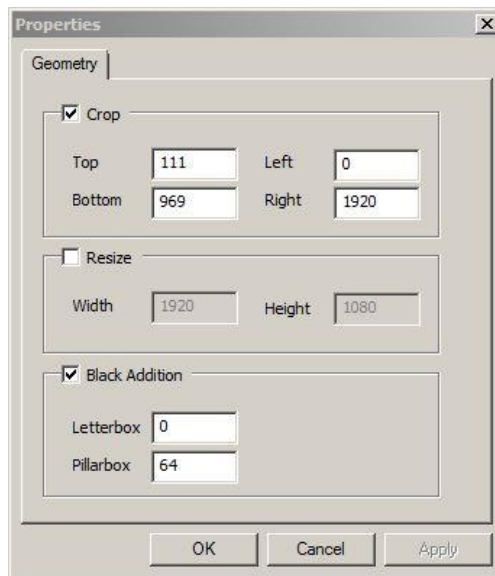
- DCI compliant Digital Cinema Packages should be in the following Aspect Ratios
 - 2K Scope - 2048x858
 - 2K Flat - 1998x1080
 - 4K Scope - 4096x1716
 - 4K Flat - 3996x2160
- Use the options in the Geometry filter to change the aspect ratio
 - PAD - to pad black as Pillarbox or Letterbox
 - RESIZE - to scale
 - CROP - to Crop
 - Cropping numbers need to be calculated based on the size of the frame.
- **Convert 1920x1080 (HD Source) to 2048x858 (Scope)**

For a 1920x1080 source to be made into a Scope (2048x858) DCP, there are two options. Both will result in black bars on the side (pillar-boxes) or “Padding” of the encoded image with black pixels to achieve the required 2048 pixels on the

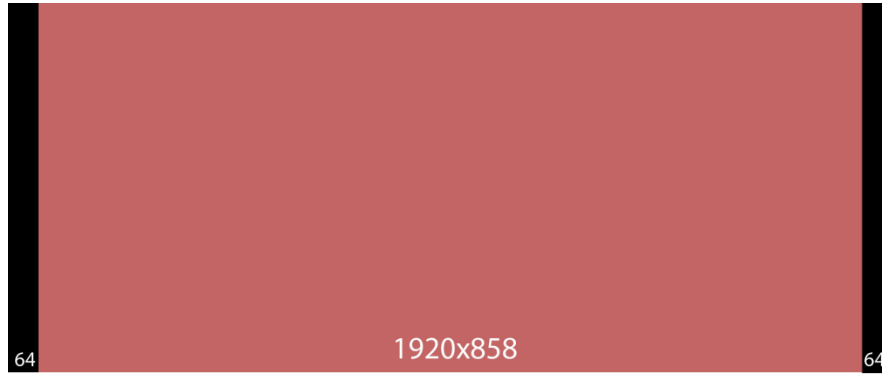
“X”/horizontal axis. Option 1 will result in loss of picture by cropping, Option 2 will result in the picture being resized (scaled-down)



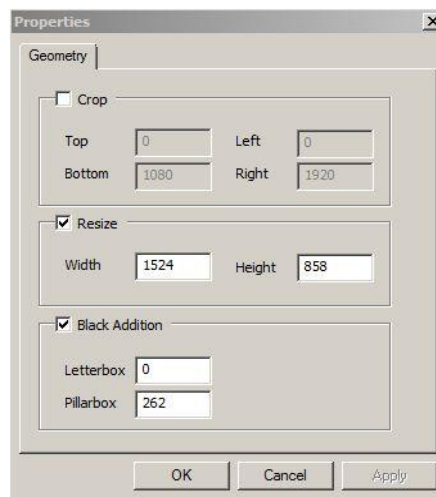
- Option 1 - CROP + Pad
 - First CROP the image on the top and bottom to achieve 858 along the “Y”/Vertical axis. To do this - enter the number 111 in TOP, and **962 in BOTTOM** (NOT 111).
{This is because QMPro’s Crop function asks for the line number after which it has to crop, not the number of lines to Crop. So, subtract the number of lines to crop from the total number of lines (1080-111 = 962}!!
 - Then PAD 64 in pillarbox. This will add a total of 128 pixels to the width to achieve the required 2048 pixels on the “X”/Horizontal axis.



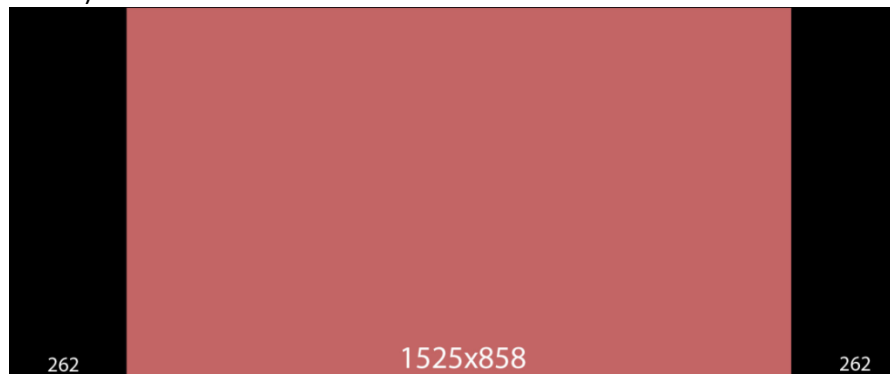
This will result in a Scope DCP which has 111 lines of the original image cut off from the top and bottom and black bars of 64 pixels each on either side of the image – as below.



- Option 2 - RESIZE + Pad.
 - First RESIZE the image proportionately to 1525x858. This will result in an image which retains the same aspect ratio of the original source, but now fits within the 858 pixel height of the Scope container
 - Then PAD 262 in pillarbox. This will add a total of 524 pixels to achieve the required 2048 pixels on the "X"/Horizontal axis.



The resultant image in the DCP will be smaller than the original and will have larger black bands on the side than the original source (the image will not fill the screen)



► **Convert 1920x1080 (HD Source) to 1998x1080 (FLAT)**

- PAD 39 pixels in pillarbox.

► **Convert 1998x1080 (FLAT) to 2048x858 (Scope)**

- **Option 1 - CROP + Pad**

- To CROP enter the number 111 in TOP, and **962 in BOTTOM** (NOT 111).

{This is because QMPro's Crop function asks for the line number after which it has to crop, not the number of lines to Crop. So, subtract the number of lines to crop from the total number of lines (1080-111 = 962}!!

- Then PAD 64 in pillarbox

This will result in a Scope DCP which has 111 lines of the original image cut off from the top and bottom and black bars of 64 pixels each on either side of the image

- **Option 2 - RESIZE + Pad.**

- First RESIZE the image proportionately to 1588x858. This will result in an image at the same aspect ratio of the source but which fits within the Scope container
- Then PAD in pillarbox by 230 to achieve the required 2048 pixels on the "X"/Horizontal axis.

The resultant image in the DCP will be smaller than the original and will have larger black bands on the side than the original source (the image will not fill the screen)

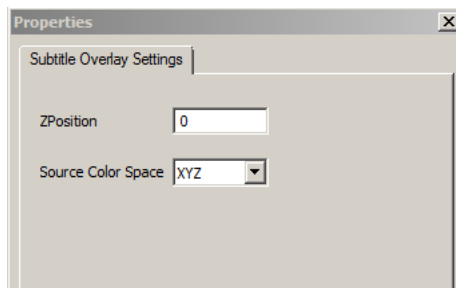
► **Convert 2048x858 (Scope) to 1998x1080 (Flat)**

- Resize to 1998x838 and the PAD in letterbox to 121.

Subtitle Overlay

To overlay (burn-in) subtitles onto the image

- Choose the colour-space as XYZ or RGB depending on whether the overlay filter has been applied before or after colourspace conversion filter.



- For 3D DCPs, subtitles can specify a 3D depth for the subtitle by specifying a "z" depth.
"Z" depth values usually range from -10 to +10

- "Z" depth of 0 - means the subtitle will be placed at the screen plane.
- A "-"ve number pushes the text behind the screen plane
- "+"ve number brings the text in front of the screen plane.

Other Options in the Encoder Window

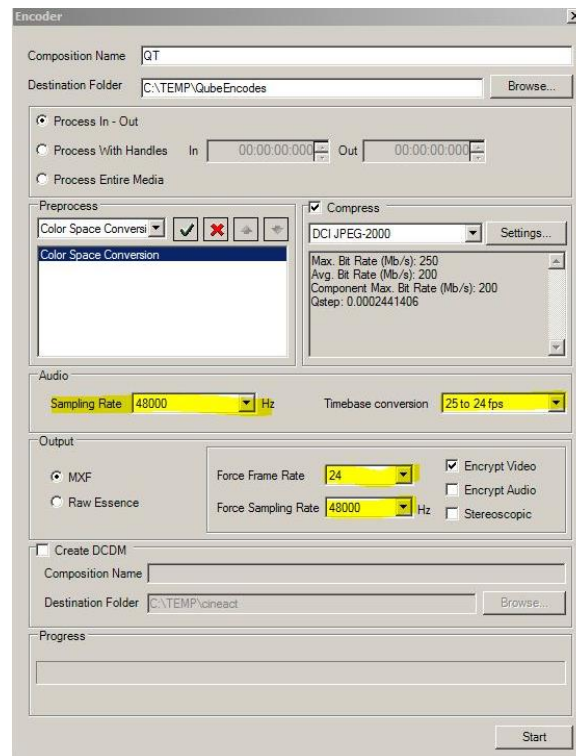
Frame-rate and Sample Rate conversions

- ▶ The **“Force Frame Rate”** option allows the Frame-rate of the IMAGE to be changed.
- ▶ By default, the frame rate of the mxf is the frame rate of the source content
This can be used to playback 23.97fps at 24 fps.
This can also be used to playback 25fps files at 24fps.
- ▶ If force-frame rate is applied, corresponding audio Timebase conversion (frame-rate conversion) must be performed along with sample-rate conversion.

Converting 25fps source to 24fps DCP

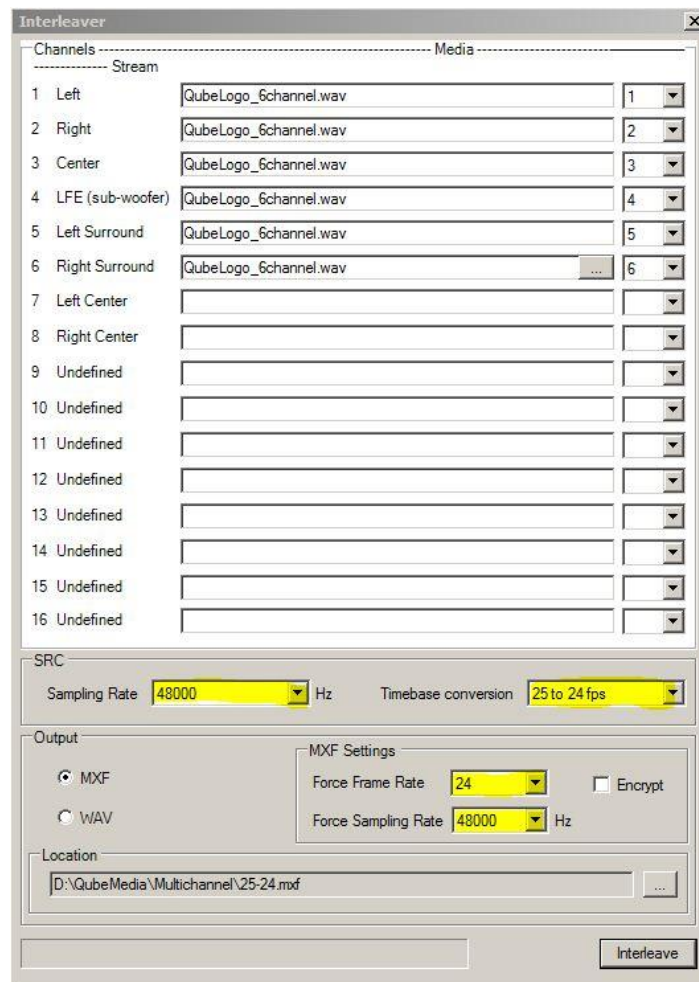
Changing the frame rate from 25fps to 24 will cause the content to play 4% slower and the duration to increase by the same 4%.

- ▶ **25fps video file with embedded audio:**
 - Create reels and compositions as usual file.
 - **In the Encoder window** - select the following options:



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- **For Audio** - Sampling Rate: 48000
Timebase Conversion: 25-24
Force Sampling Rate: 48000
 - **For Video** – Force Frame Rate: 24
- **EDIT** the newly created Encoded Reel to move the OUTPOINT of the REEL to the newly increased duration.
- **25fps Image sequence with separate audio:**
- **Image** - When creating a track file for video specify the frame rate as 24. This will ensure that the picture essence will play at 24 fps.
 - **Audio** - USE THE AUDIO INTERLEAVER (Multi-file Audio Source selection from “Track File” pane.

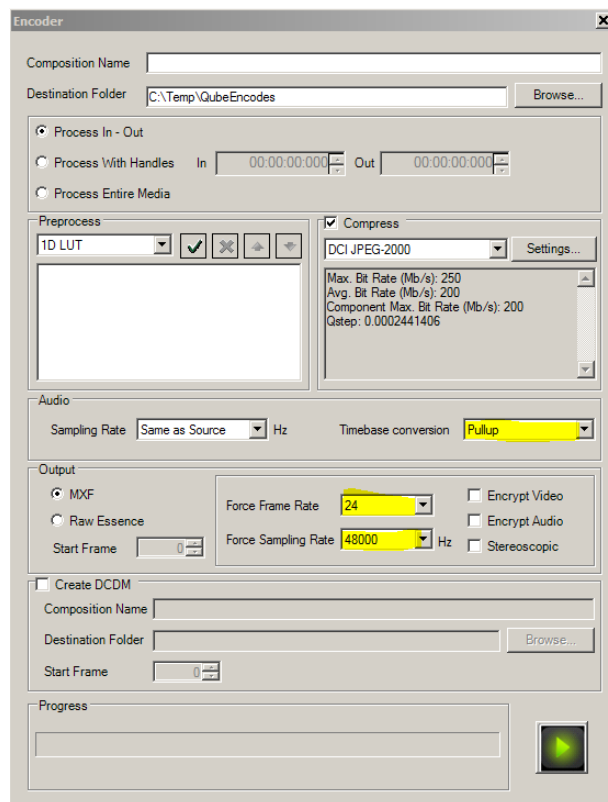


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- Set Sampling Rate - 48000
 - Set Timebase Conversion - 25-24
 - Force Framerate - 24
 - Force Sampling Rate – 48000
- **EDIT** the newly created Encoded Reel to move the OUTPOINT of the REEL to the newly increased duration. (By default the outpoint is at the old position of the encoded reel).

Converting 23.98FPS source to a 24FPS DCP:

- Create reels and compositions as usual file
- In the Encoder window:
 - **IMAGE**
 - “FORCE FRAME RATE” to 24 to convert the image from 23.97 to 24
 - **AUDIO**
 - PULL-UP in TIME-BASE conversion to convert the speed of the audio
 - “FORCE SAMPLE-RATE” to 48KHz to ensure the correct audio sample-rate.



DCDM

- Selecting the “Create DCDM” option in the encoder window will create a sequence of TIFF files from the original source with the chosen filters applied.
- When creating a DCDM ensure that there is sufficient space on the HDD to accommodate this large amount of data. A single TIFF file can be as large as 20MB.

Raw Essence

- Creating “Raw Essence” creates a sequence of J2C files WITHOUT the MXF wrapper
- In both cases a separate audio wav file is created.
- The raw essence can be used for archival purposes

Previewing/Trimming

Playback of Jpeg2000 mxf files at HIGH quality

- It is possible to playback encoded Jpeg2000 files in realtime
- The smoothness and quality of playback will depend on the performance of the host computer, especially the graphics display card.
 - Currently an 8-core CPU,
 - a compatible graphics display card and
 - a 2-way striped SATA drive are the minimum requirements for realtime (24fps) playback of Jpeg2000 mxf files at HIGH Quality.
- Since J2K files are in the XYZ colour-space and the computer monitor is in RGB colour-space a LUT must be applied in the preview window. Select the XYZ-RGB colour space.

Full-screen playback on an external monitor

- the DVI output of the graphics display card can be connected to an external projector or monitor capable of Progressive 2048x1080 display.
- Set the Preferences (Edit menu) for Preview to “Display 2”

Previewing and Trimming 3D files

- 3D files can be previewed on a 3D TV by connecting the DVI output of the graphics display card to the 3D TV.
 - When previewing a 3D Sequence (BEFORE ENCODING) both L and R frames will be played back.
 - When previewing an ENCODED 3D track file or reel, the user can choose to view only the L frames, only R or side-by-side, over-under.
 - Select the same 3D “format” on the TV as well
- Realtime playback of sequential graphic file sources is entirely dependent on the performance of the host Mastering system and the HDDs on which the source files reside. Currently a minimum 6-way stripe of SATA drives is necessary for realtime playback of sequential graphic files.

The following shortcuts may be used in the TRIM window to playback and mark trim points:

Spacebar, L – Play/Pause

1, 2 – Step back 10 frames, Step forward 10 frames

3, 4 – step back 1 frame, step forward 1 frame

E, R – Mark in and Mark out

I, O – Mark in and Mark out

Q, W - Go to in, Go to out

Home, End – Go to beginning and Go to end

D, F – Clear in and Clear out

G – Clear both marks

C – Close Trim window

Importing Digital Cinema Packages

To import and preview a completed DCP (generated by any other mastering application)

- ▶ Right-click on any pane (Composition, Reels or Track-files) to Select the “Import” option
- ▶ Or, drag-and-drop the DCP folder into any pane in QMPro.
- ▶ Imported compositions will be highlighted in the Composition pane.
- ▶ KDMs for Encrypted DCPs can be imported using the “IMPORT” option
- ▶ KDMs can also be dragged-and-dropped into any pane.

Adding Subtitles to existing Digital Cinema Packages

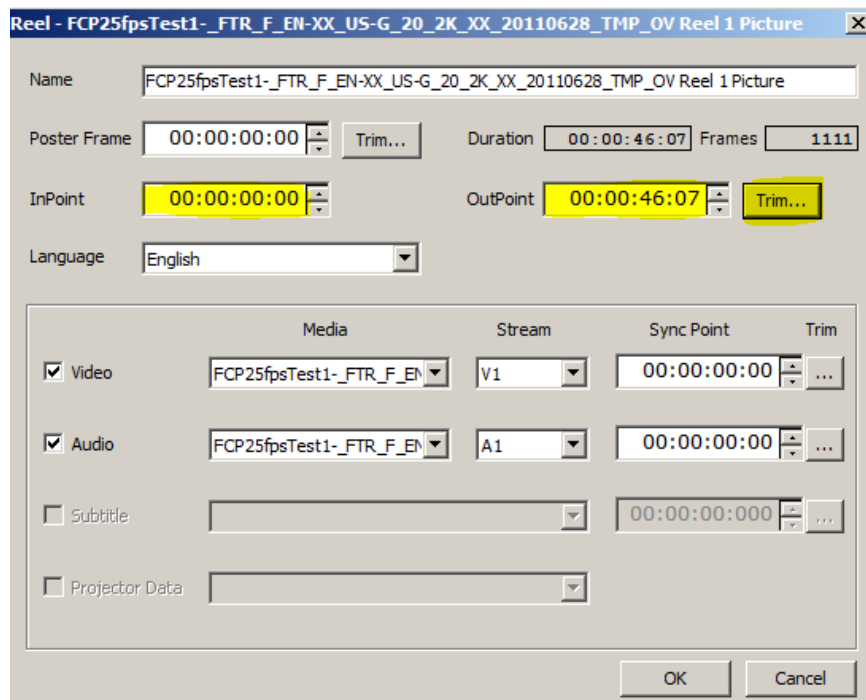
- ▶ Import the DCP into QubeMaster Pro
 - The DCP is now available in QMP for further editing and addition of assets.
- ▶ Create a new copy of every reel in this composition, using the COPY-PASTE method.
 - Right-click on the reel> Select copy.
 - Click anywhere in the Reel window right-click>paste
- ▶ Name the copies to reflect the changes you will be making
 - “subtitled”, “edited” etc.
- ▶ Double-click these reels to open it in the Trim window and edit each reel to make the necessary changes.
 - For a subtitled version of a DCP, Edit each reel to attach subtitles...
 - For a dubbed language version, edit the reel to attach the dubbed audio etc.
- ▶ Follow the procedure for all reels.
- ▶ Combine all these NEW (edited) reels into a NEW composition (named appropriately).
- ▶ Package the Edited Composition
 - This new composition does not need to be encoded. It can be packaged directly.
- ▶ If it needs to be “Re-Encrypted”
 - Right-click on the Composition and selecting the ENCODE option.
 - In the ENCODER window, name the new encrypted composition.
 - Select the “ENCRYPT” option,
 - DESELECT the COMPRESS option and click the Encode button
 - By ONLY selecting “Encrypt” and not selecting “Compress” the mxfs are merely “re-wrapped” not re-encoded.
 - PACKAGE this new Encrypted Composition
- ▶ Generate KDMs if this is an Encrypted Package.

Editing Digital Cinema Packages

To implement a cut within a reel using QubeMaster Pro:

(for purposes of illustration, the workflow below assumes that a cut needs to be implemented in Reel 1 of a feature).

- ▶ Import the Original composition into QubeMaster Pro
- ▶ Select Reel 1 of the ingested composition
- ▶ Copy and Paste it TWICE
 - right-click>copy.
 - Click anywhere in the window right-click>paste (2 times).
 - This will create two duplicates of the first reel.
- ▶ Add an A to the name of the first copy
- ▶ Add B to the name of the second copy
- ▶ Edit Reel 1A
 - To edit a reel's in and out point, you can add the inpoint and outpoint directly in the area provided.



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- Optionally, use the “In” and “out” buttons available in the Preview window to select the region.
- Remember to set the Out Point of Reel 1A to the start of the portion to cut. Close Reel1A.

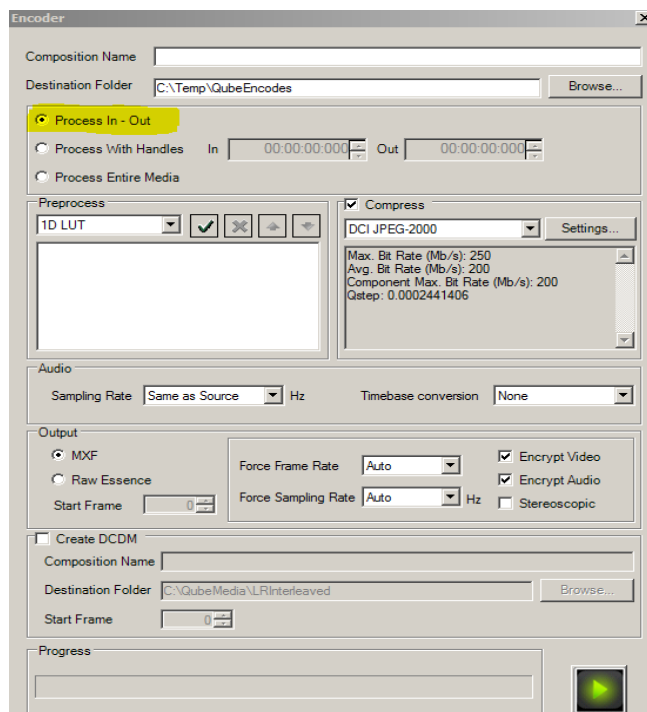


For example, in the image above - everything BEFORE 00:00:01:07 will not play and everything AFTER 00:00:27:09 will not play. Only the content between these two points will play.

- ▶ Similarly, Edit Reel 1B
 - Set the In Point of Reel 1B to the End of the portion to be cut.
- ▶ There are now two reels
 - 1A which ENDS before the cut and
 - 1B which STARTS after the cut.
 - BOTH these reels should be added to a NEW edited COMPOSITION.
- ▶ Repeat this procedure for all other edits required in relevant reels.
- ▶ Combine all these NEW (edited) reels into a NEW composition (named appropriately).
- ▶ Package the Edited Composition
 - This new composition does not need to be encoded. It can be packaged directly.

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- By not re-encoding the reel, the original mxf files are retained and the “edited” content is still available in the MXF file, but the in and out points will be specified in the CPL and therefore the edited portions will not play. The in and out points in the CPL will ensure that only the desired content will play in the server.
- If you want to ENSURE that the edited content no longer exists in the MXF, then you need to Re-ENCODE each EDITED reel with the default option of “process in-out” selected in the encoder window (this is the default selection). This will result in new mxfs being created which only contain the required content.



- ▶ PACKAGE the new Composition and check it.
- ▶ Generate a KDM

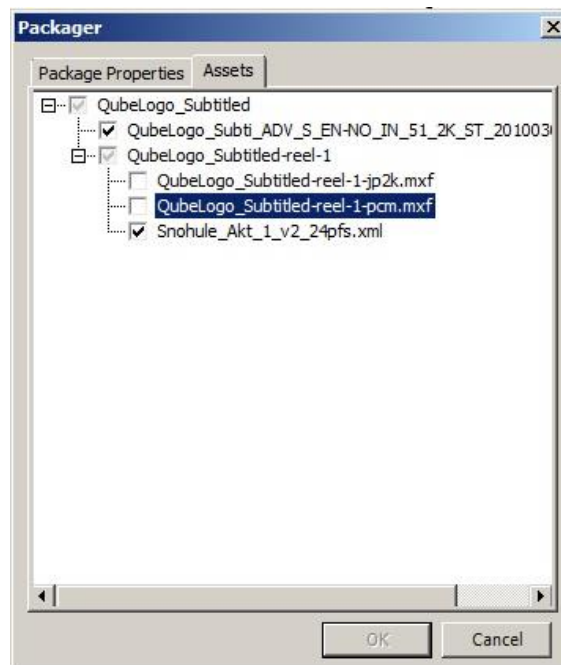
PARTIAL or SUPPLEMENTAL PACKAGES

DCI specifications support the concept of “Partial” or “Supplemental” packages which do not contain ALL the assets of the original DCP.

- ▶ These “partial” packages contain only SOME of the assets, and are used in situations where a DCP has already been distributed to a location, but now needs to be EDITED in some way or some new assets added (subtitles or dubbed audio).
- ▶ A partial package will have only a partial number of assets:
 - In all cases a partial package will have a CPL, PKL, Assetmap and Volindex,
 - Additionally it can have
 - newly added subtitles
 - Newly added dubbed audio
 - New Files missing from the original DCP

**** IMPORTANT**

- ▶ For a Partial Package to work the ORIGINAL DCPS with the EXACT same MXF files must already be **ingested** into the server.
 - In other words, the MXF assets are already available in each of the servers and therefore do not need to be sent again.
 - When the server ingests the package it will link to the existing video and audio mxfs that have already been ingested previously.
- ▶ If the ORIGINAL DCP is encrypted, it should have a valid KDM whose validity period matches those for the new “partial package”
- ▶ SONY has issued an advisory regarding the failure of partial packages on Sony Servers. If the Partial DCP is intended for wide distribution, which includes Sony servers, it is highly advisable to send a FULL DCP instead of a Partial one.
- ▶ To create a Partial Package
 - Edit the reels in the composition to make necessary changes.
 - Package the new composition
 - In the ASSETS tab of the Packager window, **DESELECT** the assets that have ALREADY BEEN SENT (video and audio mxfs that have already been sent in the earlier package)
 - The “cpl” asset must ALWAYS be selected
 - Without a CPL file a server will not display the composition in the play list.



- Generate a KDM for the new Partial Package.
- Since this partial DCP is often without the video and audio mxfs, it is small enough to be EMAILED
- Always ZIP DCP files before emailing them.

Storage recommendations for optimal performance

- ▶ Access source files from and store encoded files to different drives.
- ▶ SCSI, SAS or SATA drives are recommended. 6-10 drive SAS or SATA array in RAID 0 configuration for source media
- ▶ If accessing files off a network share, ensure a reliable Gigabit network connection
- ▶ For playback
 - For real-time playback of J2K files a minimum 2-way stripe (RAID 0) of SATA drives is necessary
 - For real-time playback of TIFF or DPX sequential source files; an 8-way RAID stripe of SATA/SAS drives is recommended.

Trouble-shooting common problems in QubeMaster Pro

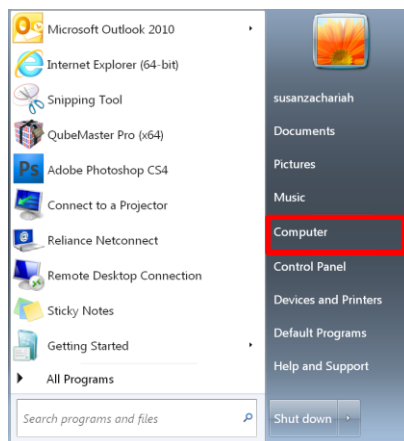
- ▶ Installation issues
 - a. Check if all the necessary prerequisites have been installed as per the installation document.
 - b. Ensure that the same login credentials used to install MicrosoftSQL is being used when installing QubeMaster Pro
 - c. It has been found that Hyper-threading causes problems on **some** x64 installs. Disable Hyperthreading and try again.
 - d. Ensure compatible graphics display cards
 - i. Install current/up-to-date graphics card drivers
 - e. Ensure compatible audio cards
- ▶ Quicktime Source file issues
 - a. Check if QT player is installed and all necessary codecs are installed. This can be checked by playing the file in Quicktime Player.
 - b. Quicktime mov files can only be imported into the 32bit version of QMPro since there is no 64bit version of the Quicktime engine for windows.
 - c. Check if other MXF/media file players are installed on the same system
- ▶ Encoding issues
 - a. Check if any file in the sequence is corrupt
 - b. It has been found that Hyper-threading causes problems on **some** x64 installs. Disable Hyperthreading and try again Check if any file in the sequence is different (has alpha channel etc.)
 - c. Check for sufficient HDD space
 - d. If Mpeg2 encodes on x64 machines crash after each reel
 - i. Install Win7Tweak
 - e. If Mpeg2 outputs crash – check mpeg 2 settings
 - i. For Mpeg2 DVD aspect ratio cannot exceed 1920x1080
 - ii. Check frame-rate – DVD cannot be 24 or 48fps.
 - iii. If settings say “unspecified level” then there could be problems with output.
- ▶ Playback issues
 - a. Check graphics card and driver
 - b. Check if Hyperthreading is enabled.
- ▶ Final DCP issues (at theatre)
 - a. If a 3D DCP is not displaying in 3D – check if the “stereoscopic” option was selected in the encoder window during encoding.

- b. If No audio plays – check the Sample-rate of the audio
- c. If subtitles Play out-of sync
 - i. SYNC POINTS were added to subtitles – this is not supported on many projector versions.
- d. Partial/supplemental DCP errors with Sony servers – this is a known issue on older Sony servers – must send a full DCP
- e. Signed DCPs sometimes have problems – send unsigned DCPs or sign them with SHA256 certificates (option is available in QMPro’s preferences)
- ▶ Source DCP issues.
 - a. Check if KDM is valid
 - b. Cannot ingest from a network drive
 - c. Copying DCPs to x64 systems running Ext2FSD sometimes causes file level corruption/failure of integrity check. Uninstall Ext2FSD.
- ▶ Subtitle issue
 - a. Check the XML file for syntax errors
- ▶ KDM generation errors
 - a. Root and Intermediate certificates need to be installed

Event Log

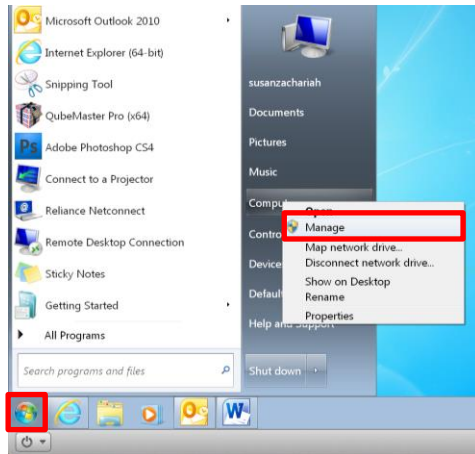
QubeMaster Pro events and errors are logged in the Window’s Event Viewer. The event log can be accessed thus:

- ▶ Click windows “Start” and right-click on your computer name.



- ▶ Select “Manage” to open the “Computer Management Console”

QubeMaster Pro



- In the “Computer Management Console” window:
 - Expand Applications and Services logs
 - Expand Qube
 - In the rightmost pane select “Save All Events as” and save as “.evtX”
 - Zip and email to support@qubecinema.com

