IMF–TOOL

A TOOL FOR BROWSING AND EDITING OF IMF PACKAGES

The initial development of this tool has kindly been sponsored by Netflix, Inc.

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Abstract

IMF-Tool is a Qt GUI application for browsing and editing of IMF App #2 and App #2E packages: Users can preview video and subtitles, browse metadata, edit CPLs, delete tracks, add audio and subtitle tracks.

The modified IMP can be written back to disk as either full package (Complete IMP) or supplemental package (Partial IMP).

IMF-Tool features a timeline visualization of CPLs, a resource browser, metadata editors TTML preview, image decoding and video playback.

IMF-Tool is written in C++ / Qt and builds under Linux, Mac OS X and Windows using CMake build configuration.

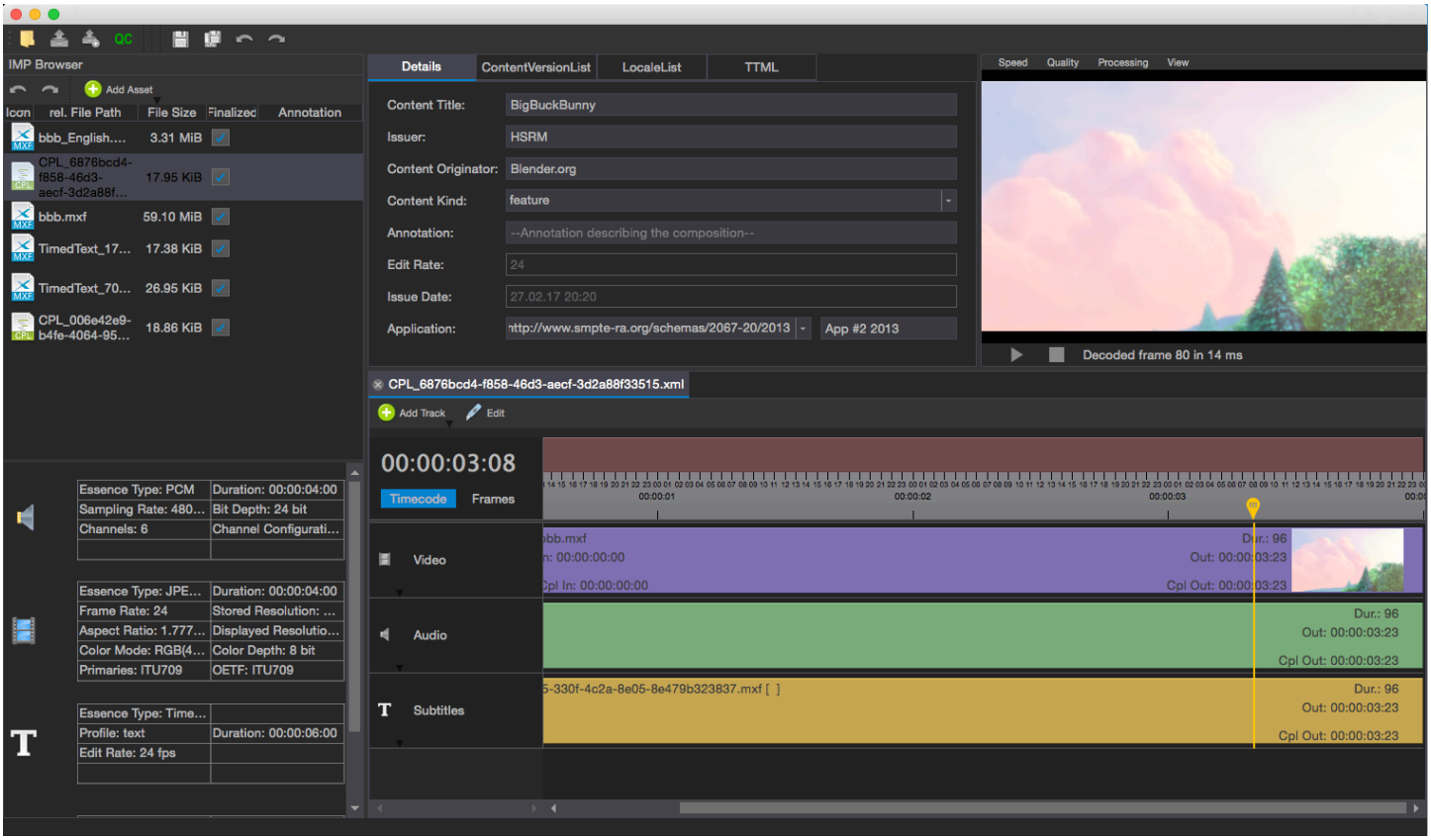
IMF-Tool is available under GPLv3 (GNU Public License Version 3) at http://www.github.com/IMFTool.

Supported workflows

- Opening an IMP, opening one or more CPLs, timeline visualization, video preview and subtitle rendering
- Editing CPL metadata
- Adding PCM or Timed Text (IMSC1) resources to an IMP
- Duplicating an existing CPL and modifying it by
    - Adding one or more audio track
    - Adding one or more subtitles track
    - Adding a marker track
- Adding resources to a track by
    - Dragging & dropping assets from the IMP browser
- Modifying tracks
    - Visually editing EntryPoint and Duration on the timeline
    - Creating edit points (cuts)
- MXF metadata and essence descriptor inspection
- Generate a Photon QC report
- Open an IMP and CPLs upon startup using command line options

Overview of the GUI

Picture 1 shows the GUI with an IMP opened and a CPL on the timeline. The individual elements of the GUI will be explained below.

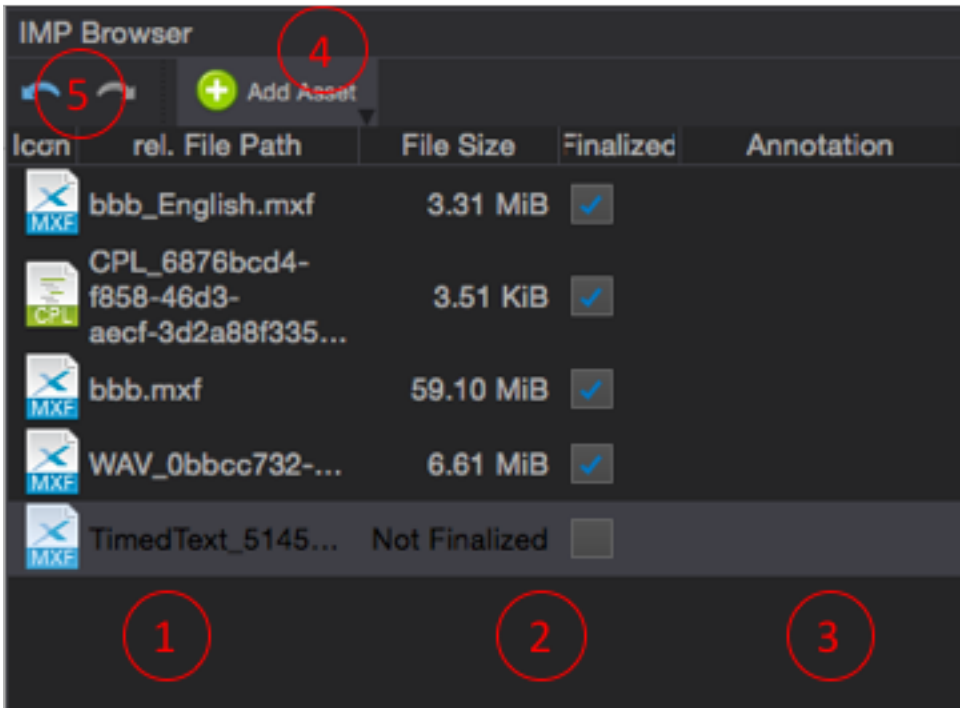


Picture 1: IMF-Tool GUI

Toolbar

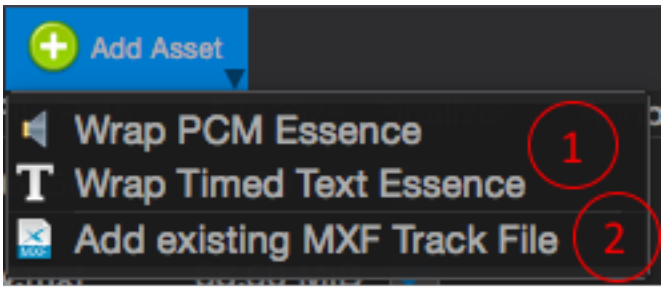
Element #	Function	More details
1	Open IMF package	Opens a file browser to select a folder with an IMP.
2	Write IMF package	Writes the modified package to the original location. Attention: ASSETMAP.xml will always be overwritten! A new PKL will be created and the former PKL will be kept (but not be referenced any more)
3	Write Partial IMF package	All files created in addition to an Original IMP will be written to a new folder.
4	Generate QC Report	Generate a QC report using Photon. QC report will be displayed in a pop-up window and can be copied into the clipboard.
5	Save CPL	Saves the CPL currently visible in the timeline. Users will be alerted if an existing CPL is about to be overwritten. Button is only available when a CPL has been modified.
6	Save as new CPL	Save the CPL currently visible in the timeline with a new UUID under a new file name. The formerly edited CPL will still be present in the timeline.
7	Undo	Undo last CPL editing operation. “Save CPL” and “Save as new CPL” cannot be undone!
8	Redo	Redo last CPL editing operation

IMP Browser



Element #	Function	More details
1	File names of assets	To edit the timeline of a CPL, double-click on the CPL asset or right-click and select “Edit CPL”.
2	File size of assets	“Not finalized” indicates that a freshly added asset has not been written to disk yet. It can be written selecting “Write IMF package” from the control panel.
3	AnnotationText from Packing List	Only if AnnotationText element is present in Packing List
4	Add Asset	See section below for details!.
5	Undo / Redo	Undo / redo last operation in the IMP browser.

Add Asset Dialog



Element #	Function	More details
1	Wrap PCM essence Wrap Timed Text Essence	Allows to select a “PCM resource” or “Timed Text Resource” to be wrapped into MXF. In addition, an empty IMSC1 resource can be created which may be used for filling gaps on the timeline. The selected essence files will be wrapped into MXF and appear as MXF assets in the IMP browser.
2	Add existing MXF Track Files	Allows to add an existing MXF file to the IMP. The MXF file must upfront be copied into the IMP folder, or in a subfolder. Essence types JPEG 2000, PCM Audio and Timed Text are supported. If the modified IMP is exported as a Partial IMP, the imported MXF file(s) will be moved to the Partial IMP’s location.

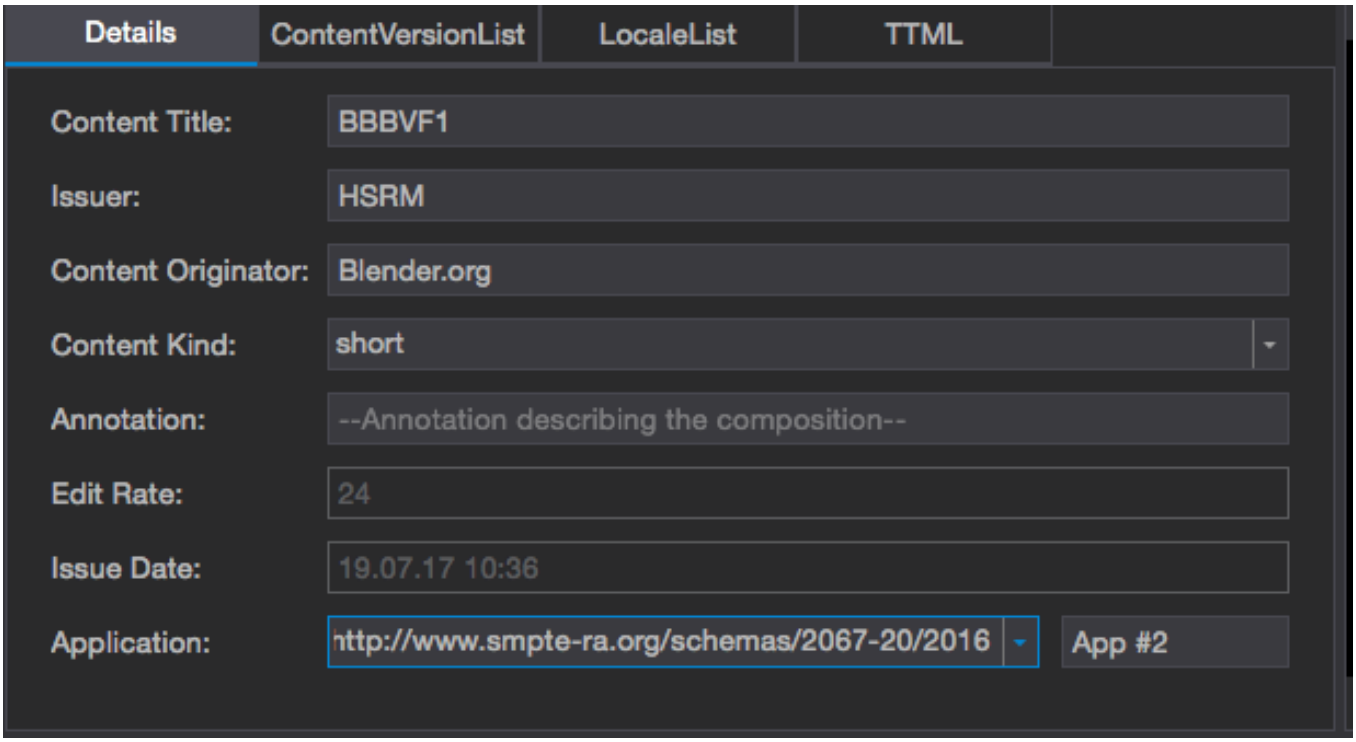
Note on Importing MXF Track Files:

When dragging&dropping imported MXF Track Files into the timeline of an existing Virtual Track, essence homogeneousness will be checked and related warnings or errors issued.

Since IMF Tool may not cover all potential essence descriptor conflicts, a QC check of the resulting IMP, e.g. by using [Photon], is highly recommended.

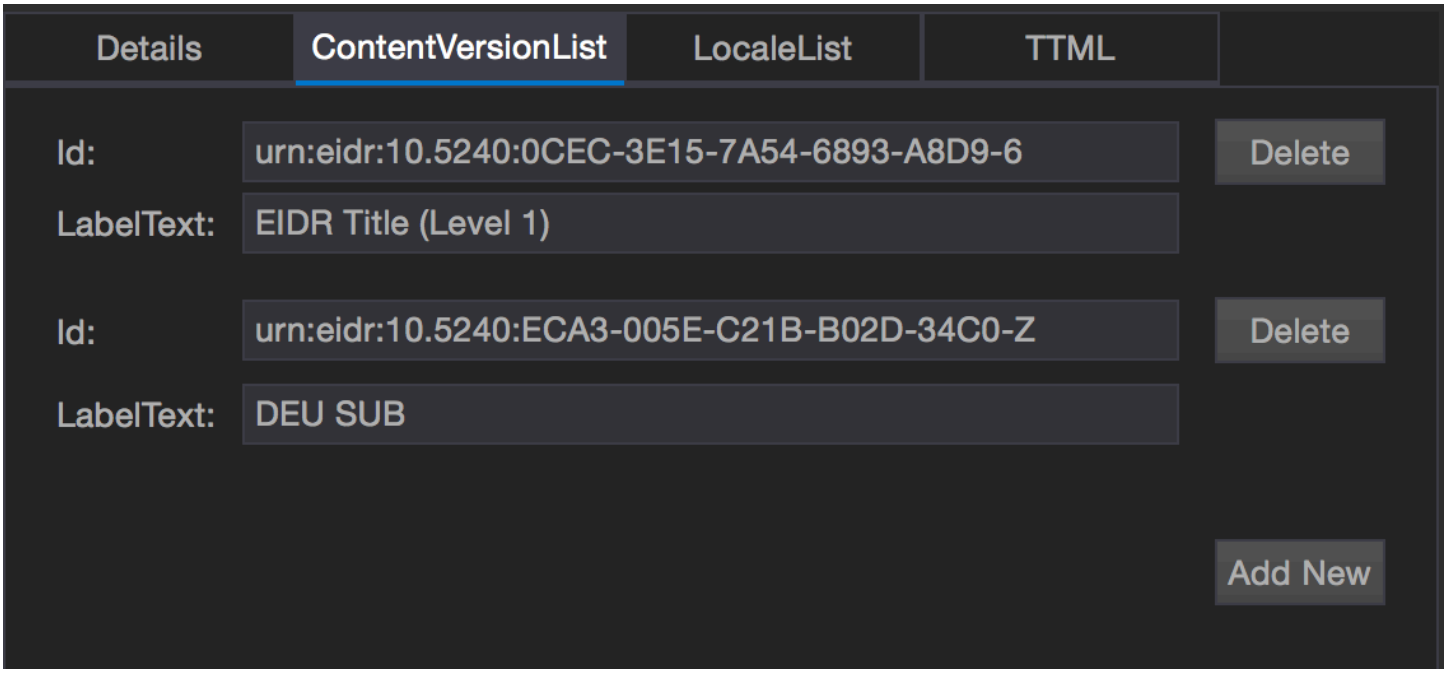
[Photon] https://github.com/Netflix/photon

CPL metadata editor



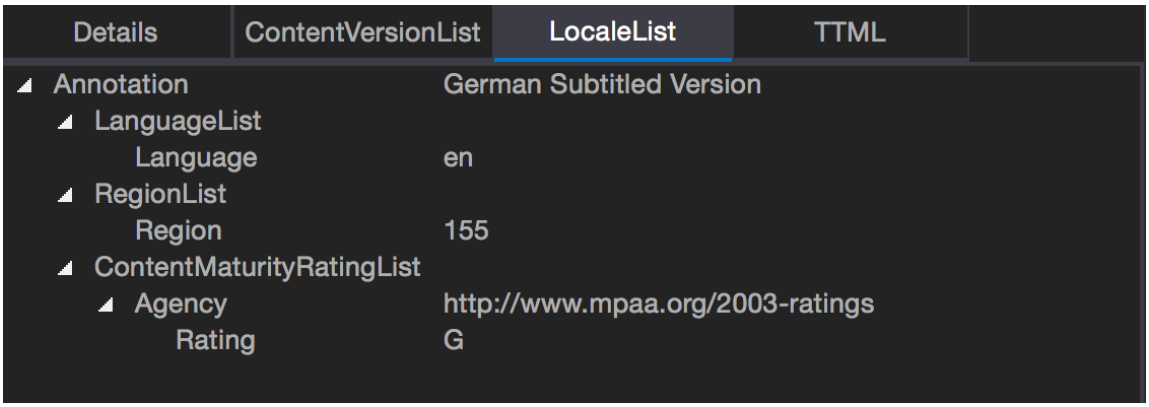
Edit the metadata of the CPL currently visible on the timeline. Content Kind, Edit Rate and Issue Date cannot be edited.

Content Version List Editor

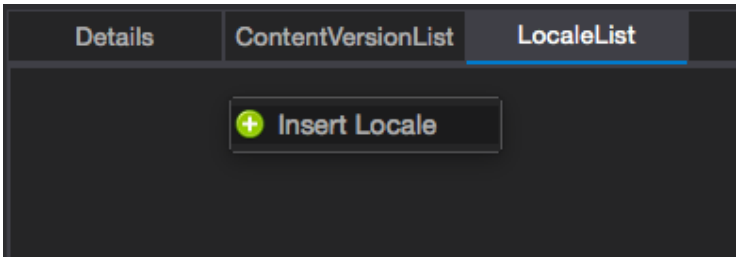


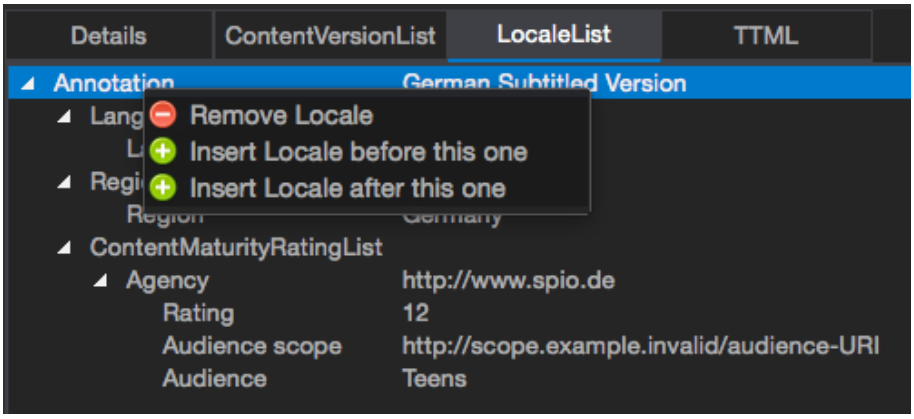
Edit the Content Version List. Items can be deleted and added to the Content Version List.

Locale List Editor

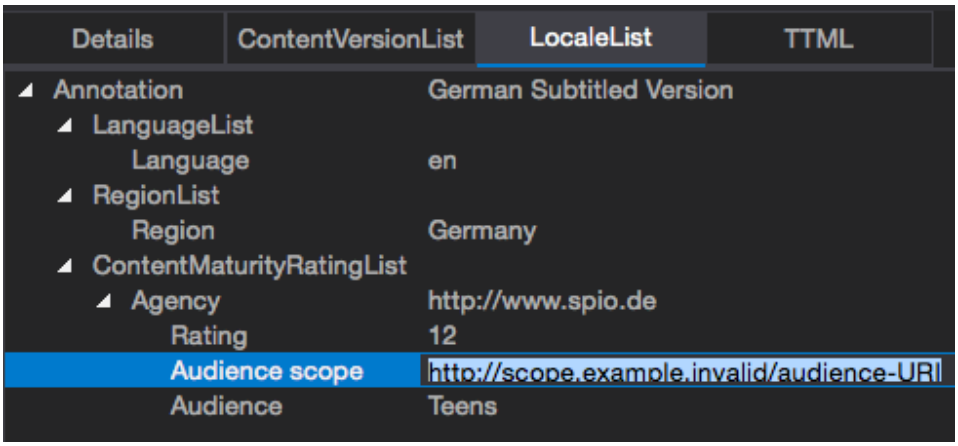


Items can be added or deleted from the Locale List by using right-click context menus:

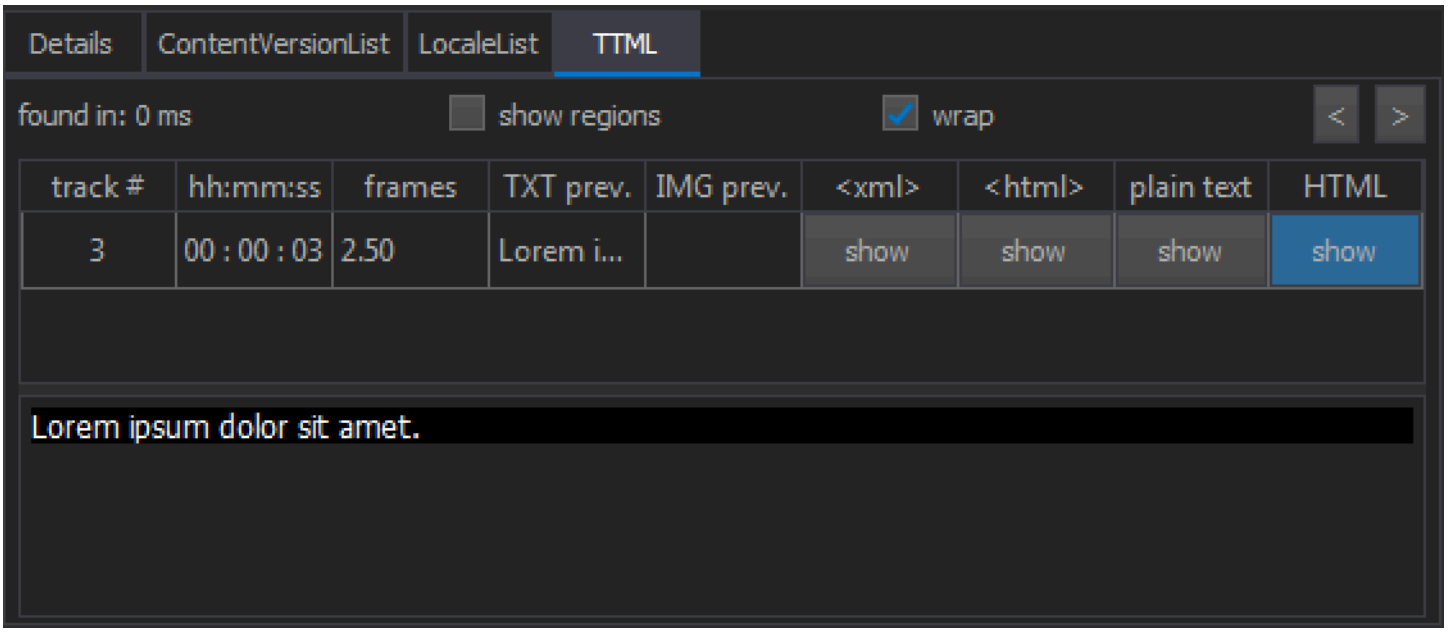




Values in the second column can be edited by double-clicking:



TTML Preview



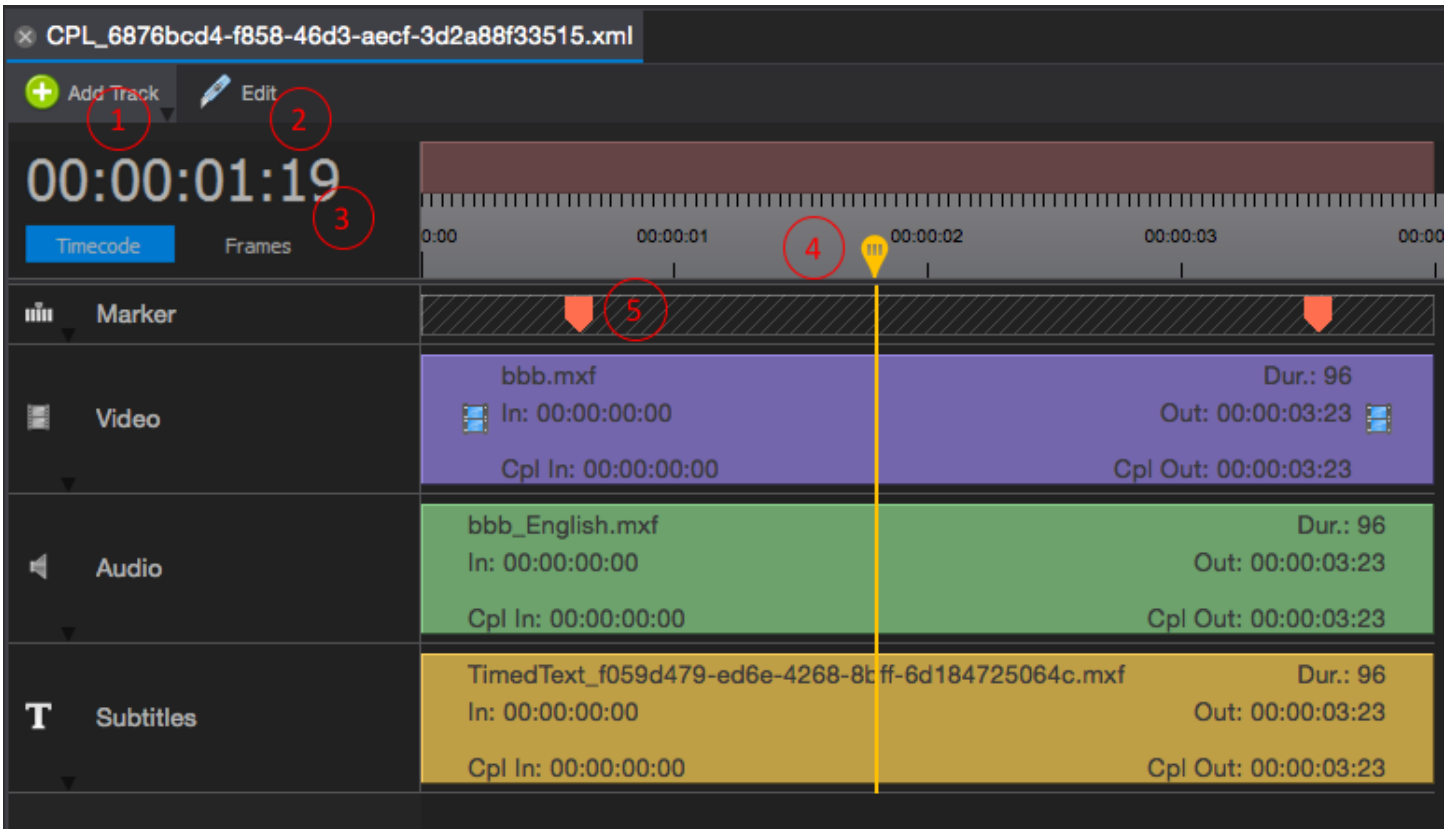
This tab shows a preview of timed text tracks conforming to the IMSC1 text profile. The “<” and “>” buttons jump to the preceeding and the following timed text instance, respectively.

The following preview options are available:

Button	More details
<xml>	Show the entire IMSC1 file. Hint: Mark all and copy into text editor.
<hmtl>	Show the HTML representation of the current instance. (text profile only)
plain text	Show the current instance in plain text.
HTML	Show the rendered HTML representation of the current instance. (text profile only)

Note: IMSC1 resources conforming to the image profile will be overlaid to the image preview!

CPL Editor: Overview



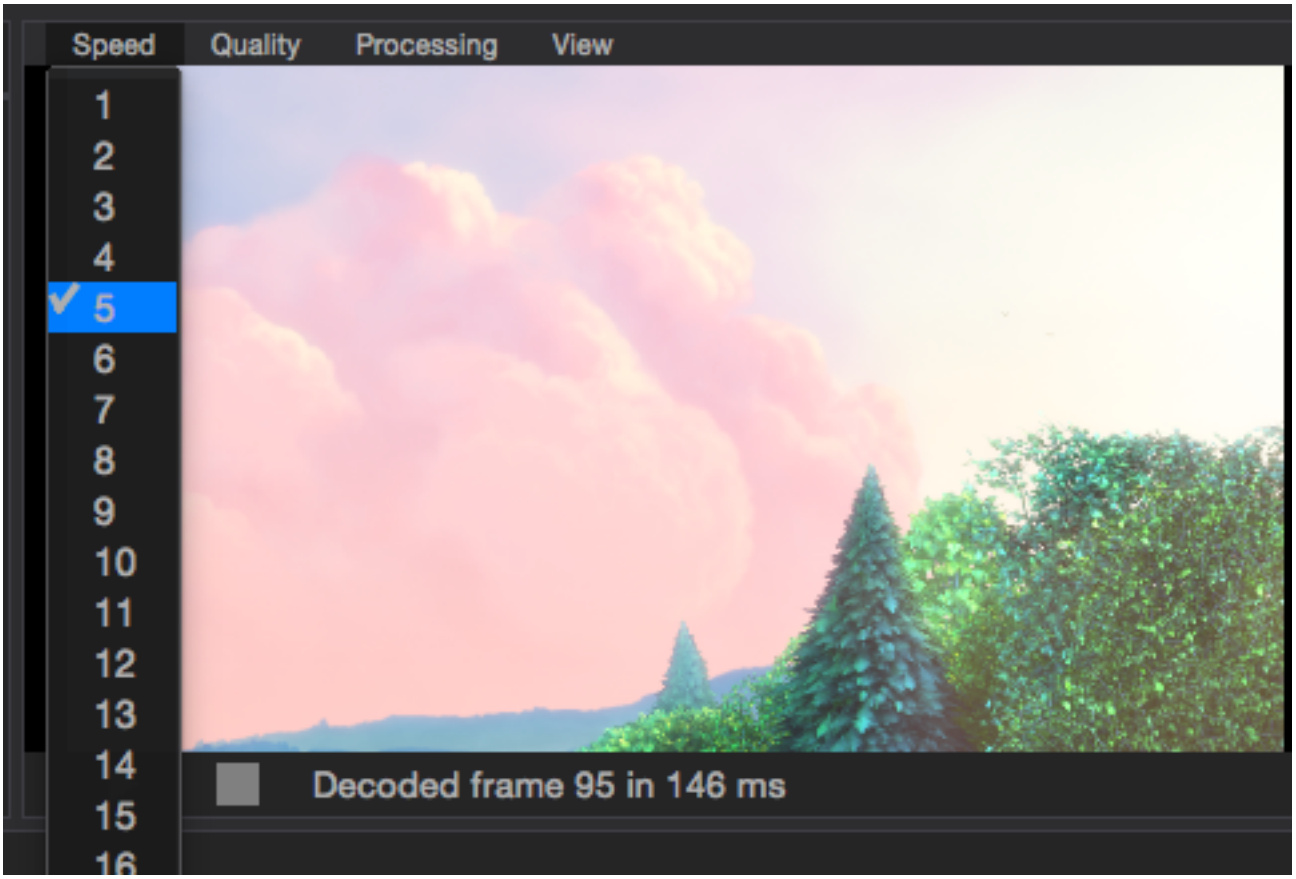
Element #	Function	More details
1	Add an additional track	Multiple **audio tracks** and multiple **subtitle tracks** can be added. If not already present, a single **marker track** can be added.
2	1st click: Create a cut for the currently selected resource 2nd click: Create a cut for all other resources	The resource currently selected will be cut at the current timeline position, i.e. it will be divided into two resources, both referencing the same track file with adapted EntryPoint and Duration. Can be undone using the “Undo” button on the control pane. Clicking “Edit” twice will also cut all other resources at the very same timeline position
3	Media time code	Toggle between timecode HH:MM:SS:FF and frame counter representation. Note: For CPLs with fractional frame rates, non-drop frame NTSC time code will be shown!
4	Timeline cursor	
5	Marker editing	Right-click to add or remove markers on an (optional) marker track. (Add marker track first → 1, if not present.)

CPL Editor: Editing EntryPoint and Duration of a resource

EntryPoint and Duration can be edited by dragging and moving the IN or OUT point of a resource, respectively:

In this example, the duration of the timed text resource has been reduced to 87 frames by moving the OUT point.

Image Preview: Speed Options

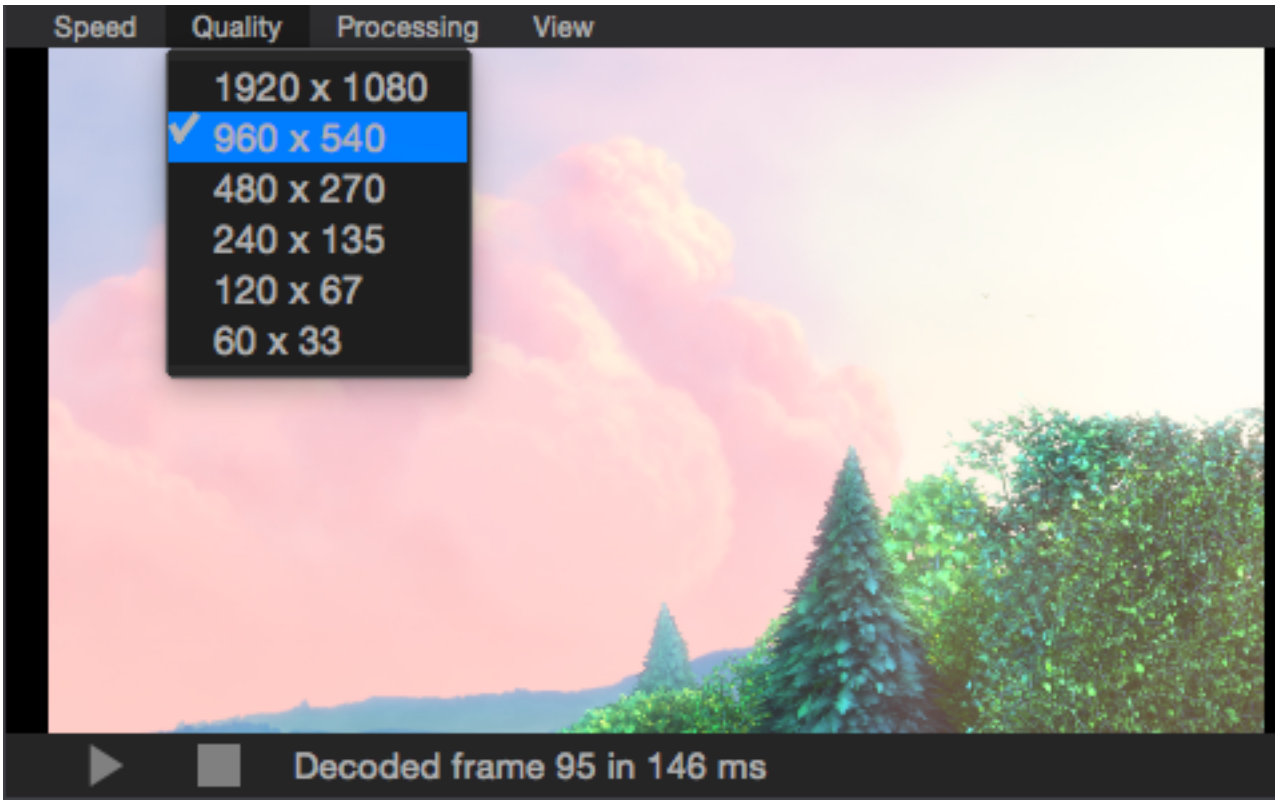


Chooses the playback frame rate.

If the processing option “Real speed” is NOT checked: Determines the playback frame rate (lower than or identical to the CPL Edit Rate).

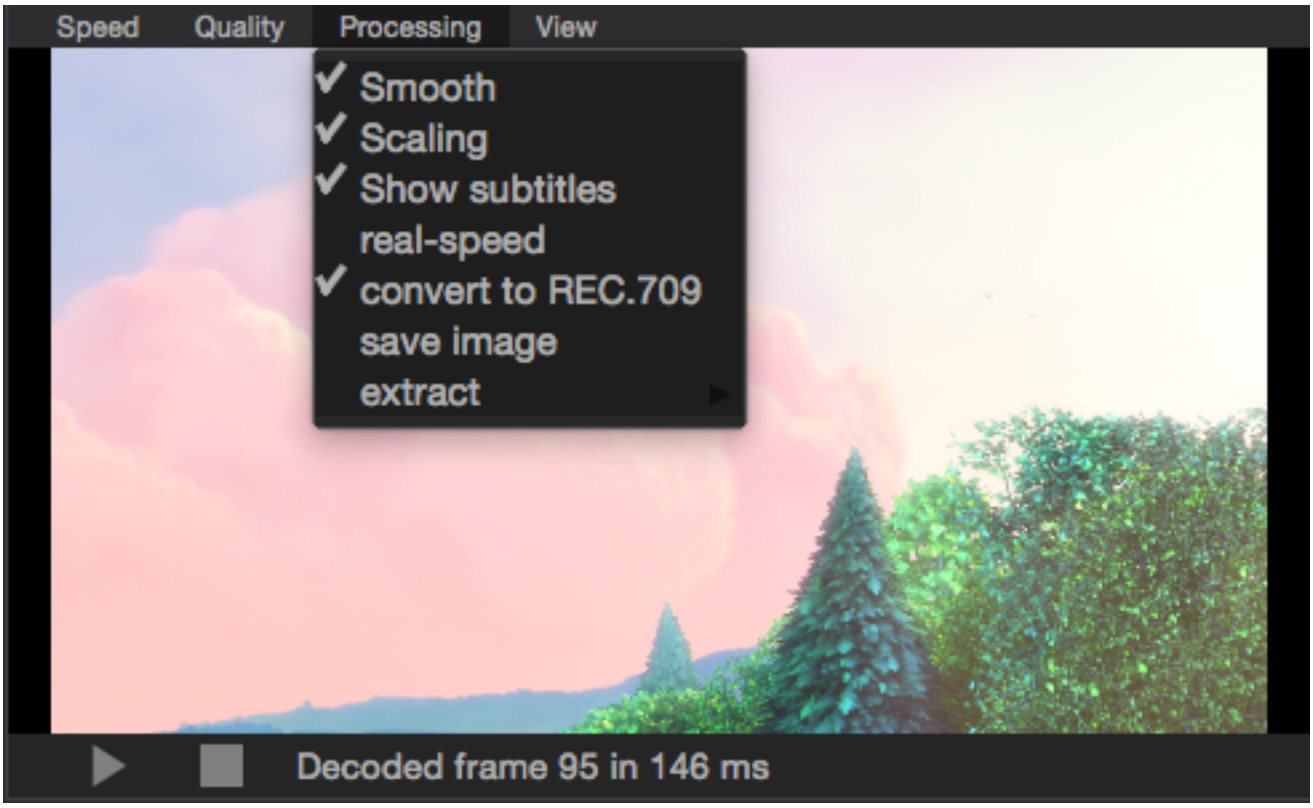
If the processing option “Real speed” is checked: Determines the real number of frames per second being decoded while the timeline proceeds in real time. (i.e. frame dropping will occur if lower than CPL Edit Rate)

Image Preview: Quality Options



Choosing a lower resolution reduces the decoding time and improves playback speed.

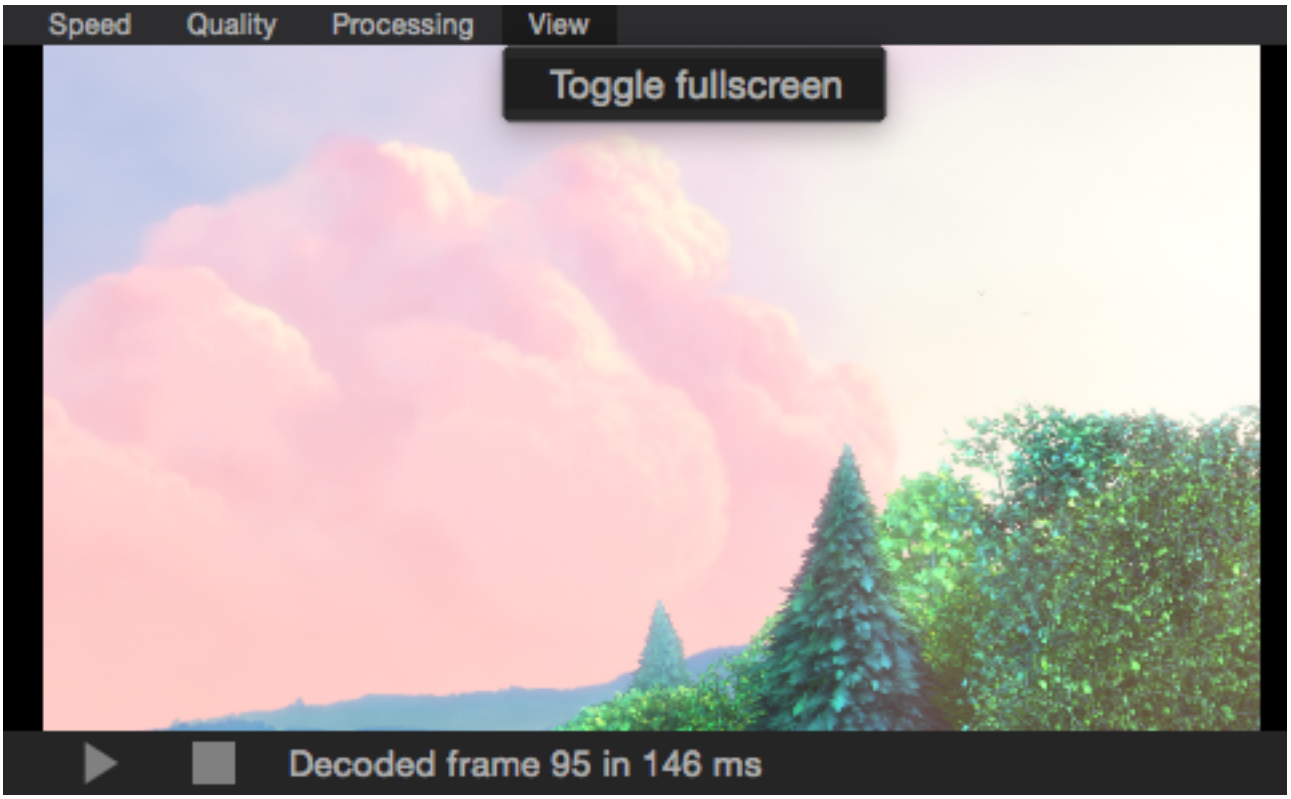
Image Preview: Processing Options



The following options are available:

Option	More details
Smooth	Apply a smoothening filter to reduce artifacts for low-res images.
Scaling	Scale image to the size of the preview widget
Show subtitles	Overlay subtitles for IMSC1 resources conforming to the image profile. Note: Overlay of text-based subtitles is not supported!
Real speed	Playback at the nominal CPL Edit Rate. Frames will be dropped in order to maintain playback speed.
Convert to REC.709	Images in color spaces other than BT.709 (E.g. BT.2020 or P3D65) will be converted to Rec.709. Note: No tone mapping is applied, just simple clipping.
Save image	Allows for saving the image currently display to disk. Format will be BMP and the bit depth will be 8 bit only.
Extract	Display only a part of the image (sub-options available)

Image Preview: View Options



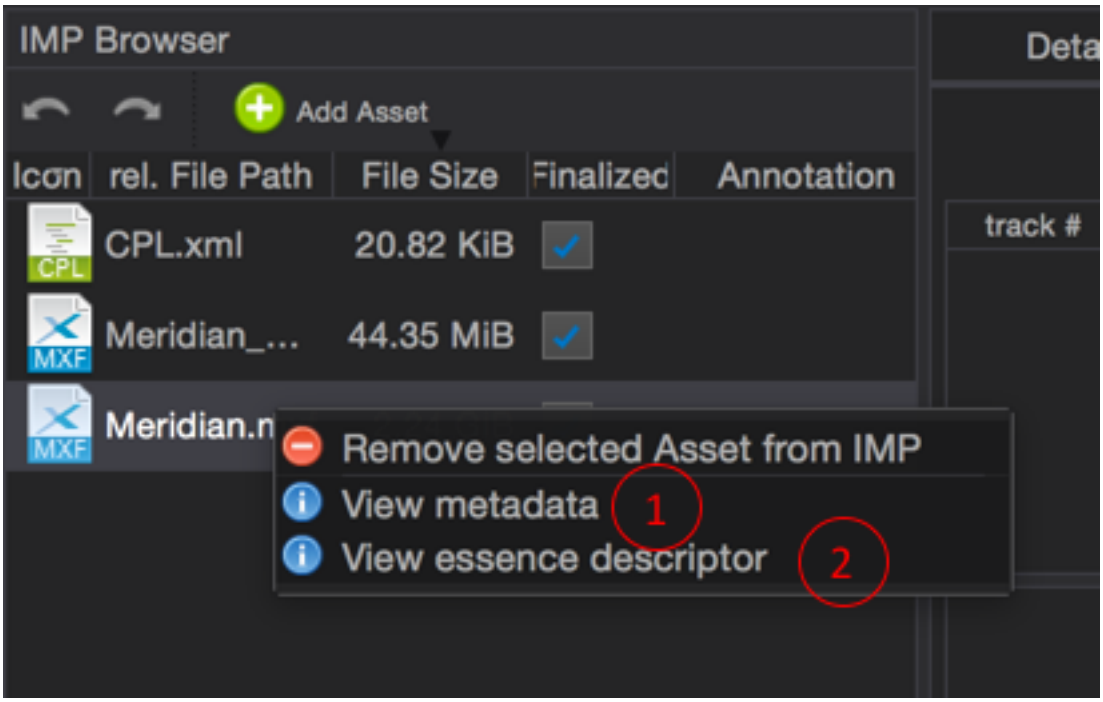
“Toggle fullscreen” enters / leaves full screen mode.

NOTE: In case of a dual-monitor machine, full screen will always go to the second monitor.

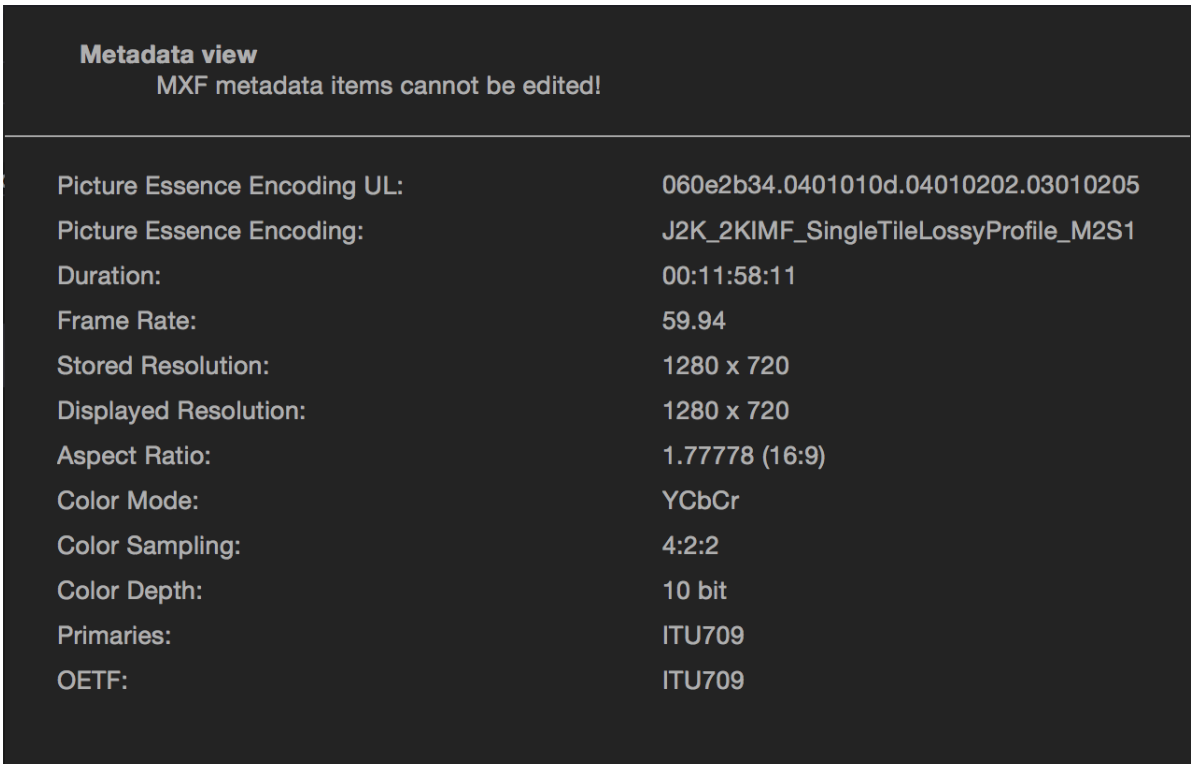
The following hot keys are available for controlling view and playback:

Key	Action
Space	Start / stop playback.
Cursor-Left	One frame forward
Cursor-Right	One frame backwards
K	Pause playback
L	Resume playback
ESC	Leave full screen (in full screen mode only)
Double-click	Toggle full screen

MXF metadata and essence descriptor inspection



Element #	Option	More details
1	View metadata	Shows additional metadata items for the selected MXF asset. Example for a Video Asset see below. This option is only available for MXF assets. For newly added assets, the Metadata wizard will open instead. The metadata view can also be opened by double-clicking on the MXF asset icon.
2	View essence descriptor	Shows the essence descriptor for the selected asset in XML format. Example see below. Note: This option is not available for newly added assets, which have not been finalized yet. The essence descriptor is extracted from the MXF file using regxmllibc [1]. [1] https://github.com/sandflow/regxmllib



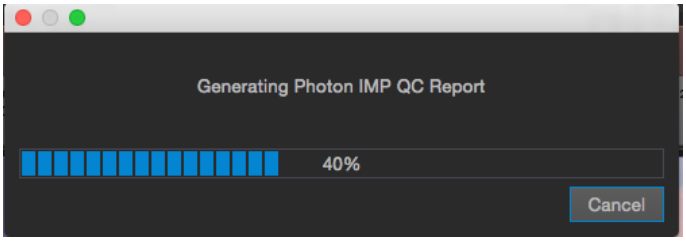
Sample metadata view

Sample essence descriptor view

Photon QC report

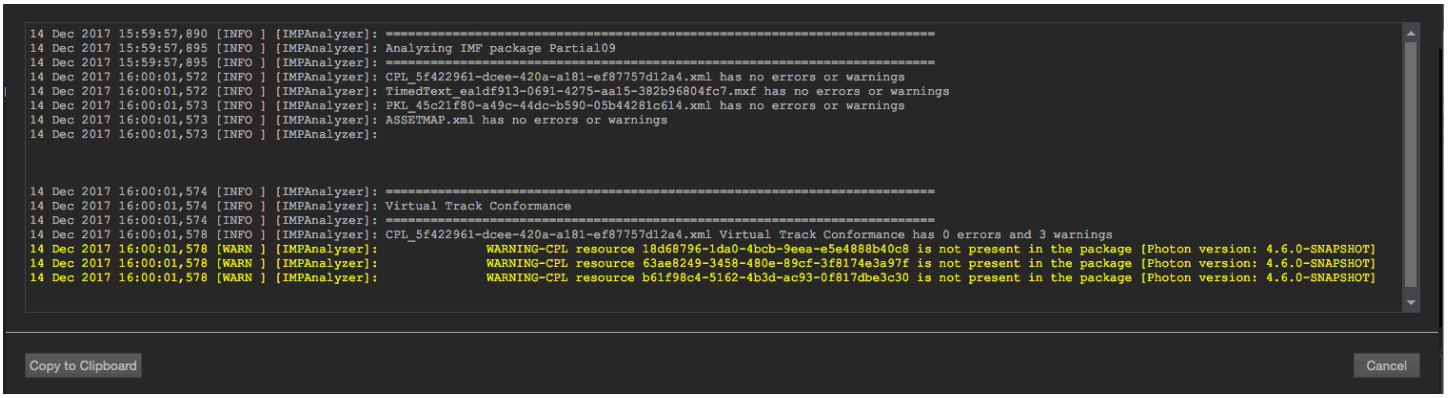
The QC button is available in the main window, once an IMP has been opened in the IMP browser.

When generating a QC report, a progress bar is shown:



Depending on the complexity of the IMP, the report may require several minutes to be generated.

A sample QC report looks like this:



Important: Generating a QC report requires Java™ Runtime Environment Version 1.8 to be installed!

If an appropriate Java™ runtime is not available, an error message will pop up.

Note: The Photon source code is available under Apache License 2.0 at https://github.com/Netflix/photon

Command line options

For advanced workflow integration, IMF Tool supports command line options:

```
Usage: IMF-Tool [options]

IMF-Tool


Options:
  -h, --help                          Displays this help.
  -v, --version                       Displays version information.
  -i, --imp-directory <directory>     Open IMP in <directory> upon startup.
  -a, --open-all-cpls                 Open all CPLs from <directory> in Timeline View.
```