



Audio Solutions for Media Files

MXF, LXF, GXF, QuickTime, WAV, AIFF



Engine saves you time and money by automating repetitive tasks commonly done in an edit suite: Loudness Processing, Dolby E transcoding, Stream Processing, File Wrapping, Audio Channel Add / Remove, Language Tagging, Pitch Correction, and almost any type of non-creative audio processing you can think of. The software is scalable and can grow as your business increases.

Engine has been used 24/7 by Broadcasters for several years, guaranteeing reliable and consistent operation. Engines flexible automation options let you control Engine from various API based tools including Teletream Vantage and Aspera Orchestrator, as well as from the included Watch Folder system, or our network client tool.

Engine includes an easy to use graphical workflow creation tool, needing minimal training to become an expert, keeping you fully in control. Processing management tools are also included for real time monitoring.

Comprehensive PDF, XML and CSV reporting facilities are part of the package, giving you access to all the information you need to keep your clients informed.

Engine is compatible with Windows, OSX and Linux, and supports virtual machine installation. A wide range of professional media file types are supported, including MXF, QT/MOV, WAV and AIFF, in all video resolutions from SD through to UHD.



Signal Processing Optional Modules:

- Loudness Compliance
- LRA Processor
- Dolby E Encode
- Dolby E Decode
- Dolby E Guard Band Correction
- Dolby Digital , Digital Plus Encode
- Channel Mapping and Mute
- Upmix
- Downmix
- Audio Descriptor
- Pitch Adjustment
- Examine
- Add and Remove Channels
- File Wrap and Language Tag
- Conditional Workflows
- Stream Manipulation
- Mono to Stereo Conversion

Engine is a software application providing audio processing solutions for Media Files. Used in Post Production and in automated broadcast environments, it is a modular product that features:

- Easy to orchestrate complex audio processing workflows
- Easy to use visual workflow creation
- Built in job management system
- Scalable processing
- Manual, Watch Folder & API operation
- High quality audio processing
- Detailed PDF and XML reports

Engine Architecture

Engine is a software application providing audio processing solutions for Media Files.

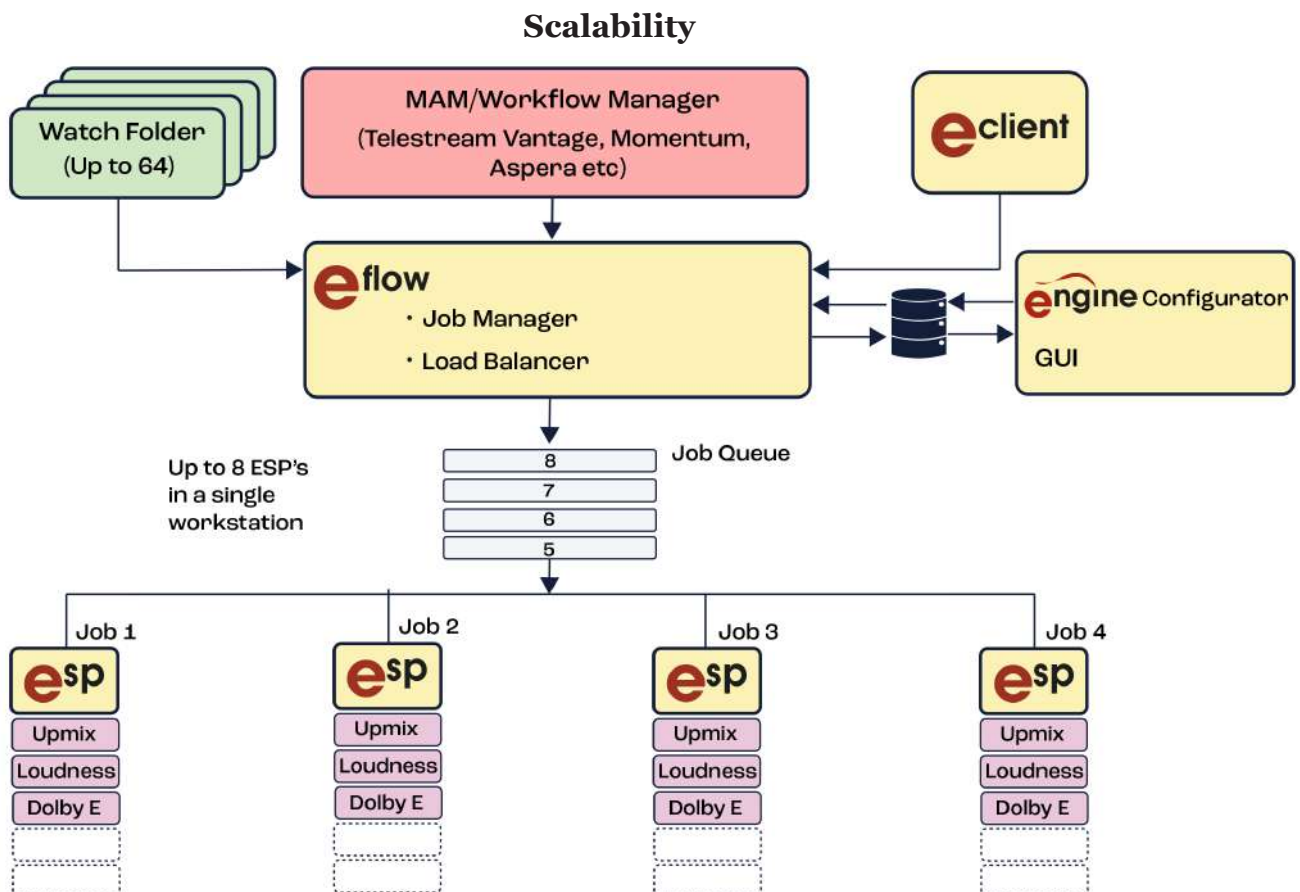
Eflow is the job management system of Engine. It registers posted jobs and adds them to a queue, assigning them to an ESP (Emotion Signal Processor) when one becomes available. Running as a service (on Windows) and a Daemon (on Mac and Linux) it is able to restart the Engine, restoring all job and workflow information and restarting the queue in the case of an application or server failure.

ESP is the Emotion Signal Processor application. It is the file processing system that executes a workflow, unwrapping audio from Media Files, applying a sequence of audio processes quickly and efficiently, then rewrapping into a Media File preserving the video and metadata content.

Scalability

Engine has been designed to provide scalability in terms of control, breadth of signal processing and speed.

Up to eight ESPs can be allocated to a single Eflow allowing up to eight files to be processed simultaneously. ESP operates at a high speed and is a simple, scalable model that provides the ability to increase total throughput.

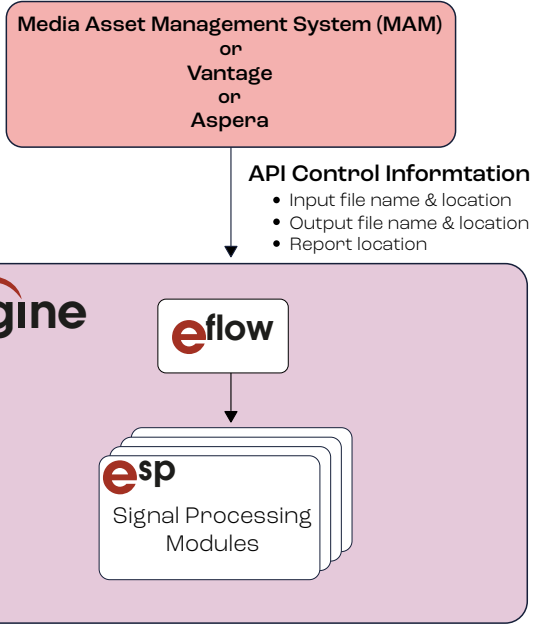


Engine Control

Engine has four modes of operation:- API, Manual, Watch Folder, Eclient

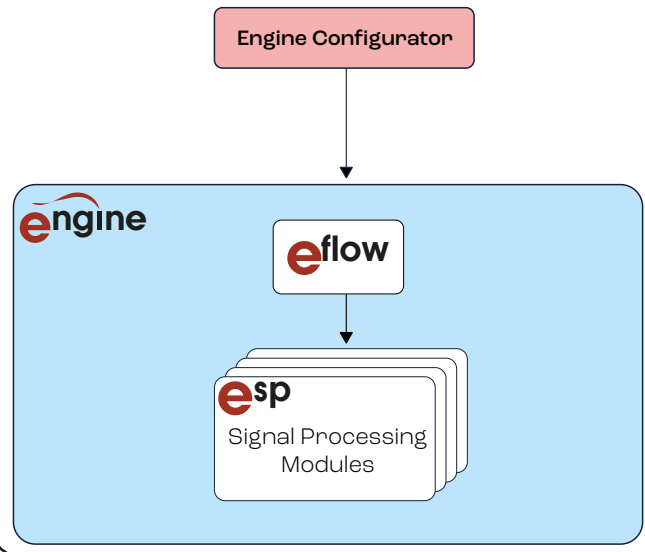
API

Simple ReSTful XML-based interface. Commands to post jobs, view workflows and monitor status.



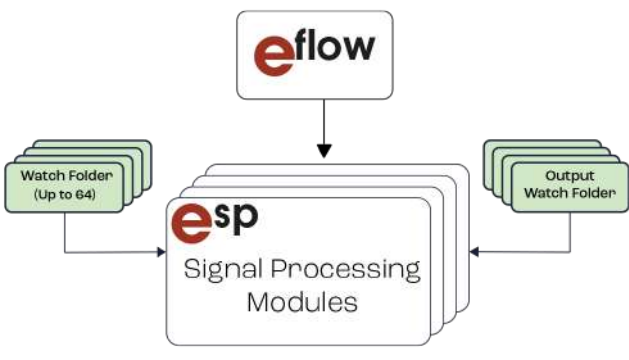
Manual

Single file can be processed and a report generated.



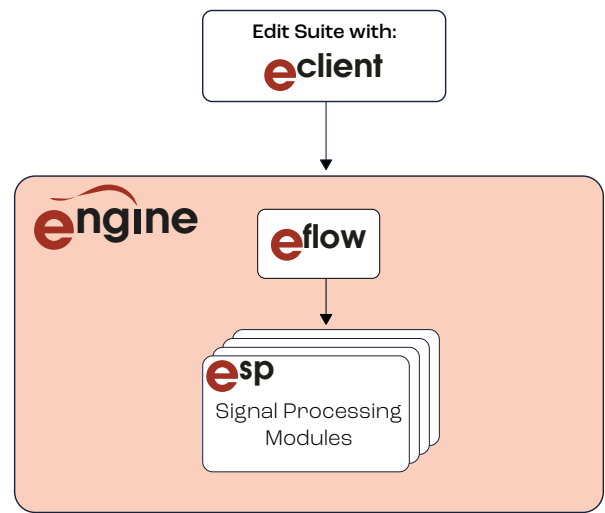
Watch Folder

Simple Watch Folder mechanism whereby files can be dropped in folders and jobs will automatically be posted to Engine. Up to 64 folders can be configured, each carrying out a unique workflow.



Eclient

Client based desktop application that provides simple UI interface to the Engine API. Multiple Eclients can be used over a network to communicate with Engine, allowing job posting monitoring and ability to view reports.



Engine Workflows

A frequent requirement for File-based workflows is to process audio to make it suitable for a wide range of delivery requirements. A series of audio processing operations are required and Engine allows creation of user defined workflows that define a sequence of operations (For example, Loudness Correction followed by Dolby® E Encoding and Channel Muting).

Engine has an easy to use UI that allows the creation and storage of workflows. These workflows can be used by MAM systems, Watch Folders and Eclient to allow a chosen file to be processed in accordance with the chosen workflow to create a new file. Particular attention has been paid to the design of the UI to quickly and easily allow creation, editing and naming of the workflows.

The UI allows the user to select audio channels (e.g. Stereo or 5.1), apply a process (e.g. Loudness), create or choose a preprogrammed profile for the process and repeat this for every unique Audio Program (so 4 Stereos could have 4 unique profiles). This operation is repeated for every required process to allow a sequence of operations (Loudness, Dolby® E Encode, Dolby® E Decode, Channel Mapping & Mute, Upmix, Downmix) that make up a workflow.

The workflow can be named and saved. The workflow can be previewed and edited at any stage of creation. Figure below shows an example workflow.

Any number of workflows can be created. These workflows can now be utilised by any of the Engine Operation modes: API, Watch Folder, Eclient and Manual Operation.



Example Workflow

Signal Processing Modules

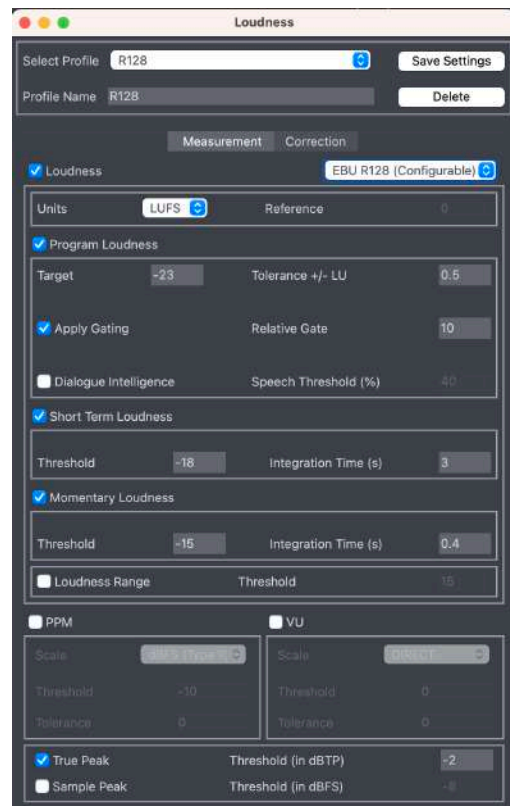
Loudness

There is a global movement to adapt Program Loudness and True Peak correction. Engine allows the creation of file based workflows that deal with all the worldwide standards and can also Measure and Correct a wide range of Channel layouts (4 Stereos, Stereo + 5.1, etc...)

Engine supports up to 64 channels of audio. An optional module will also allow loudness correction of files with Dolby E encoded audio.

The Loudness Compliance algorithm used is designed to provide correction with minimal change to the creative mix. This is achieved by using global gain for Program Loudness and local processing for True Peak, Short Term and Momentary Loudness.

There is also an optional module to allow LRA correction.

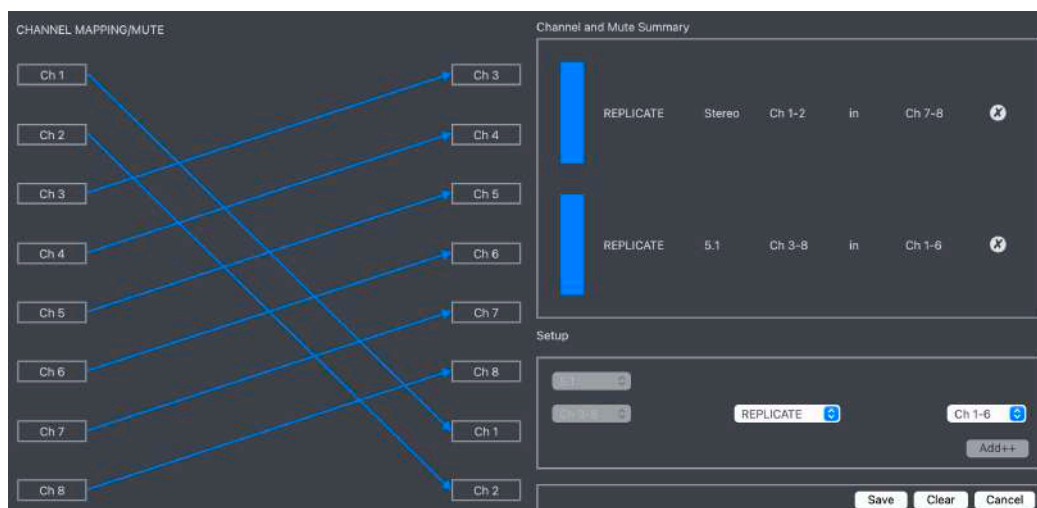


Channel Mapping & Mute

Engine's Channel Mapping module allows remapping, replication and muting of selected audio channels.

Engine's workflow configurator lets you quickly and simply configure complex channel mapping tasks as shown in the diagram.

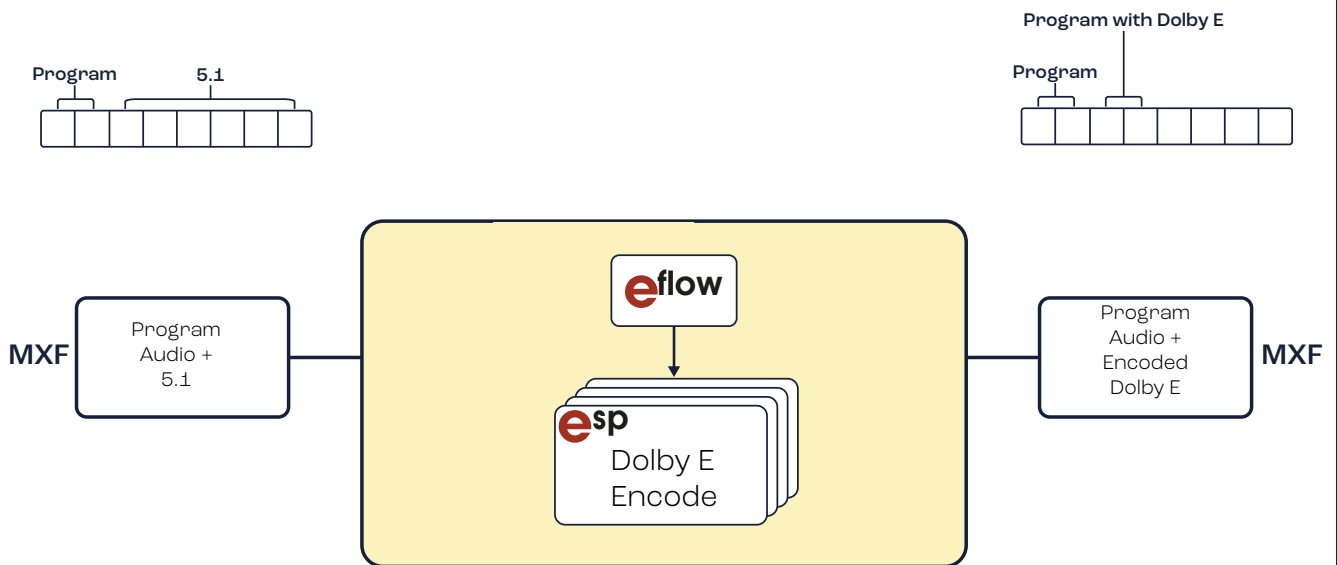
The example below remaps the stereo and the 5.1 in the audio to new locations.



Signal Processing Modules

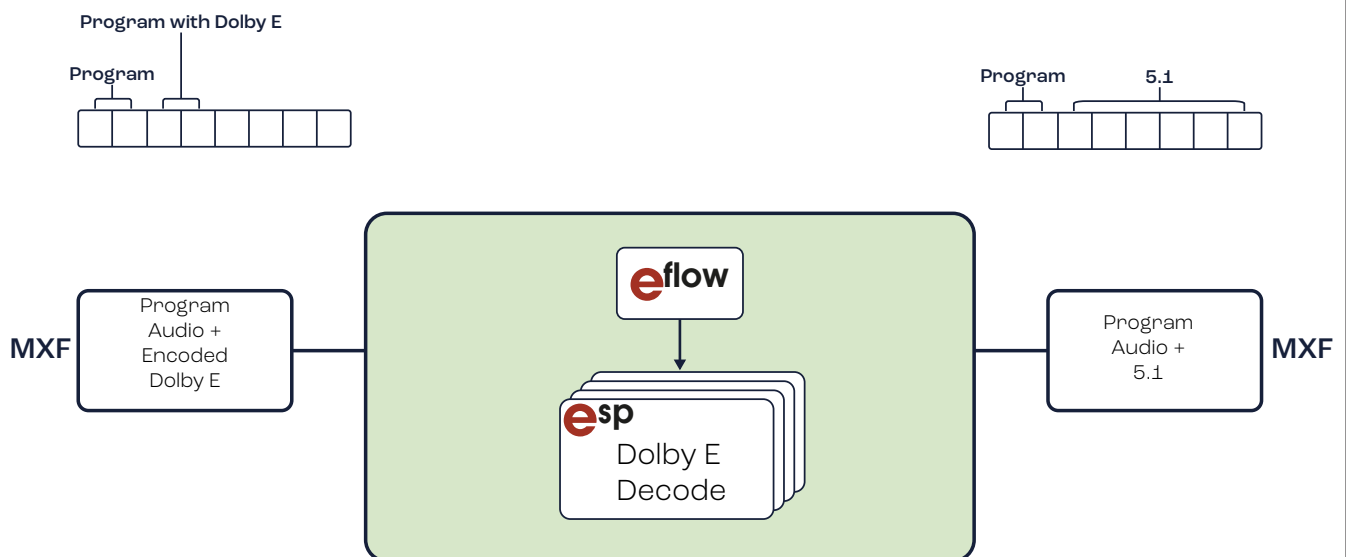
Dolby E Encode

Dolby E encoding is in regular use by many Broadcasters. The Dolby E Encode module has been designed to simplify the complexity and operational difficulties associated with encoding the different program configurations and the management of metadata profiles. Additionally, the module allows positioning of the guard band and channel selection of where the encoded Dolby E is placed.



Dolby E Decode

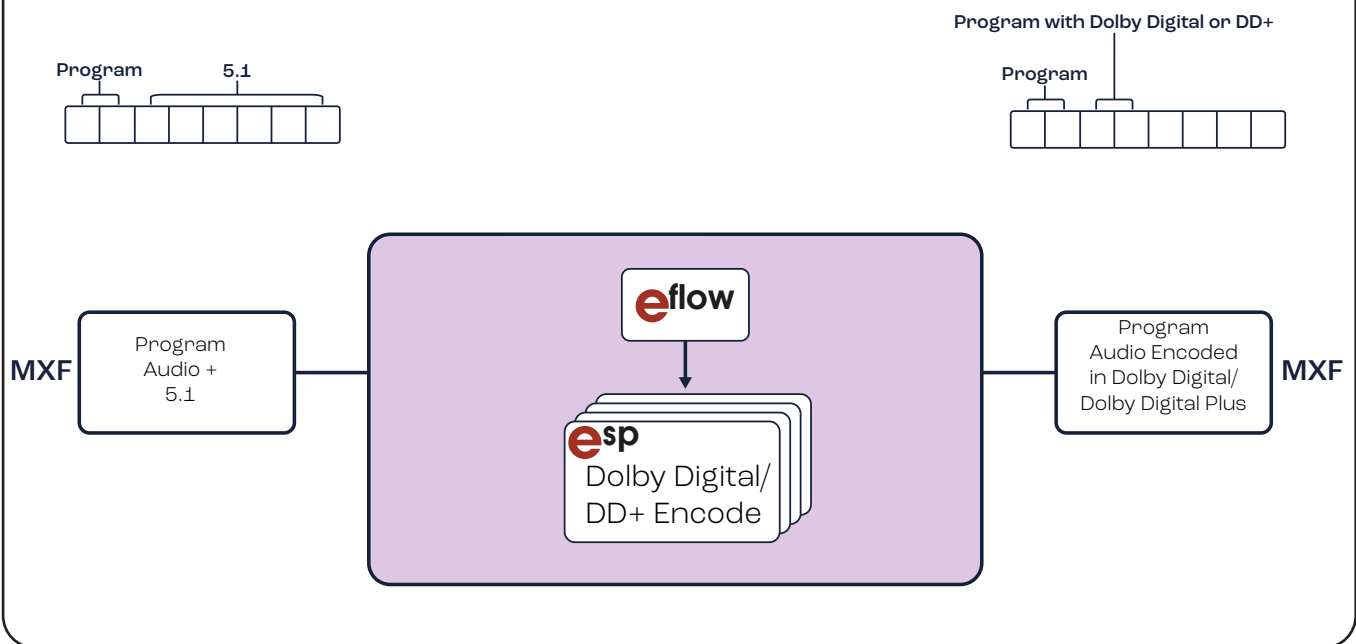
As with the Dolby E encoding, Dolby E decoding is regularly used by Broadcasters. Engine's Dolby E Decode module has been certified and has additional features that allow robust decoding from files that have a few frames of PCM at the beginning of the file and or misaligned guard bands.



Signal Processing Modules

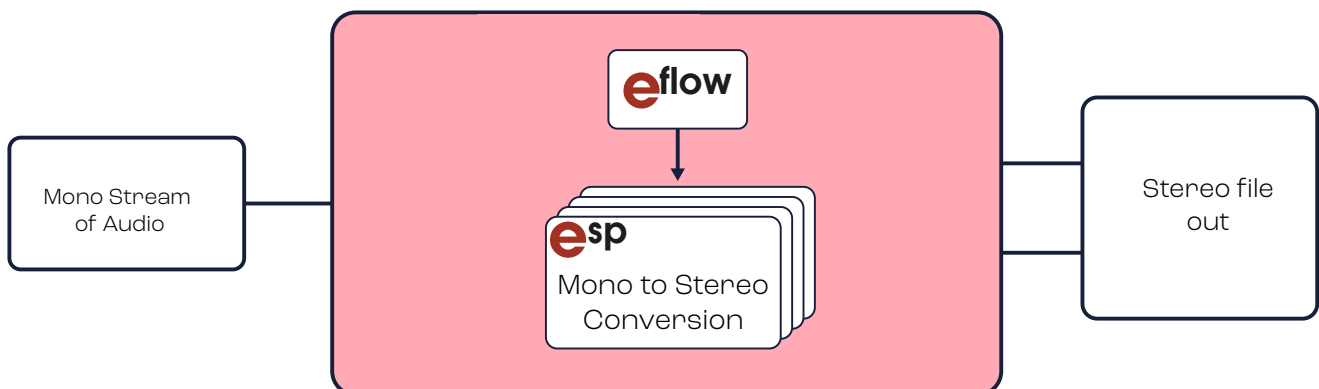
Dolby Digital/Dolby Digital Plus Encode

Dolby Digital/DD+ encoding is in regular use by many Broadcasters. Just like the Dolby E Encoding module; the DD/DD+ Encode module has been designed to simplify the complexity and operational difficulties associated with encoding the different program configurations and the management of metadata profiles. Additionally, the module allows the user to add extra streams to be encoded if and, correct the loudness to the relevant 'Dialnorm' level.



Mono to Stereo Conversion

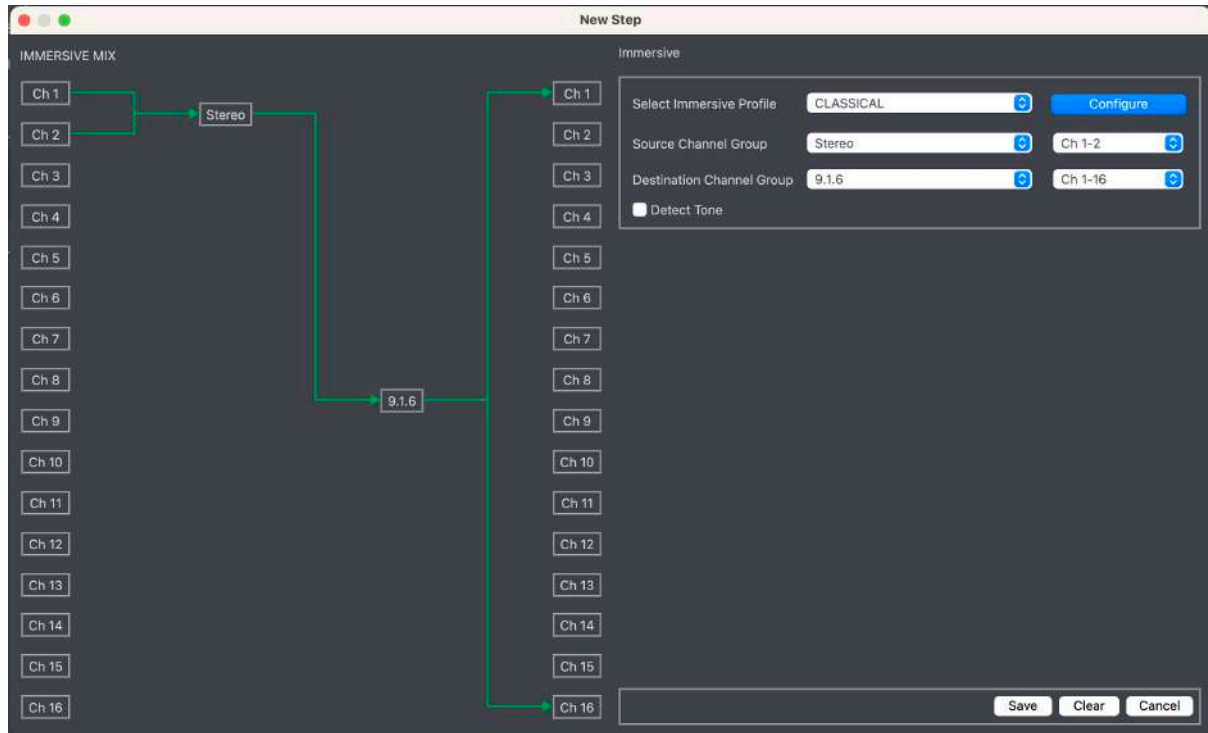
This module is used to convert mono audio content into stereo. A broadcaster may have a requirement to play out archived footage which has mono audio content. In order to be able to play this out on a modern day television, broadcasters should at least have a stereo file which has differing levels on both the Left and Right channels, so the file will not be rejected before playout. Our module offers the chance to convert a mono file to stereo, as well as offering spatial enhancement so the VU meter will accept the file.



Signal Processing Modules

Emmersive Mix

Broadcasters who multicast (SD and HD) or have archive material with a stereo or surround mix, have a frequent requirement to provide a high quality Upmix or Downmix from various sources. Emotion have teamed up with Illusonic to provide a high quality Upmix and Downmix solution.



The Emix module expands on Emotion Systems previous Upmix/Downmix solution by offering the ability to create immersive formats with the inclusion of height channels. This expands the range of available formatting options. This also means that users have the ability to perform an Upmix and Downmix at the same time, in a single process. This is necessary when going from a format like 7.1.2 to 5.1.4 (a downmix is necessary for the height channels, but an upmix is necessary for the bed surround channels).

Engine uses the Illusonic algorithm which offers the standard Lo/Ro (Left only and Right only) and Lt/Rt (Left total and Right total) upmix/downmix options and includes some unique features such as adaptive EQ and independent direct and ambient downmix levels for the surround channels. Essential controls for this module have also been left available to tweak. This means the user can carefully craft the exact sound they are after.

Emotion Systems still support existing customers who own the previous upmix/downmix solution.

Signal Processing Modules

Audio Descriptor

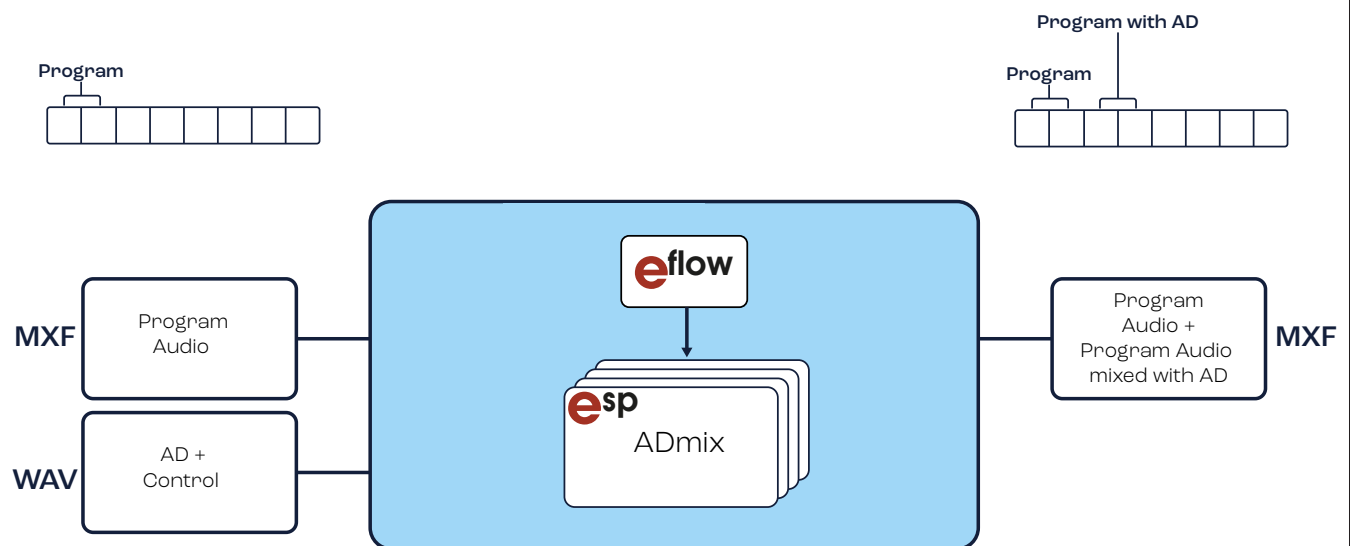
Audio Description (also called Descriptive Video Service (DVS)) is service to make video-content more accessible to visually impaired people.

The Admix module within Engine provides a simple method for mixing the program audio with AD commentary track. This function is particularly useful for delivering VOD content, and for delivery to mobile devices, where hardware for AD merging is not normally present.

Example 1:

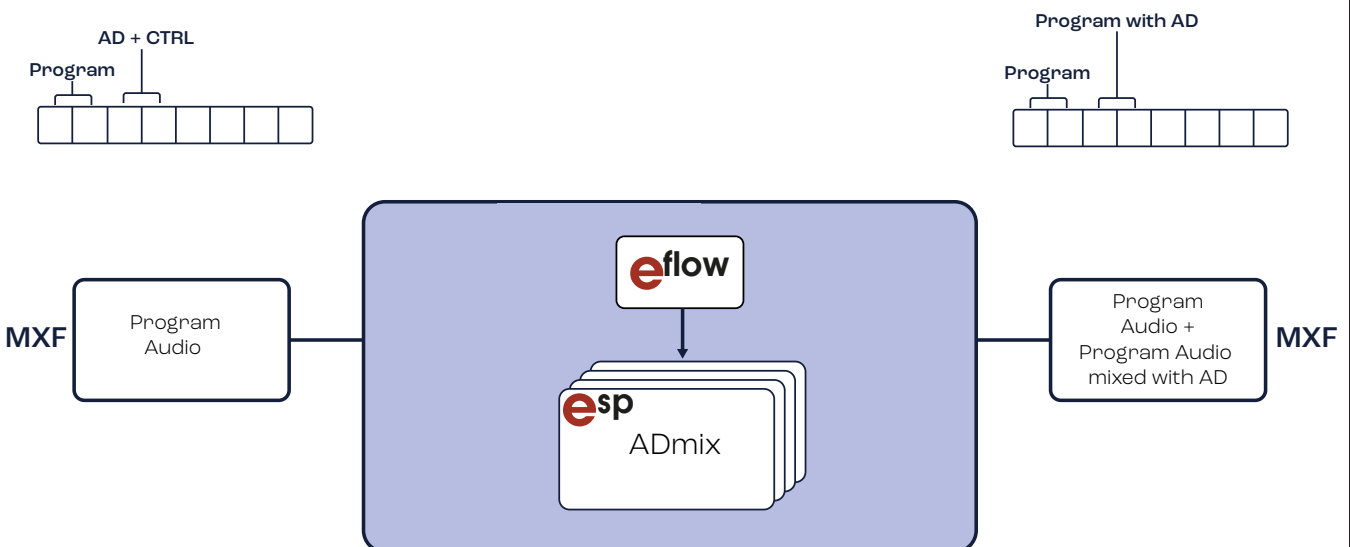
MXF with program audio AD + Control from external WAV file:

The Audio Descriptor module takes Program Audio, Mono Audio descriptor Audio and uses the Control track to creates a new combined Audio Mix.



Example 2:

MXF file has program audio as well as Audio Descriptor + Control.



Signal Processing Modules

Examine

The Examine module within Engine provides easy metadata extraction and reporting. Files with any number of audio channels may be processed and the metadata is reported in PDF or XML formats.

An example of the onscreen display is shown on the right.

If required, the complete AC3 metadata in Dolby E streams can be decoded and included in reports.

Audio Information

Number Of Channels: 2
Number Of Streams: 1
Sample Rate: 48000 Hz
Bits Per Sample: 24
Audio Duration: 1417.60 seconds
Audio Sample Groups: 68044800

Stream Information

1: 2 channels
Channel 1, Dolby E, LittleEndian
Channel 2, Dolby E, LittleEndian

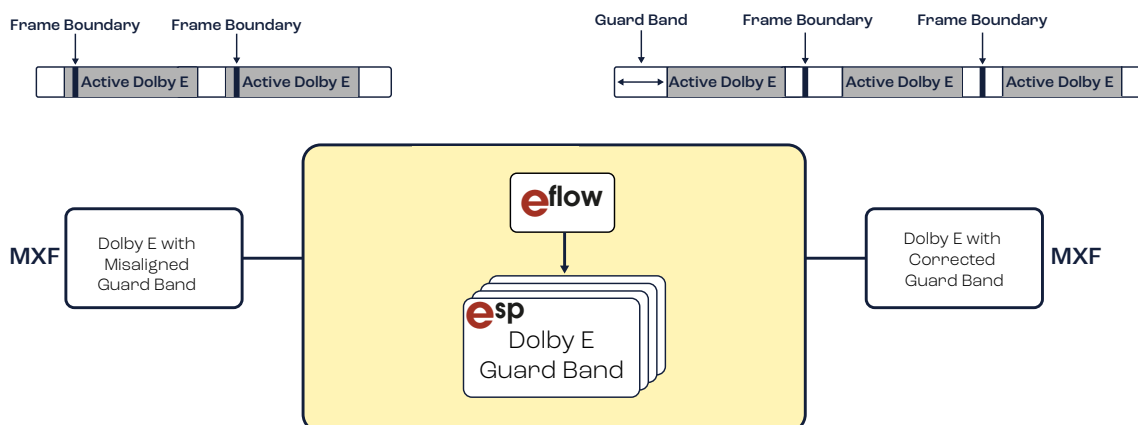
Dolby E Information

#Ch 1-2 Dolby E
Program Configuration: 2 + 2
Frame Rate: 25 fps
Bit Depth: 16-bit
Guard Band: 68 Samples
Start timecode: N/A
Offset: 15 Frames

Dolby E Guard Band Correction

Dolby have a concept called the Guard Band position, and this refers to the delay from the start of the video frame, to the start of the Dolby E audio frame. For every different video format, Dolby have defined an 'ideal' start position for Dolby E data. The Dolby E Guard Band Correction module measures the position of the Dolby E data within the frame structure and reports this. It can also be used to adjust the position to the ideal position.

In a real time environment, Dolby E audio encoding usually causes a one frame delay. The Guard Band correction module can be configured to move the Dolby E audio either forwards or backwards by up to two frames in case there is an issue caused by frame offsets.



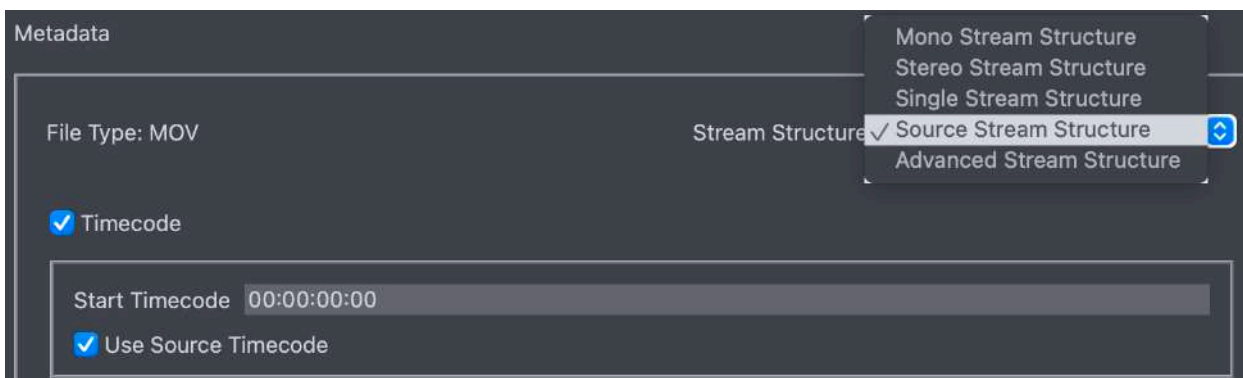
Stream Manipulation Features

Mono/Stereo/Interleaved streams metadata

Traditionally, SD MXF files contained 8 channels of audio in a single interleaved stream. HD MXF is most commonly created with mono streams, so a file containing a stereo and a 5.1 would contain 8 streams.

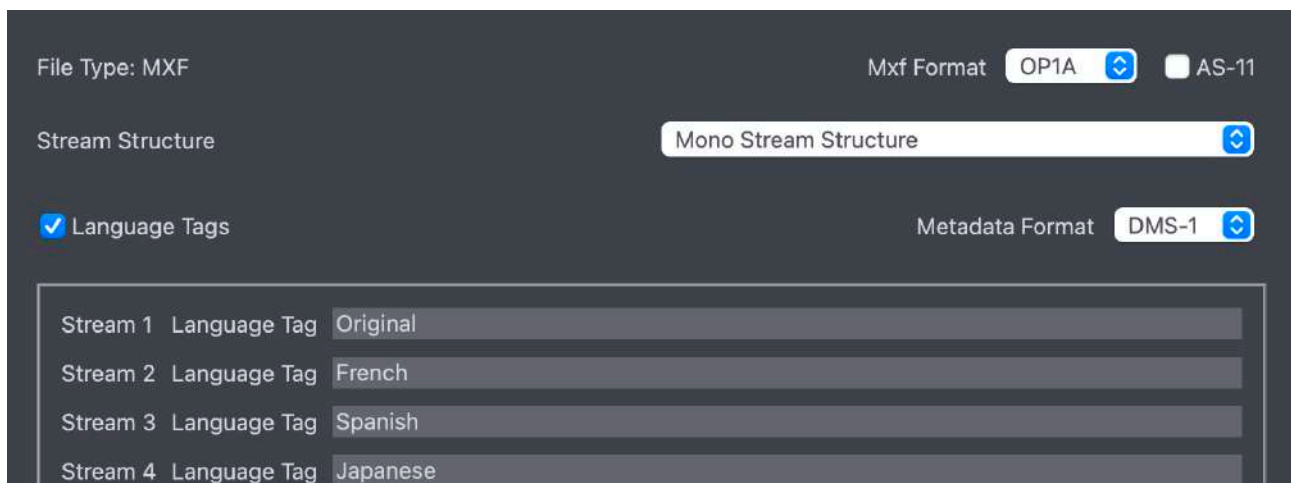
However, people are realising it is sometimes more helpful to merge channel groupings into streams. So a file containing stereo and 5.1 could be created as one stereo stream and one 6-channel interleaved stream.

Engine's stream manipulation module can convert from any input stream format to any output stream format for MXF & QT/MOV files.



Language Tagging

Language tagging is supported with the MXF OP1A format. Here you are able to insert directly into your metadata tags for individual audio streams. Varying stream structures e.g. 5.1, Stereo Streams, Mono Streams can all be assigned individual language tags.

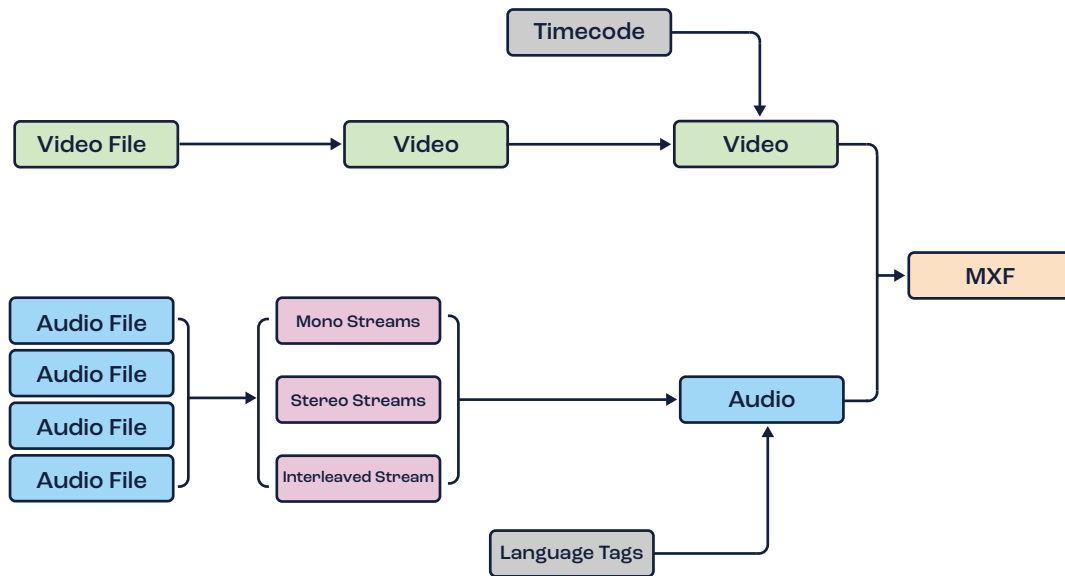


Signal Processing Modules

File Wrap and Language Tag

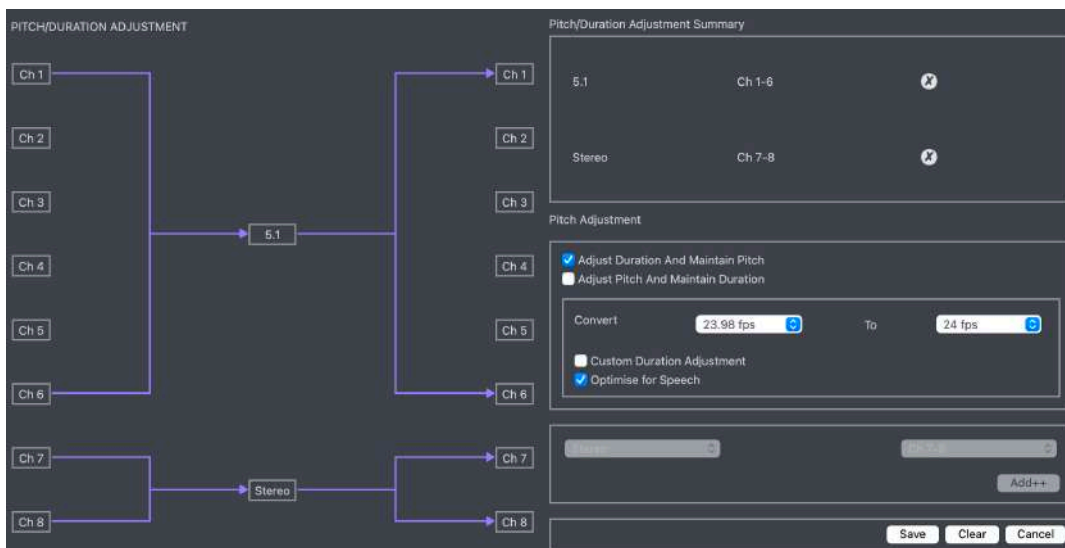
In a multilingual environment, there is often a single video essence file and multiple language versions of audio files stored as individual WAV files. This module allows the selection of the video file and the desired audio files to be wrapped into an MFX file and language tagged. The control over the operation uses a RESTful API.

Audio and Video Multiplexing to MXF



Pitch & Duration Adjustment

When converting files from US to European formats and vice versa, it is increasingly common to restamp the frame rate metadata, as this is both quick and easy, but also avoids all the potential artefacts of full standards conversion. However, the audio needs to be processed to fit the new duration, and that is the purpose of this high quality module.



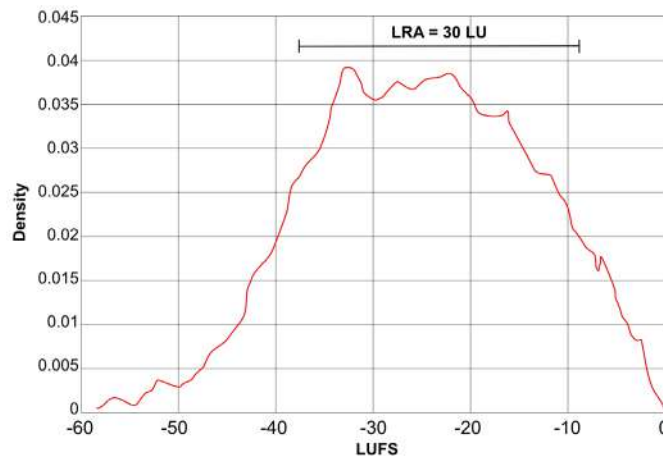
Signal Processing Modules

Loudness Range processor (LRA)

LRA is a parameter defined in the EBU Tech 3342 Loudness specification. Most applications have a flexible guideline as to the maximum permitted LRA. A few countries, and specifically Brazil, set an absolute maximum value for LRA.

Loudness range is a generic measure that helps to decide if Dynamic Compression is needed.

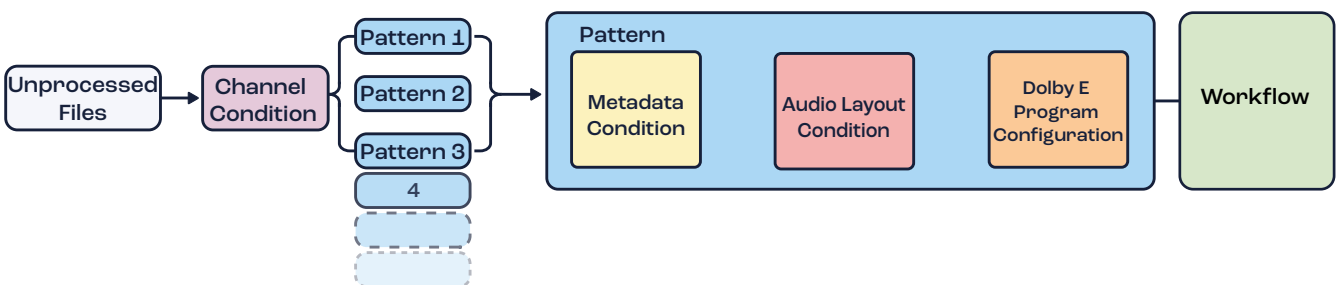
This option in the Loudness module, lets you specify the maximum LRA for the output file to meet the requirement. As a compression algorithm is used, this option should only be enabled when required, as compression in an automated environment will change the overall mix of the sound.



Conditional Workflows

Using a combination of the examine module, channel layout detection and silent channel detection - Engine is able to identify key characteristics of the file as it is loaded in, and these characteristics define which workflow the file will be processed by. This process is able to be automated through the use of watch folders or a MAM system.

The characteristics Engine is able to identify and then use to select an appropriate workflow are: Channel layout, encoded audio, Dolby E program configuration, duration, video resolution, audio bit depth, file type, frame rate.



Engine Order Options

Engine comes as standard with Eflow and 4 Watch Folders – which is a costed item.

1. Decide which ESP options are required for the workflow
2. Decide how many instances you want to have running simultaneously
3. Multiply the ESP options by the number of instances to calculate the cost of ESPs
4. Support is chargeable at 15% of the total value of the order

Engine Order Guide

ESP Modules:

	Please Tick
Loudness	<input type="checkbox"/>
Dolby E Decode	<input type="checkbox"/>
Dolby E Encode	<input type="checkbox"/>
Dolby E Guard Band Correction	<input type="checkbox"/>
Dolby Digital or Dolby Digital Plus Encode	<input type="checkbox"/>
Upmix	<input type="checkbox"/>
Downmix	<input type="checkbox"/>
Audio Descriptor	<input type="checkbox"/>
Channel Mapping & Mute	<input type="checkbox"/>
Channel Replace & Extract	<input type="checkbox"/>
Examine	<input type="checkbox"/>
Add and Remove Channels	<input type="checkbox"/>
File Wrap and Language Tag	<input type="checkbox"/>
Stream Manipulation	<input type="checkbox"/>
LRA Processor	<input type="checkbox"/>
Conditional Workflows	<input type="checkbox"/>
Pitch Adjustment	<input type="checkbox"/>
Mono to Stereo Converter	<input type="checkbox"/>
	Quantity
Number of instances	<input type="checkbox"/>
Eclient (1 as Standard)	<input type="checkbox"/>
Number of addition Eclients	<input type="checkbox"/>
	Please Tick
Eflow + 4 Watch Folders (as Standard)	<input type="checkbox"/>
28 additional Watch Folders	<input type="checkbox"/>
60 additional Watch Folders	<input type="checkbox"/>

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