User Guide

AWS Elemental Server

Version 2.18

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AWS Elemental Server: User Guide

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This is version 2.18 of the AWS Elemental Server documentation. This is the latest version. For prior versions, see the *Previous Versions* section of AWS Elemental Conductor File and AWS Elemental Server Documentation.

What Is AWS Elemental Server?

AWS Elemental Server provides fast and reliable video processing for file-based workflows. It performs simultaneous, faster-than-real-time conversion of multiple video files to create mezzanine deliverables, traditional on-demand assets, and adaptive bitrate outputs for delivery to TVs, PCs, and mobile devices.

Ideal for large-scale broadcast and multi-screen video applications, AWS Elemental Server operates seamlessly with on-premises storage systems and Amazon Simple Storage Service (Amazon S3).

Finding Information About AWS Elemental Server

Information about AWS Elemental Server is available in the following guides and resources.

AWS Elemental Server Features Guide (this guide)

This guide offers conceptual and procedural information for specific features of the software. For a list of the features covered in this guide, see the topic list previous to this section.

AWS Elemental Server API and User Guide

This document is intended for system integrators and AWS Elemental Server operators. It contains the following information:

- An outline of the interfaces for machine and human control, configuration, and monitoring. Each API is defined in enough detail to explain how to use the system and how to integrate it into larger workflow automation systems.
- An overview of how to work with transcoding jobs, job profiles, and presets.
- A list and explanation of job and system parameters.

This document is available on the **Support** tab of the web interface of your AWS Elemental Server appliance and as a PDF on the AWS Elemental User Community.

AWS Elemental Server Installation Guide

This document describes how to perform initial installation of AWS Elemental Server. For the most recent version, see AWS Elemental Server Installation Guide.

AWS Elemental Server Configuration Guide

This document describes how to complete the initial settings configurations for AWS Elemental Server. For the most recent version, see AWS Elemental Server Configuration Guide.

Including Inserted Images (Graphic Overlays) with AWS Elemental Server

The image inserter (graphic overlay) feature lets you insert a still image or motion graphic at a specified time and display it as an overlay on the underlying video for a specified duration. With still overlays, you can specify fade-in and fade-out times and adjust the opacity.

You can set up an output with both a motion graphic overlay and still overlays. For example, you might include a motion graphic logo in the corner of the video frame throughout the duration of the video and a still image HDR indicator for only the portions of the file that are HDR. Each overlay is independent of the others, with its own settings for opacity, fade-in and fade-out times, position on the frame, and the length of time that it is on the video. You can set up overlays so that they all appear on the underlying video at the same time and physically overlap each other.

You can use up to one motion overlay and 100 still overlays per job.

Topics

- Still Image Inserter (Graphic Overlay) in AWS Elemental Server
- Motion Image Inserter (Graphic Overlay) in AWS Elemental Server

Still Image Inserter (Graphic Overlay) in AWS Elemental Server

The following procedure walks you through setting up a still graphic overlay. To begin, decide where in your job to specify the overlay. This choice affects how the overlay appears in outputs.

> **Note**
>
> One job can have any combination of input, stream, and global overlays. To set up multiple overlays, repeat this procedure.

To set up a still image overlay

1. Decide where in your job to specify the overlay.For information about how this choice affects how the overlay appears in the outputs, see Choosing Between Input, Stream, and Global Overlay.

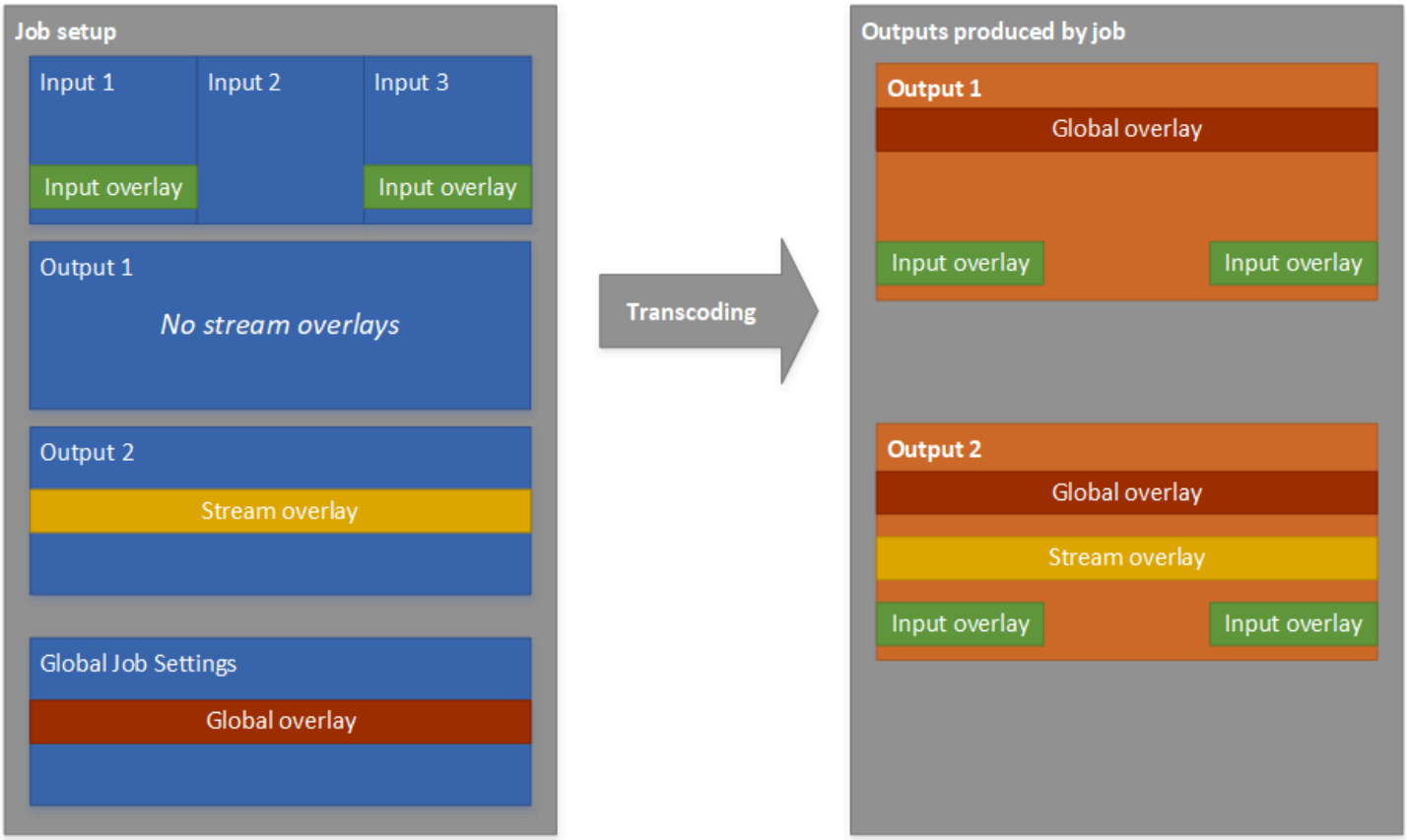
2. Prepare your overlay file.For more information, see Overlay File Requirements and Sizing Your Overlay to Account for Scaling.
3. In the appropriate section of the job, choose the **Image Inserter** slider and then choose **Add Image**. Find the appropriate sections as follows:
   - Find the dark gray **Input** section at the top of the job.
   - Find the medium gray **Global Processors** section just below the **Input** section.
   - Add **Stream** sections in the **Output** sections that are on the appropriate group tab in the very light gray **Output Groups** section at the bottom of the job.
4. Specify values for the image inserter settings. For more information about these specific settings, see the following topics:
   - For information about **Start Time**, **Duration**, **Fade In**, and **Fade Out**, see Setting Up When Your Overlay Plays.
   - For information about **Layer**, see Setting Up Overlapping Overlays.

Choosing Between Input, Stream, and Global Overlay

You can add still image overlays to your inputs, your streams, and throughout the job globally. Where you specify your graphic overlays affects where in your transcoded assets the overlays appear. One job can have any combination of input, stream, and global overlays.

The following diagram shows how input, stream, and global overlays appear in the video files that are created by a job. Input overlays appear on all outputs, but only in the portions of the outputs that come from the input that has the overlay.Stream overlays appear throughout the entirety of any output that uses the stream. Global overlays appear on all outputs throughout the entire length of the outputs.

> **Note**
>
> In this diagram, all overlays are specified for the entire duration of the input or output. You can instead specify a shorter overlay duration within that time.



Input Overlays

Choose input overlay for the following situations:

- You want the same overlays on every output.
- You want an overlay on only the parts of your outputs that correspond to individual inputs.

Here are examples of situations where you would use an input overlay:

- Some of your inputs already have your logo as an overlay and some of them don't. You want to add the logo to the inputs that don't already have it.
- Some of your inputs are programming that you want your logo on. Other inputs are advertisements or blank slates that you don't want your overlay on.
- Your job has only one input and you want your overlay to appear for the entire duration of the video on every output of the job.

Global Overlays

Choose Global Overlay for these situations:

- You want overlays that appear the same way on every output.
- You have multiple inputs, but you want the same overlay across all of them.

Stream Overlays

Choose Stream Overlay for the following situations:

- You want overlays on some outputs but not others.
- You want different overlays on different outputs.
- You want different overlays on different renditions within one ABR stack.
- You have multiple inputs, but you want the same overlay across all of them.

These examples are situations where you would use stream overlay:

- You set up a standalone file output with high definition and another standalone file output with standard definition. You want to include an HD indicator in the corner of the frame on the high definition output only.
- You set up one of the renditions in your ABR stack with high definition. You want to include an HD indicator in the corner of the frame on this rendition only.
- You are stitching together several films as separate inputs to create a single-asset film marathon. You want to put a graphic on all of them indicating that they are part of the larger marathon.

Overlay File Requirements

Set up the image files that you want to insert over your video as follows:

- **File type**: Use files with the extension `.png` or `.tga`.
- **Aspect ratio**: Use any aspect ratio; the aspect ratio of the overlay file doesn't need to match the aspect ratio of the underlying video.
- **Size in pixels**: Use any size. If the overlaid graphic is larger than the output video frame, the service crops the graphic at the edge of the frame.

> **Note**
>
> In jobs that scale the video resolution, whether your overlay scales with your video depends on where you specify the graphic overlay. For more information, see Sizing Your Overlay to Account for Scaling.

Sizing Your Overlay to Account for Scaling

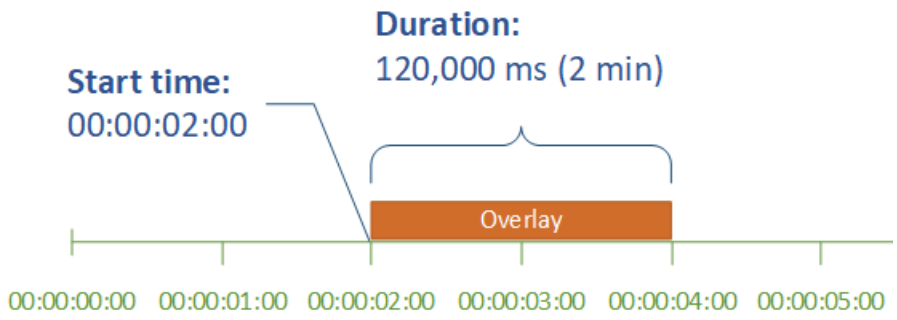
In jobs that scale the video resolution, whether your overlay scales with your video depends on where you specify the graphic overlay. Global and input overlays scale with the video; stream overlays do not.

For example, suppose that the input video for your job is 1080 x 1920 and you specify three outputs at 720 x 1280, 480 x 640, and 360 x 480. You want your square logo to be 10% of the width of your frames. You would provide overlay images at the following resolutions:

- For a motion graphic overlay or an input graphic overlay, provide a 108 x 108 image. AWS Elemental Server appropriately sizes each overlay on each output.
- For a stream graphic overlay on your 720 x 1280 output, provide a 72 x 72 image.
- For a stream graphic overlay on your 480 x 640 output, provide a 48 x 48 image.
- For a stream graphic overlay on your 360 x 480 output, provide a 36 x 36 image.

Setting Up When Your Overlay Plays

Regardless of whether you specify a still graphic overlay in an input, a stream, or globally to the job, you set up when it starts and how long it runs by specifying the **Start time** and **Duration**. The following image shows how you would specify these settings if you wanted your overlay to start two minutes into the video and to remain on the video for two minutes. If you keep these settings in their default state, the overlay begins at the first frame of the input or output and remains on the video for the duration of the input or output.



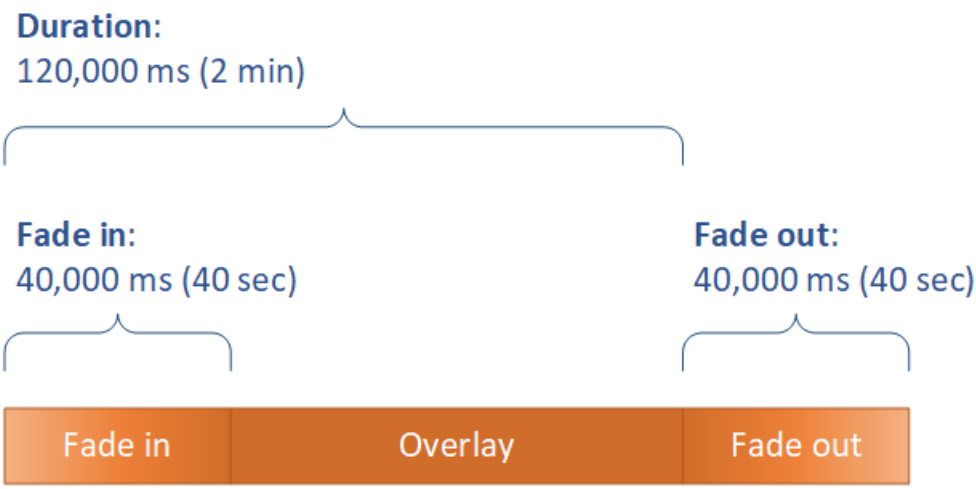
Start time

Provide the timecode for the first frame where you want to have the overlay appear. If you set up your overlay to fade in, set the the fade-in to begin at the start time.

> **Note**
>
> Make sure that you take your timecode source settings into account when you provide your start time. For input overlays, the input **Input > Timecode Source** setting affects your overlay start time. For stream and global overlays, the job-wide **Timecode Config > Source** setting affects your overlay start time.
> Unless you have a reason to set it otherwise, set both of these settings to **Start at 0** and specify your timecode counting from 00:00:00:00 at the first frame, as illustrated in this example.

Duration

Specify the length of time, in milliseconds, that you want the overlay to remain for. This duration includes fade-in time, but not fade-out time, as the following image shows.

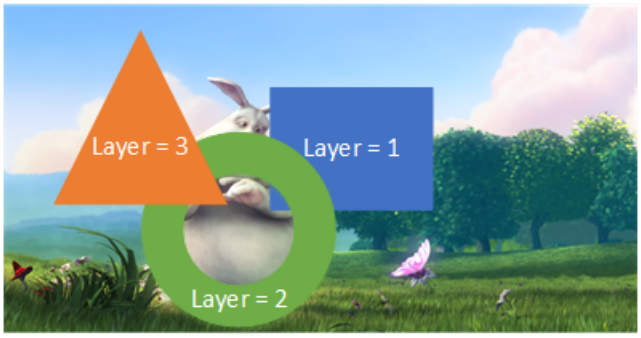


Setting Up Overlapping Overlays

The **Layer** setting specifies how overlapping graphic overlays appear in the video. The service overlays graphics with higher values for **Layer** on top of overlays with lower values for **Layer**. Each overlay must have a unique value for **Layer**; you can't assign the same layer number to more than one overlay.

> **Note**
>
> Even if your overlays never overlap, you need to specify unique **Layer** values for each overlay in the job.

The following illustration shows how the value for **Layer** affects how a graphic overlay appears in relation to other overlays. The triangle has the highest value for **Layer** and appears on top, obscuring the video frame and all graphic overlays with lower values of **Layer**.



To specify a value for the Layer setting

1. Set up your graphic overlay as described in Still Image Inserter.
2. For **Layer**, enter a whole number from 0 to 99.

> **Note**
>
> You can use each number only once. Each graphic overlay must have its own layer.

Motion Image Inserter (Graphic Overlay) in AWS Elemental Server

The following procedure walks you through how to set up motion graphic overlays. Motion graphic overlays are global, so they appear in all outputs.

To set up a motion graphic overlay

1. Prepare your overlay asset. For more information, see Requirements for Motion Overlay Files.

> **Note**
>
> Motion graphic overlays are in the global processors. They appear on every output of the job and they scale with the video. Therefore, make your overlay size proportional to the size of your input video.

2. In the medium gray **Global Processors** section of the job, choose the **Motion Image Inserter** slider. The **Global Processors** section is just below the dark gray **Input** section.
3. Specify values for the motion image inserter settings. See the following table for information about each field. For information about **Action Time** and **Loop Input**, see Setting Up When Your Motion Graphic Plays.

Field	Description
Insertion Mode	Choose SWF, MOV, or PNG.
Input	The location and file name of the motion graphic.

Field	Description
	For more information, see Specifying the Motion Overlay File Location.
Username, **Password**	If access to your local or mounted directory requires a user name and password, choose the lock icon next to **Browse** to show the **Username** and **Password** fields. If you're using Amazon S3, enter the Access Key ID for **Username**. Enter the Secret Access Key for **Password**.
Left	Placement of the left edge of the motion overlay relative to the left edge of the video frame, in pixels. 0 is the left edge of the frame.
Top	Placement of the top edge of the motion overlay relative to the top edge of the video frame, in pixels. 0 is the top edge of the frame.
ActionTime	The start time for the overlay. Specify the start time in ISO 8601 UTC time format with no dashes or colons. For example, 20160102T030405.678Z. For more information, see Setting Up When Your Motion Graphic Plays.

Field	Description
Loop Input	Check to loop the motion overlay indefinitely. The motion overlay runs until the event ends. Deselect if you want to run the motion overlay only once. For more information, see Setting Up When Your Motion Graphic Plays.
Full Frame	Expand the overlay to fit the video frame. In this case, make sure **Left** and **Top** are set to 0. If you enable **Full Frame** and the motion overlay has a different aspect ratio than the underlying video, AWS Elemental Server scales the overlay until either: • The motion overlay fits in the length. The overlay is then positioned with equal space on the left and right. • The motion overlay fits in the width. The overlay is then positioned with equal space above and below. **Note** The **Stretch to output** field in the **Stream** section does not affect the motion overlay. When the video is stretched, the overlay is not stretched.

Field	Description
Numerator, **Denominator** (.png only)	If you're using a series of `.`png files for your overlay, specify the frame rate as a fraction. For example, to set the frame rate to 23.976 frames per second, set **Numerator** to 24000 and set **Denominator** to 1001.
SWF Arguments (`.swf` only)	If your overlay is a `.swf` file and if you included ActionScript code in the `.swf` asset that includes arguments, enter values for the arguments in simple JSON name/value format.

Requirements for Motion Overlay Files

General requirements for motion graphic files

Set up the files for your motion graphic as follows:

- **File type**: Use `.swf`, `.mov`, or a set of sequential `.`png files.
- **Frame rate**: Use any frame rate; it doesn't have to match the frame rate of the underlying video. Frame rate is embedded in `.mov` and `.swf` files; with a set of `.`png files you specify the frame rate when you set up the overlay.
- **Aspect ratio**: Use any aspect ratio; it doesn't have to match the aspect ratio of the underlying video.
- **Size in pixels**: Use any size. AWS Elemental Server scales the motion graphic with any outputs that have video scaling. Create the overlay in the size that looks how you want it when overlaid on your input video.
- **Location**: Save your overlay files in one of the following places:
  - Local to the AWS Elemental Server system.

    For example: `/data/assets/overlay_001.`png
  - A remote server via a mount point.

    For example: `/data/mnt/assets/overlay_001.`png

- **AWS Elemental Server version 2.10 and later** An Amazon S3 bucket, using SSL.

  For example: `s3ssl://company.test/sample_bucket/overlay_001.png`
- **AWS Elemental Server version 2.10 and later** An Amazon S3 bucket, without SSL.

  For example: `s3://company.test/sample_bucket/overlay_001.png`

For Amazon S3, use sse=true to enable S3 Server Side Encryption (SSE) and rrs=true to enable Reduced Redundancy Storage (RRS). Default values for RRS and SSE are false.

Additional requirements for sets of sequential .png files

Set up your .png motion image files follows:

- Make sure that the names of the .png files end with sequential numbers that specify the order that they are played in. For example, `overlay_000.`png, `overlay_001.`png, `overlay_002.`png, and so on.
- Pad your initial file name with enough zeros to complete the sequence. For example, if the first image is `overlay_0.`png, there can be only 10 images in the sequence, with the last image being `overlay_9.`png. But if the first image is `overlay_00.`png, there can be 100 images in the sequence.
- Make sure that the number of images in your series matches the frame rate and your intended overlay duration. For example, if you want a 30-second overlay at 30 fps, you should have 900 .png images.

Specifying the Motion Overlay File Location

Specify one of the following valid locations for your overlay file:

- Local to the AWS Elemental Server system.

  For example: `/data/assets/overlay_001.`png
- A remote server via a mount point.

  For example: `/data/mnt/assets/overlay_001.`png
- **AWS Elemental Server version 2.10 and later** An Amazon S3 bucket, using SSL.

  For example: `s3ssl://company.test/sample_bucket/overlay_001.`png

- **AWS Elemental Server version 2.10 and later** An Amazon S3 bucket, without SSL.

  For example: `s3://company.test/sample_bucket/overlay_001.png`

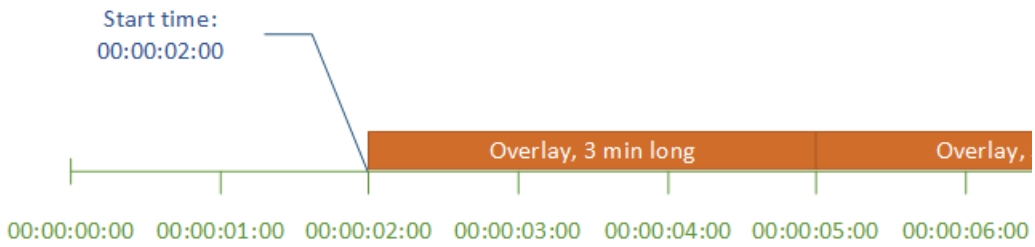
For Amazon S3, use sse=true to enable S3 Server Side Encryption (SSE) and rrs=true to enable Reduced Redundancy Storage (RRS). Default values for RRS and SSE are false.

> **Note**
>
> If your motion overlay is a series of `.`png images, the way you specify it depends on the version of AWS Elemental Server you're running. In version 2.10 and later, include the full filename of the first image, as in the examples in the previous list. In version 2.9 and earlier, include the part of the filename that is common to all the images. For example, `/data/assets/overlay_`.

Setting Up When Your Motion Graphic Plays

When you place a motion graphic overlay, you set up when it starts and how long it runs by specifying the **Action Time** and **Loop Input**. The following image shows how you would specify these settings if you wanted your overlay to start two minutes into the video and to continuously loop over the rest of the video. If you keep **Action Time** and **Loop Input** in their default state, the overlay will begin at the first frame of each output and remain on the video for the duration of the motion graphic played once.

> **Note**
>
> In this example, the motion graphic is three minutes long, but the overlay is set to continue to repeat the motion graphic until the end of the output.



Action Time

Provide the timecode for the first frame that you want to have the overlay appear on. If you set up your overlay to fade in, the fade-in begins at the start time.

> **Note**
>
> Make sure that you take your timecode source settings into account when you provide your start time. For motion graphic overlays, the job-wide **Timecode Config > Source** setting affects your overlay start time. The input **Input > Timecode Source** setting affects doesn't affect your overlay start time.
> Unless you have a reason to set it otherwise, set both of these settings to **Start at 0** and specify your timecode counting from 00:00:00:00 at the first frame, as illustrated in the example.

Loop Input

You can set your overlay to last the duration of the motion graphic played through once or you can set it to loop motion graphic continuously from the start time to the end of the output. The duration of a `.mov` motion graphic is built into the `.mov` file, which has a set number of frames and a defined frame rate. If your motion graphic is a set of .png images, you determine the duration of the overlay by how many images you provide and the framerate you specify. The duration in seconds is the number of frames times the framerate in frames per second.

Using SWF Files for Motion Graphic Overlay with AWS Elemental Server

With Shockwave Flash (SWF) files, the AWS Elemental encoder renders each frame of animation during transcoding. SWF rendering is resource-intensive, so poorly optimized SWF assets may significantly slow down transcoding time.

If your motion graphic overlay doesn't rely on any of the ActionScript abilities of Flash, for example, performing squeezeback, then a SWF file may not be the best choice, especially at high resolutions and/or high framerates. For more information about using the other supported formats for motion graphic overlay, see *Including Inserted Images (Graphic Overlays)*.

For motion graphics that rely on ActionScript, follow the best practices outlined in this document to create SWF files that are optimized to render with the least impact on encoder system resources.

Topics

- Minimize Your Flash Stage Size
- Optimize Flash Stage for Input
- Optimize Your Assets
- Sandbox the SWF File
- Do Not Embed Video
- Be Wary of Simulating Video in Flash
- Set Publish Target and Script

Minimize Your Flash Stage Size

If your overlay only takes up a small portion of the screen (such as a lower-third or animated bug), size your Flash stage as small as possible to still contain the asset's size/motion/movement. Position it within the underlying video in AWS Elemental Server when setting up the event or job. For example, instead of putting a 40x40 animation on a 1280x720 Flash canvas, size your canvas down to 40x40 (or just slightly larger to capture any dropshadow, embossing, and such).

To specify the position of the animation, go to the Motion Image Inserter portion of the Global Processors section of the AWS Elemental event or job. Use the “Left” and “Top” fields to specify the offset, in pixels, from the top left corner of the screen.

Optimize Flash Stage for Input

For best quality, the resolution and framerate of the animation should match those of the underlying video. We particularly recommend against scaling down.

If the animation resolution and framerate cannot be changed, the AWS Elemental encoder automatically adjusts the animation, but the quality of the animation may suffer.

Optimize Your Assets

Be sure the assets in your Flash animation are optimized for the canvas.Don’t embed a series of large images and scale them down to fit.Instead use images that are properly sized before bringing them into Flash.

Sandbox the SWF File

Test the SWF file in the sandbox environment before using it. In the sandbox testing environment, the SWF file must not reference other resources on the filesystem or network, which would slow down the rendering of the frames.

Do Not Embed Video

The AWS Elemental motion graphic overlay feature does not have the ability to decode video.

Therefore, you cannot embed video into your Flash animation.

Be Wary of Simulating Video in Flash

One way of simulating video in Flash is to include a sequence of images in the SWF file.This mechanism is supported but not recommended. We strongly encourage use of the native Flash animation components as Flash is optimized for those. Fall back to using sequences of images only as a last resort and only for small subsections of the screen as Flash is more reliable in those situations.

If you do use a sequence of images, it is especially important to optimize your images—make sure they are small and simple, crop them down to the smallest possible area, and keep them scaled 1:1 with the image canvas.

Set Publish Target and Script

Set your Publish Settings so that Target is Flash Player 11.1 and Script is set to ActionScript 3.0. This is the only version that is supported.

Including SCTE-35 Markers with AWS Elemental Server

You can use AWS Elemental Server to manipulate the SCTE-35 messages in MPEG-2 transport stream (TS) inputs. These messages may or may not include segmentation descriptors. You can also use AWS Elemental Server to remove or include the cueing information conveyed by SCTE messages in the output streams (video, audio, closed captioning, data) and in any associated manifests. The processing instructions are all set up in the AWS Elemental Server job.

Note that AWS Elemental encoders do not support processing of manifests that are present in the input. The information in these manifests is not ingested by the AWS Elemental encoder and is not included in the output or the output manifest.

About this topic

SCTE messages may convey DPI cueing information for ad avails and for other non-ad-avail messages such as programs and chapters.

This topic covers both ESAM and non-ESAM processing of SCTE messages.

Assumptions

This topic assumes you are familiar with the following:

- SCTE-35 standards and how the input you are encoding implements these standards
- Profiles and with managing AWS Elemental Server jobs.

SCTE Processing Options

AWS Elemental Server supports the following processing possibilities.

Blanking and Blackout

The “cue out” and “cue in” instructions in SCTE-35 messages line up with specific content in the video, audio, and closed captions streams. You can set up so that this content is blanked out in the output.

- The content for ad avails is blanked out using the Ad avail *blanking* feature.
- The content for other messages is blanked out using the *Blackout* feature.

You must set up the desired behavior in the job or profile.

SCTE-35 Message Passthrough

SCTE-35 messages can be included in the output data stream in any TS output. You must set up the desired behavior in the job or profile.

Manifest Decoration

Manifest decoration has the following options:

- HLS and HDS outputs can be set up so that their manifests include instructions that correspond to the original SCTE-35 message content.
- MS Smooth outputs can be set up to include these instructions in the sparse track.

You must set up the desired behavior in the job or profile.

Conditioning by a POIS

Optionally, SCTE-35 messages can be diverted to a POIS for ESAM conditioning. This conditioning is in addition to all the other processing (manifest decoration, blanking and blackout, and passthrough).

POIS and ESAM conditioning are covered in this manual in POIS Conditioning.

Default Behavior

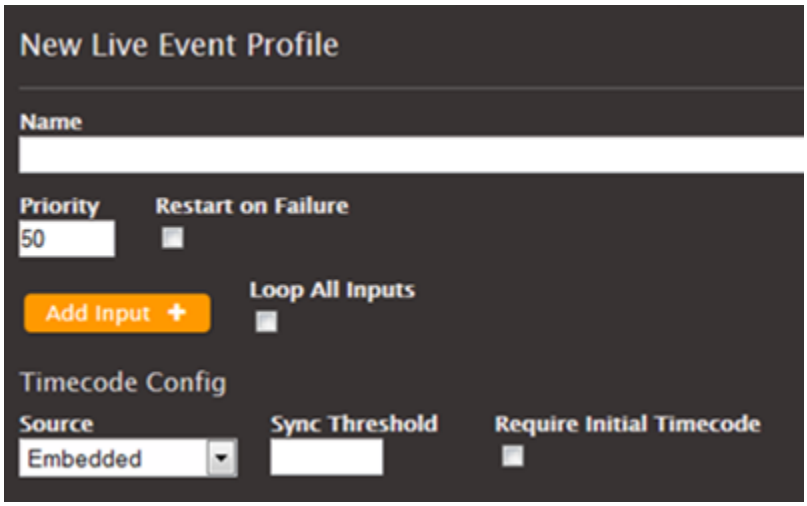
The default handling of SCTE-35 messages by AWS Elemental Server includes the following:

- No manifest decoration: Does not convert any SCTE-35 messages to job information in any output manifests or data streams.
- No passthrough: Does not pass through SCTE-35 messages in any data stream outputs.
- No blanking: Does not blank out video content for any jobs: leave the content as is.

If you want this default behavior in all of your outputs, you can submit your job without adjusting any SCTE-35 settings.

About Timecode Configuration and Timers

The job or profile includes a **Timecode Configuration** field that identifies the source for time code stamps to be inserted in the output. The source for these stamps may be a timecode embedded in the input or may be a source external to the input (for example, the system clock or a specified time).



Before starting the transcode, the transcoder gets the timecode from the source.

After the initial sampling, AWS Elemental Server calculates the timecode of every frame and attaches it to the output. The timecode stops advancing if there is no output. So, for example, if the input fails at 10:55:03:009, the timecode at that point is 10:55:009. If the input restarts 3 seconds later, the timecode of the next frame may be 10:55:03:012. The timecode will *not* be 10:55:**06**:009.

Given the importance of accurate times with SCTE-35 messages, it is important to have NTP (Network Time Protocol) configured on the node.

Scope of Processing SCTE-35 Messages Depending on Outputs

The following table summarizes which options apply to which kind of output. Following the table are details for each kind of output.

Output	Pass-through in TS Outputs	Manifest Decoration	Blanking
Archive outputs with MPEG-2 as the container	Include all the original SCTE-35 messages.	Not applicable	Applicable
Archive outputs with other containers	Not applicable	Not applicable	Applicable
HLS	Include all the original SCTE-35 messages. Note that, with HLS, you either implement both manifest decoratio n and passthrough or you implement neither.	Decorate the HLS manifest with one or more of the following types of ad markers: • Adobe • AWS Elemental • SCTE-35 enhanced.	Applicable
DASH	Not applicable	Not applicable	Applicable
HDS	Not applicable	Decorate the HDS manifest with one or more of the following types of ad markers: • onCuePoint SCTE-35 • Primetime DPI SCTE-35 • Primetime DPI Simple.	Applicable

Output	Pass-through in TS Outputs	Manifest Decoration	Blanking
MS Smooth	Not applicable	Include information on the SCTE-35 event in the sparse track.	Applicable
UDP/TS	Include all the original SCTE-35 messages.	Not applicable	Applicable
RTSP	Not applicable	Not applicable	Applicable

Archive Output with MPEG-2 Container

A transport stream in an MPEG-2 container supports passthrough of the SCTE-35 messages, but it does not support creation of a manifest. Therefore, the best options to use in this case appear below.

SCTE-35 Passthrough	Insertion of SCTE-35 Messages	Manifest Decoration	Blanking and Blackout	Effect
Enabled	Yes or No	Not applicable	Yes or No	Turn on passthrough of SCTE-35 messages. In this case, you could also insert more SCTE-35 messages if desired. You could also implement blanking and blackout.

SCTE-35 Passthrough	Insertion of SCTE-35 Messages	Manifest Decoration	Blanking and Blackout	Effect
Disabled	No	Not applicable	No	Turn off passthrough in order to remove SCTE-35 messages from the video stream. Do not insert extra messages: they simply get stripped out of the output. Do not implement blanking or blackout. Choose this option only if, in a downstrea m system, you do not want to replace video that was originally marked by cues.

Archive Output with Other Containers

Other archive outputs do not support passthrough of the SCTE-35 messages or manifest decoration. Therefore, the only option that makes sense is the default behavior as listed below.

SCTE-35 Passthrough	Insertion of SCTE-35 Messages	Manifest Decoration	Blanking and Blackout	Effect
Not applicable	No	Not applicable	No	SCTE-35 messages are removed from the output. The manifest is not decorated. Do not implement blanking or blackout because, without SCTE-35 messages in the video stream and manifest decoration, it is impossible to find these blanks and blackouts programma tically.

Apple HLS Output

Apple HLS output supports both passthrough of the SCTE-35 messages and manifest decoration. In fact, with HLS outputs, passthrough and manifest decoration are either both enabled or both disabled. Therefore, options that make sense appear below.

SCTE-35 Passthrough	Insertion of SCTE-35 Messages	Manifest Decoration	Blanking and Blackout	Effect
Enabled	Yes or No	Enabled	Yes or No	Turn on passthrough of SCTE-35 messages and manifest decoration. In this case, you could also insert more SCTE-35 messages if desired. You could also implement blanking and blackout.
Disabled	No	Disabled	No	Turn off passthrough in order to remove SCTE-35 messages from the video stream. Turn off manifest decoration. Do not insert extra messages: they simply get stripped out of the output. Do not implement

SCTE-35 Passthrough	Insertion of SCTE-35 Messages	Manifest Decoration	Blanking and Blackout	Effect
				blanking or blackout. Choose this option only if, in a downstrea m system, you do not want to replace video that was originally marked by cues.

DASH Output

DASH ISO output does not support passthrough of the SCTE-35 messages or manifest decoration. Therefore, the only option that makes sense is the default behavior shown below.

SCTE-35 Passthrough	Insertion of SCTE-35 Messages	Manifest Decoration	Blanking and Blackout	Effect
Not applicable	No	Not applicable	No	SCTE-35 messages are removed from the output. The manifest is not decorated. Do not implement blanking or blackout because, without SCTE-35

SCTE-35 Passthrough	Insertion of SCTE-35 Messages	Manifest Decoration	Blanking and Blackout	Effect
				messages in the video stream and manifest decoration, it is impossible to find these blanks and blackouts programma tically.

Adobe HDS Output

Adobe HDS output does not support passthrough of the SCTE-35 messages but does support manifest decoration. Therefore, the options that make sense appear below.

SCTE-35 Passthrough	Insertion of SCTE-35 Messages	Manifest Decoration	Blanking and Blackout	Effect
Not applicable	Yes or No.	Enabled	Yes or No	SCTE-35 messages are removed from the video stream. But instructions are included in the manifest. You could insert extra messages: although they are not included

SCTE-35 Passthrough	Insertion of SCTE-35 Messages	Manifest Decoration	Blanking and Blackout	Effect
				in the video stream of the output, they are represented by instructions in the manifest. You could also implement blanking and blackout
Not applicable	No	Disabled	No	SCTE-35 messages are removed from the output. The manifest is not decorated. Do not implement blanking or blackout because, without SCTE-35 messages in the video stream and manifest decoration, it is impossible to find these blanks and blackouts programmatically.

MS Smooth Output

MSS output does not support passthrough of the SCTE-35 messages but does support instructions in the sparse track. Therefore, the options that make sense appear below.

SCTE-35 Passthrough	Insertion of SCTE-35 Messages	Manifest Decoration	Blanking and Blackout	Effect
Not applicable	Yes or No.	Enabled	Yes or No	SCTE-35 messages are removed from the video stream. But instructions are included in the sparse track. You could insert extra messages: although they are not included in the video stream of the output, they are represent ed by instructi ons in the sparse track. You could also implement blanking and blackout
Not applicable	No	Disabled	No	SCTE-35 messages are removed from the output. The sparse track

SCTE-35 Passthrough	Insertion of SCTE-35 Messages	Manifest Decoration	Blanking and Blackout	Effect
				does not include instructions. Do not implement blanking or blackout because, without SCTE-35 messages in the video stream and data in the sparse track, it is impossibl e to find these blanks and blackouts programma tically.

UDP/TS Output

UDP/TS output supports passthrough of the SCTE-35 messages, but it does not support creation of a manifest. Therefore, options that make sense appear below.

SCTE-35 Passthrough	Insertion of SCTE-35 Messages	Manifest Decoration	Blanking and Blackout	Effect
Enabled	Yes or No	Not applicable	Yes or No	Turn on passthrough of SCTE-35 messages. In this case, you

SCTE-35 Passthrough	Insertion of SCTE-35 Messages	Manifest Decoration	Blanking and Blackout	Effect
				could also insert more SCTE-35 messages if desired. You could also implement blanking and blackout.

SCTE-35 Passthrough	Insertion of SCTE-35 Messages	Manifest Decoration	Blanking and Blackout	Effect
Disabled	No	Not applicable	No	Turn off passthrough in order to remove SCTE-35 messages from the video stream. Do not insert extra messages: they are simply get stripped out of the output. Do not implement blanking or blackout. Choose this option only if, in a downstrea m system, you do not want to replace video that was originally marked by cues.

RTSP Output

RTSP output does not support passthrough of the SCTE-35 messages or manifest decoration. Therefore, the only option that is useful is the default behavior which appears below.

SCTE-35 Passthrough	Insertion of SCTE-35 Messages	Manifest Decoration	Blanking and Blackout	Effect
Not applicable	No	Not applicable	No	SCTE-35 messages are removed from the output. The manifest is not decorated. Do not implement blanking or blackout because, without SCTE-35 messages in the video stream and manifest decoration, it is impossible to find these blanks and blackouts programma tically.

Blanking and Passthrough and Manifest Decoration

It is important to understand that the logic for blanking ad content works on the video content associated with the “ad avail event” while the logic for passthrough and manifest decoration works with the actual SCTE-35 message.

So you can blank ad avails and not pass through SCTE-35 messages or not blank ad avails and not pass through SCTE-35 messages and decorate the manifest, or any combination: the actions are independent.

The only exception to this rule is for HLS outputs: manifest decoration and passthrough are either both enabled or both disabled.

Getting Ready: Setting the Ad Avail Mode

Read this section if you want to support any of these features:

- Manifest decoration for all outputs.
- Ad avail blanking for all outputs. (Note that this section does not apply to the blackout feature.)

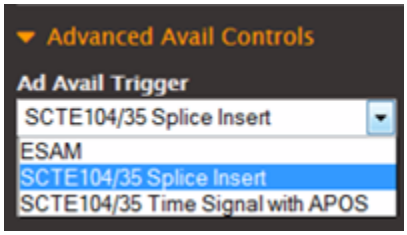
If you have several outputs and want to do manifest decoration or ad avail blanking on some outputs and not others, you have to set up two different profiles or jobs.

> **Note**
>
> You do not have to read this section if you *are* doing Blackout image insertion but you are not doing ad avail blanking or manifest decoration.

Set the Ad Avail Mode

You must set the Ad Avail mode. The Ad Avail mode applies to all outputs: it cannot be set differently for individual outputs.

1. In the Profile or job screen, click Advanced Avail Controls (in the Input section towards the top of the screen):



2. In Ad Avail Trigger, choose the desired mode. This mode identifies which of all possible “ad avail” events are actually to be treated as “ad avails.” This distinction comes into play in manifest decoration and ad avail blanking. For more information, see Manifest Decoration and Ad Avail Blanking and Blackout.

   Typically, you select the mode to match the type ID that you already know the input is using to indicate “ad avail” events.

- **Splice Insert** mode. Select this mode if the input uses splice inserts to indicate ad avails. The input may also contain messages for other events, such as chapters or programs.
- **Timesignal with APOS** mode. Select this mode if the input contains time signals of segmentation type Placement Opportunity. The input may also contain messages for other events, such as chapters or programs.

The following table specifies how a message (containing a specific combination of message type and segmentation type) is treated, depending on the mode that is specified. Each message is treated as either an ad avail, a non-ad avail, or as “other."

Mode	Message Type ID	Segmentation Type ID	Ad Avail Event	Not an Ad Avail Event	Other Event
Splice Insert mode	Splice Insert	No segmentation descriptor present	X		
		Provider advertisement	X		
		Distributor advertisement	X		
		Placement opportunity	X		
		Other type			X
	Time signal	Provider advertisement	X		

Mode	Message Type ID	Segmentation Type ID	Ad Avail Event	Not an Ad Avail Event	Other Event
		Distributor advertisement	X		
		Placement opportunity	X		
		Other type			X
Time signal APOS mode	Splice insert	Any		X	
	Time signal	Provider advertisement		X	
		Distributor advertisement		X	
		Placement opportunity	X		
		Other type			X

Manifest Decoration

You can choose to interpret SCTE-35 messages from the original input and insert corresponding instructions into the output manifest for the following outputs:

- HLS
- HDS
- MS Smooth (the instructions are inserted in the sparse track).

How SCTE-35 Events Are Handled in Manifests

The following information may be inserted into the manifest:

Type of Instruction	When Inserted
Base-64	Information about all SCTE-35 messages in the output is incorporated into the manifest; the entire SCTE-35 message is added in base-64 format.
Cue-out, Cue-in	SCTE-35 messages that are ad avails (see Getting Ready: Setting the Ad Avail Mode) result in the insertion of “cue-out, cue-in” instructions.
Blackout	Only applies to the SCTE-35 Enhanced ad marker style (for HLS output; see below). SCTE-35 messages that are *not* ad avails result in the insertion of “blackout start/end” instructions, assuming that blackout is enabled (Ad Avail Blanking and Blackout). If blackout is not enabled, these instructions are not inserted.

Splice Insert Mode

This table describes which of the three types of instructions are inserted for each message type/segmentation type.

Message Type ID	Segmentation Type ID	Base 64	Cue-out, Cue-in	Blackout
Splice insert	No segmentation descriptor present	X	X	

Message Type ID	Segmentation Type ID	Base 64	Cue-out, Cue-in	Blackout
	Provider advertisement	X	X	
	Distributor advertisement	X	X	
	Placement opportunity	X	X	
	Other type (e.g. Chapter, Program)	X		X
Time signal	Provider advertisement	X	X	
	Distributor advertisement	X	X	
	Placement opportunity	X	X	
	Other type (e.g. Chapter, Program)	X		X

Timesignal APOS Mode

This table describes which of the three types of instructions are inserted for each message type/segmentation type. Note that many segmentation types are completely ignored: they do not get included in the manifest.

Message Type ID	Segmentation Type ID	Base 64	Cue-out, Cue-in	Blackout
Splice insert	Any	X		
Time signal	Provider advertisement	X		
	Distributor advertisement	X		
	Placement opportunity	X	X	
	Other type (e.g. Chapter, Program)	X		X

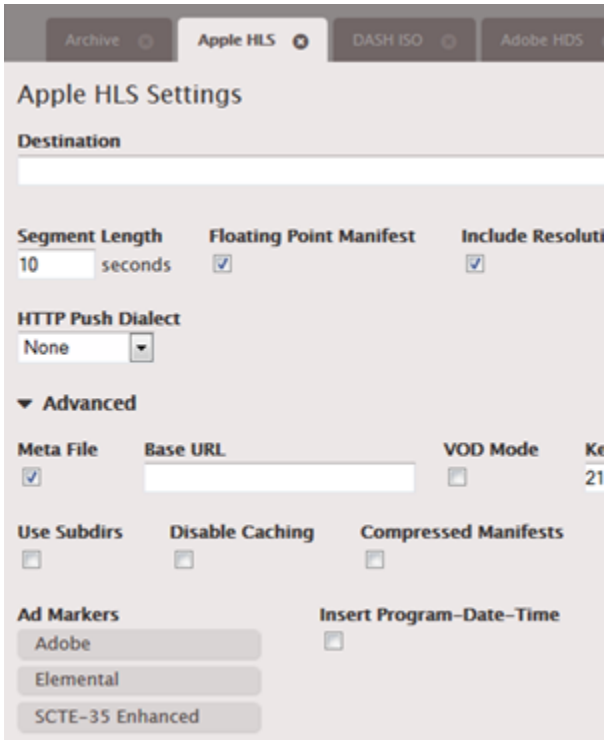
Procedure to Enable Manifest Decoration

Apple HLS

Manifest decoration is enabled at the output group level, which means that the manifests for all outputs in that group include instructions based on the SCTE-35 content.

In the Apple HLS output group section, open the Advanced section and complete the following fields:

- **Ad Markers**: Click to select a marker type. You can select more than one type.



See Example Manifests for Apple HLS for information about the different types of markers.

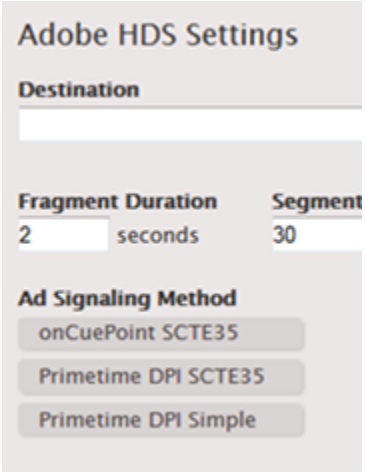
The manifest for each output includes a separate set of tags for each type that you select.

HDS

Manifest decoration is enabled at the output group level, which means that the manifests for all outputs in that group include instructions based on the SCTE-35 content.

In the Adobe HDS output group section, open the Advanced section and complete the following fields:

- **Ad Markers**: Click to select a marker type. You can select more than one type.



The manifest for each output includes a separate set of tags for each type that you select.

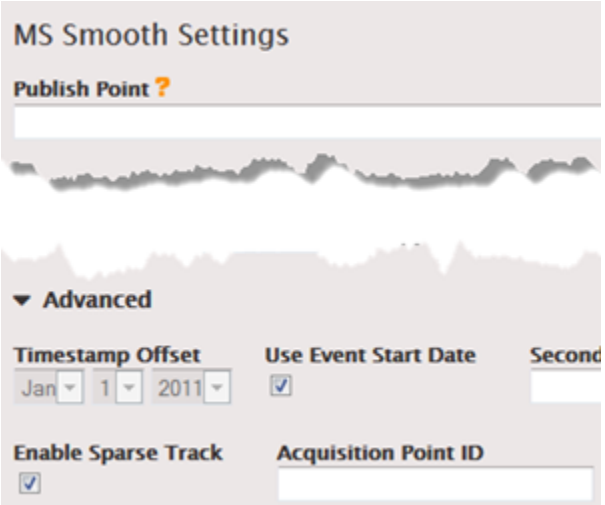
MS Smooth

With MS Smooth, if you enable manifest decoration, instructions are actually inserted in the sparse track.

Manifest decoration is enabled at the output group level, which means that the sparse tracks for all outputs in that group include instructions based on the SCTE-35 content.

In the MS Smooth output group section, complete the following fields:

- **Enable Sparse Track**: Click to select a marker type. You can select more than one type.
- **Acquisition Point ID**: Enter the address of the certificate if encryption is enabled on the output.



Ad Avail Blanking and Blackout

You can turn on one or both of the following features to blank out the content associated with a SCTE-35 event:

- "Blackout": Blank out the content for other types of SCTE-35 messages such as chapters and programs.
- "Ad avail blanking": Blank out the content for a SCTE-35 message that is considered an "ad avail" (according to the mode, Getting Ready: Setting the Ad Avail Mode).

In both features, the handling is:

- Replace the video content associated with the event with an image you specify or with a black image.
- Remove the audio associated with the event.
- Remove the closed captions associated with the event.

Blanking is Global

Both ad avail blanking and blackout apply to all outputs. You cannot choose to blank out for some outputs and not blank out for others: it is an all-or-nothing decision.

Comparison to Manifest Decoration and Passthrough

Manifest decoration and passthrough have a smaller scope than ad avail and blackout: they apply only to outputs that support these features.

Note this important fact because, if you do *not* do passthrough and do *not* do manifest decoration in a given output (because they are not supported or you choose not to), but you do implement blanking, there are no "markers" for where the blanked content occurs.

The only way of identifying where this blanking is occurring is to look for the IDR i-frames that identify where the SCTE-35 message used to be!

Scope of Blackout

All SCTE-35 messages that are "Other type" are blanked out as follows:

SCTE-35 Segmentation Type	Blanking
Programs	Always
Chapters	Always
Unscheduled events	Always
Network	See below.

Network Blackout

Network end blackout is different from the other events that trigger a blackout because:

- With other events, blanking starts when the “event start” instruction is encountered and ends when the “event end” instruction is encountered.
- With Network, blanking starts when the "Network End" instruction is encountered and ends when the "Network Start" instruction is encountered.

Scope of Ad Avail Blanking

For Ad avail blanking (but not for Blackout), the ad avail mode you set controls which SCTE-35 events result in blanking of the content.

Splice Insert Mode

This table describes which message type/segmentation type combination is blanked by Ad avail blanking when the Ad Avail mode (Getting Ready: Setting the Ad Avail Mode) is Splice Insert mode.

Message Type ID	Segmentation Type ID	Blanked	Not blanked
Splice insert	No segmentation descriptor present	X	
	Provider advertise ment	X	

Message Type ID	Segmentation Type ID	Blanked	Not blanked
	Distributor advertisement	X	
	Placement opportunity	X	
	Other type (e.g. Chapter, Program)		X
Time signal	Provider advertisement	X	
	Distributor advertisement	X	
	Placement opportunity	X	
	Other type (e.g. Chapter, Program)		X

Timesignal APOS Mode

This table describes which message type/segmentation type combination is blanked by Ad avail blanking when the Ad Avail mode (Getting Ready: Setting the Ad Avail Mode) is Timesignal with APOS mode.

Message Type ID	Segmentation Type ID	Blanked	Not blanked
Splice insert	Any		X
Time signal	Provider advertisement		X

Message Type ID	Segmentation Type ID	Blanked	Not blanked
	Distributor advertisement		X
	Placement opportunity	X	
	Other type (e.g. Chapter, Program)		X

Ad Avail Blanking and Restriction Flags: Restrictions in the Input

SCTE-35 messages of type `time_signal` always contain segmentation descriptors.

SCTE-35 messages of type `splice_insert` may or may not include segmentation descriptors.

If the input has SCTE-35 messages that *do* include segmentation descriptors, these segmentation descriptors always include two types of flags. These flags provide additional information as guidance for blanking in specific situations:

- `web_delivery_allowed_flag`
  - **`True`** means that there is no restriction on including the ad avail event's content in a stream intended for web delivery: there is no need to blank out content in streams intended for web delivery.
  - **`False`** means there is a restriction: the content should be blanked out.
- `no_regional_blackout_flag`
  - **`True`** means that there is no restriction on including the ad avail event's video in a stream intended for regional markets: there is no need to blank out content in streams intended for regional markets.
  - **`False`** means there is a restriction: the content should be blanked out.

If neither flag is present (usually the case with `splice_inserts`), then both are considered to be false: blanking should occur.

If both flags are present (which is usually the case; it is unusual to have only one flag present), then a “false” for one flag takes precedence over a “true” for the other flag: blanking should occur.

Typically, in any given message in the input only one of these flags would ever be set to **`false`**, so only one restriction would ever be in place. There would typically never be *both* a regional delivery restriction and a web delivery restriction. This is because if content is considered restricted for regional delivery, then it would not also be considered restricted for web delivery (where the concept of a region makes no sense).

To summarize, this is the blanking logic that applies to each ad avail event that is encountered:

	Content of Correspon ding SCTE-35 Message **Web delivery allowed?**	**Content of Correspon ding SCTE-35 Message** **Regional delivery allowed?**	**Result**	**Comment**
S1	Flag is not present	Flag is not present	Blanking will occur	This combinati on can occur only in a message type `splice_in sert` (where the segmentat ion descriptor is optional).
S2	True	True	Blanking will not occur	
S3	True	False	Blanking will occur	
S4	False	True	Blanking will occur	

Ad Avail Blanking and Restriction Flags: AWS Elemental Handling of Restrictions

You can modify this default blanking behavior by instructing the AWS Elemental software to ignore a restriction flag that is set to `false`, so that blanking does not occur for this ad avail event. In other words, to use this logic: "Even if the message indicates to blank content because a regional blackout is in place, do not follow this instruction. Ignore the fact that a regional blackout is in place and do not blank content."

You modify the behavior by setting one or the other of the Ignore flags to:

- Unchecked (default). The logic as above applies, so continue to observe the restriction.
- Checked. Ignore the restriction and do not blank video for the ad avail event.

> **Warning**
>
> Never set both fields to Ignore!

To summarize, the Ignore flags make a difference only to these scenarios:

	Content of Correspon ding SCTE-35 Message **Web delivery allowed?**	**Content of Correspon ding SCTE-35 Message** **Regional delivery allowed?**	**Restriction Field in AWS Elemental**	**Result**
S3	True	False	Ignore "regional delivery" restriction	Blanking will *not* occur
S4	False	True	Ignore "web delivery" restriction	Blanking will *not* occur

Ad Avail Blanking and Restriction Flags: Restriction Flags with “Splice Insert”

If you selected **Splice Insert** as the Ad Avail mode, then there is an assumption that the SCTE-35 ad avail message will not include the two restriction flags described above. Avoid assuming that every SCTE-35 ad avail message should result in an ad avail.

Therefore, if you know that input contains splice inserts (not time signals), you should leave both the fields unchecked.

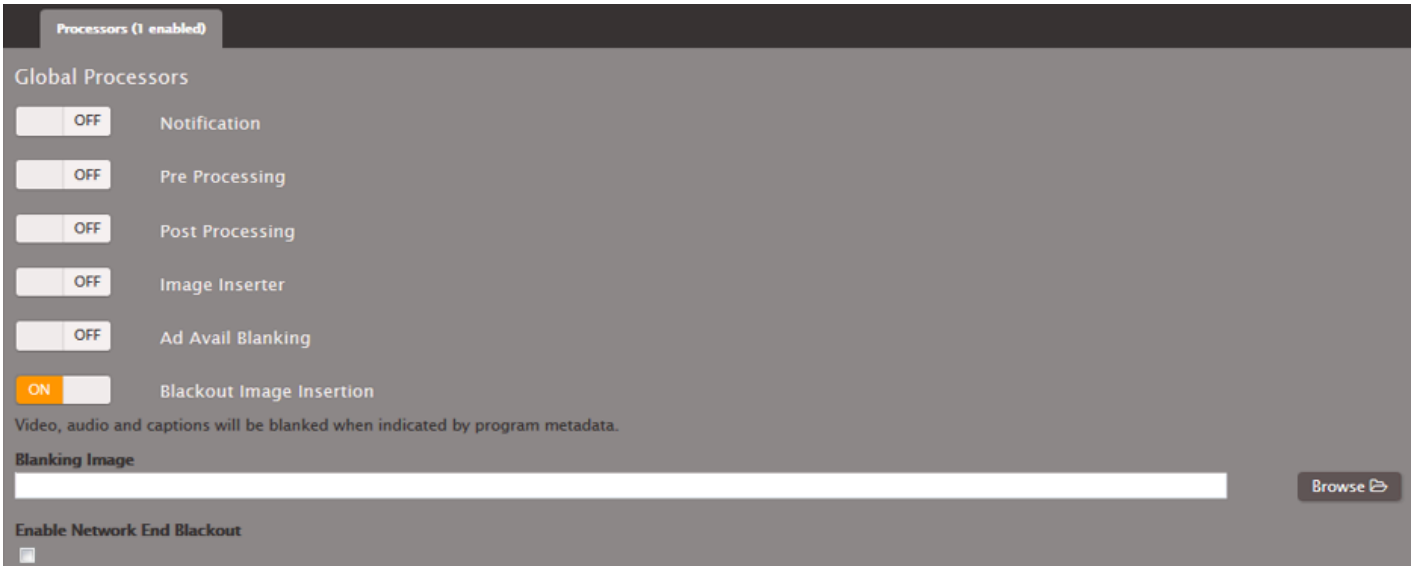
Procedure to Enable Ad Avail Blanking

- In the Profile or Event screen, click Advanced Avail Controls (in the Input section towards the top of the screen).
- Check or uncheck the two restriction fields:
  - Unchecked (default): Observe the restriction and blank the content for the ad avail event.
  - Checked: Ignore the restriction and do *not* blank the content for the ad avail event.
- Go down to the Global Processors section and complete the following fields:
  - **Ad Avail Blanking**: Click to turn on. The **Blanking Image** field appears.
  - **Blanking Image**: Specify a `.bmp` or `.png` file to use for the blanking. If you leave this field blank, a plain black image is inserted.

Procedure to Enable Blackout

- In the Profile or Event screen, go down to the Global Processors section and complete the following fields:

- **Blackout Image Insertion**: Click to turn on. The **Blanking Image** field appears.
- **Blanking Image**: Specify a `.bmp` or `.png` file to use for the blanking. If you leave this field blank, a plain black image is inserted.



- If you want to enable network end blackout (in other words, blank content when network transmission has ended and remove blanking only when network transmission resumes), follow these instructions:
  - **Enable Network End Blackout**: Selected.
  - **Network ID**: The EIDR ID of the network in the format 10.nnnn/xxxx-xxxx-xxxx-xxxx-xxxx-c (case insensitive). Only network end events with this ID trigger blackout.
  - **Network End Blackout Image**: Specify a `.bmp` or `.png` file to use for the blanking. If you leave this field blank, a plain black image is inserted.

Passthrough or Removal of SCTE Messages from Input

SCTE-35 messages from the input can be passed through (included) in the data stream for the following outputs.

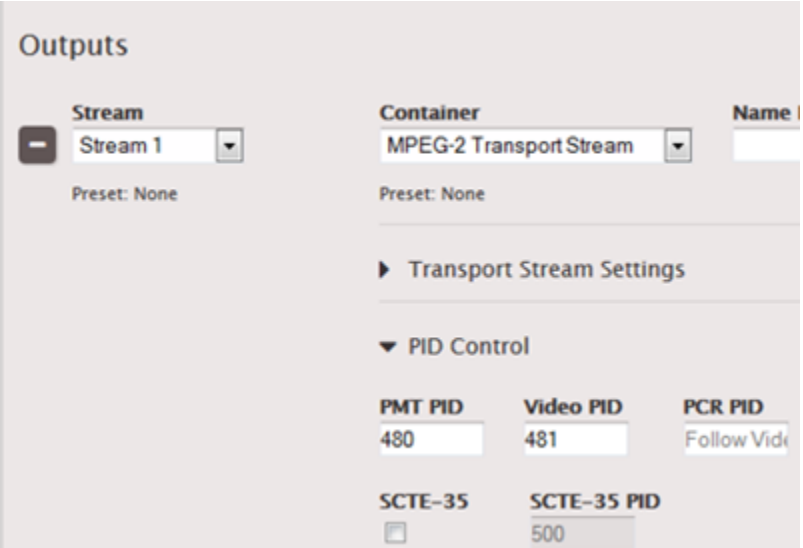
- Archive outputs with MPEG-2 as the container.

- **HLS**: You specify whether to pass through at the output group level: passthrough or removal applies globally to all outputs in the output group.
- **UDP/TS**: You specify whether to pass through at the output level: for each individual output in the output group.

Archive

Passthrough is enabled or disabled at the output level: only in outputs that have an MPEG-2 TS container.

1. In the Profile or Event screen, go to the Output Groups section at the bottom of the screen and display the tab for Archive Output Group.
2. In the output that has the MPEG-2 TS container, open the PID Control section. Complete the following fields:
   - **SCTE-35**: Click to check.
   - **SCTE-35 PID**: Enter the ID of the PID where you want the SCTE-35 messages to go.



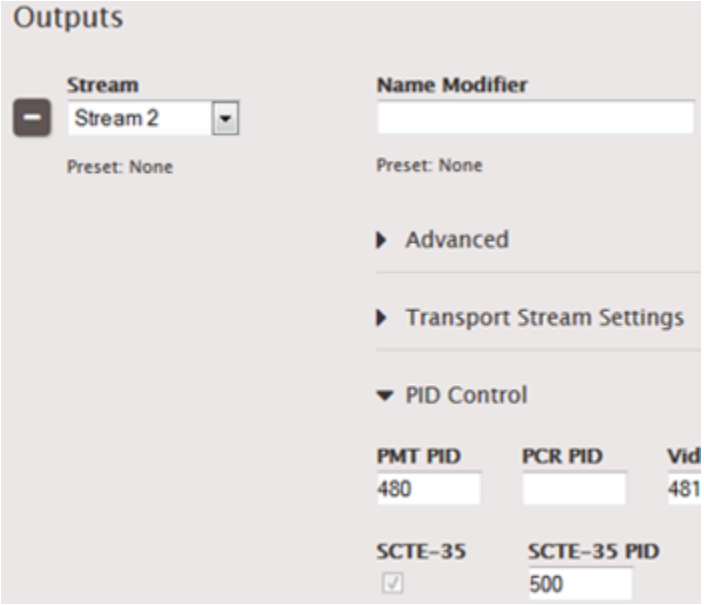
Result

All SCTE-35 messages from the input are included in the data stream of this output.

Apple HLS

Passthrough is enabled or disabled individually for each output, which means it can be applied differently for different outputs in the same group.

1. If you have not already set up for manifest decoration, do so now; see Procedure to Enable Manifest Decoration.
2. In the Profile or Event screen, go to the Output Groups section at the bottom of the screen and display the tab for Apple HLS Output Group.
   a. In each output, open the PID Control section. You will note that the SCTE-35 field is automatically checked (because you set up for manifest decoration); it cannot be unchecked.
   b. Complete the following field:
      - **SCTE-35 PID** field: Enter the ID of the PID where you want the SCTE-35 messages to go.



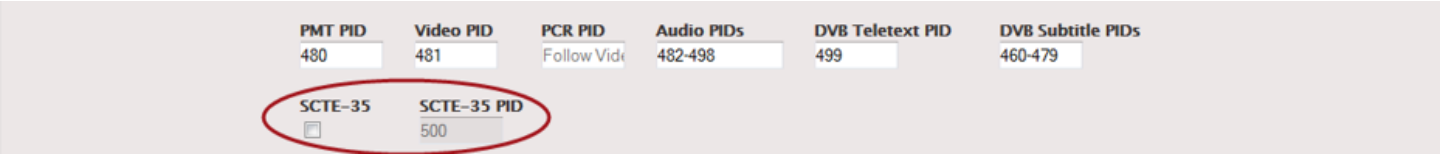
Result

All SCTE-35 messages from the input are included in the data stream of the relevant output.

UDP/TS

Passthrough is enabled or disabled individually for each output, which means it can be applied differently for different outputs in the same group.

1. In the Profile or Event screen, go to the Output Groups section at the bottom of the screen and display the tab for UDP/TS Output Group.
2. In the output where you want to pass through SCTE-35 messages, open the PID Control section. Complete the following fields:
   - **SCTE-35**: Click to check.
   - **SCTE-35 PID**: Enter the ID of the PID where you want the SCTE-35 messages to go.



Result

All SCTE-35 messages from the input are included in the data stream of the relevant output.

POIS Conditioning

You can configure AWS Elemental jobs to communicate with a POIS server. During processing of the input, each time a SCTE-35 message is encountered, the AWS Elemental encoder sends the message contents to the server. The POIS responds with SCTE-35 content that may be identical to, slightly different from, or completely different from the original.

The AWS Elemental encoder also supports handling of “out-of-band” SCTE-35 messages from the POIS – messages that are not in response to a message originally sent by the AWS Elemental encoder. If such a message is received, the AWS Elemental encoder accepts and processes it.

Effect of POIS Conditioning

When you enable POIS conditioning, an extra step is inserted into the regular processing of the SCTE-35 messages. The job’s ad avail mode, of manifest decoration, of ad avail blanking, of blackout and of SCTE-35 passthrough still apply to some degree.

You should read the other SCTE-35 topics and the following to determine how POIS conditioning changes the standard behavior.

Ad Avail Mode

When POIS conditioning is enabled, the ad avail mode is always set to “splice insert.” For information about the implications for manifest decoration and ad avail blanking that are performed by the AWS Elemental encoder, see Getting Ready: Setting the Ad Avail Mode.

SCTE-35 Messages Inserted by REST API

All these messages are sent to the POIS along with messages that were already in the input.

New or Conditioned SCTE-35 Messages

The POIS can send an instruction to insert a new SCTE-35 message, modify an existing one, or delete an existing one. A message received from the POIS may include any message type and segmentation type.

Manifest Decoration

The effect of POIS conditioning on manifest decoration is as follows:

- **HLS Outputs** – A message received from the POIS may include instructions to decorate an HLS manifest (not other types of manifests). This information is used to decorate the HLS manifest.

  How the AWS Elemental encoder processes the decoration information depends on how the job has been configured:

  - If the job does not have manifest decoration enabled for HLS outputs, then the information is ignored.
  - If the job does have it enabled, then the decoration information is inserted in the manifest.
  - The information is inserted into the manifest “as is.” The style of the information may not match the styles (ad marker styles) specified in the job. The AWS Elemental encoder does not check for format inconsistencies between these instructions and the ad marker style.
- **Other Outputs** – Decoration of other manifest types occurs according to the information in the SCTE-35 message, how the AWS Elemental encoder job is set up for manifest decoration, and which ad avail mode is enabled. The POIS conditioning has no effect on these manifest types.

Blanking and Blackout

The effect of POIS conditioning on blanking and blackout is as follows:

- **Extra Blackout Instructions** – A message received from the POIS may include explicit “blank the content corresponding to this SCTE-35 message” instructions for any SCTE-35 message.

Even if blanking or blackout (whichever applies to the message type and segmentation descriptor type) is disabled in the encoder, the AWS Elemental encoder observes the instruction for this specific message.

- **Blanking Image** – A POIS response may include reference to a blanking .png or .bmp file. The AWS Elemental encoder uses this file for any blanking/blackout if it can find the file at /data/server/esam/ on the AWS Elemental node.

  If the encoder cannot find the file, it uses a black slate.

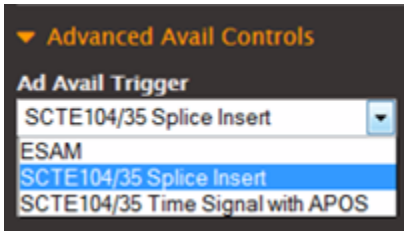
- **Restriction Flags** – The Override restriction flags in the AWS Elemental job (**Ignore Web Delivery Allowed** flag and **Ignore No Regional Blackout** flag) are always set to unchecked in ESAM mode. See Ad Avail Blanking and Blackout.

- **Passthrough or Removal** – If passthrough is enabled in the AWS Elemental job, all SCTE-35 messages are passed through, according to the rule.

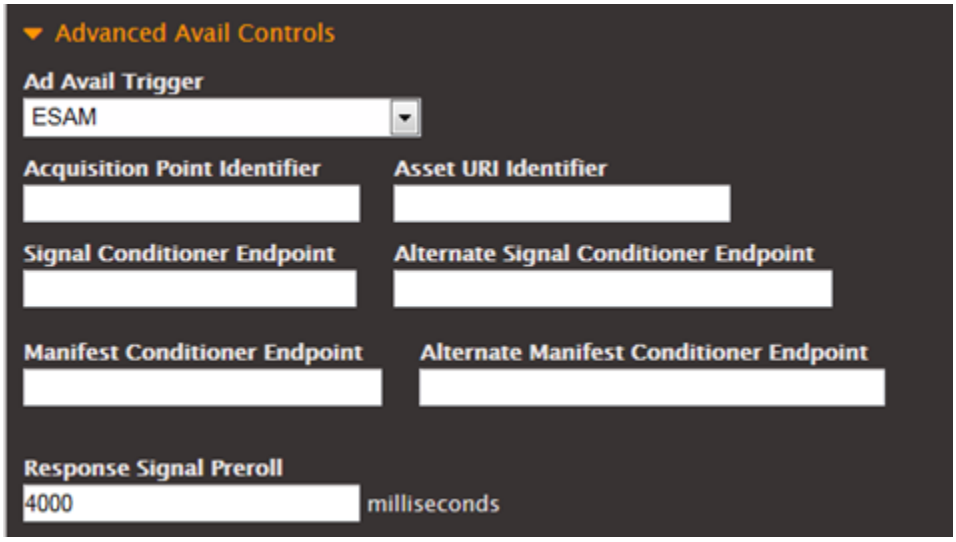
  But when POIS conditioning is enabled, the POIS can override this rule: if the POIS instruction is to remove a given SCTE-35 message, then that message is removed and is not passed through, even though passthrough is enabled in the AWS Elemental encoder.

Procedure to Enable POIS Conditioning

1. In the Profile or Job screen, click Advanced Avail Controls (in the Input section towards the top of the screen):



2. In Ad Avail Trigger, choose ESAM. More fields appear.



3. Complete the fields as follows:

   a. Complete the first 6 fields to identify the endpoints on the POIS.

   b. For **Response Signal Preroll**, change the value as desired, to set the distance (in milliseconds) between the time that the SCTE-35 message is inserted and the start time of that ad avail.

Setting Up POIS Conditioning via the REST API

This set of tables lists the parameters found on the AWS Elemental Server job or profile and specifies the location of those parameters in the XML for a job or profile.

Set Up the Ad Avail Mode

Field	XML Tag
Advanced Avail Controls > Ad Avail Trigger	ad_trigger

Manifest Decoration

Field	XML Tag
Output Group > Apple HLS > Advanced > Ad Markers	output_group/apple_live_group_settings/ad_markers

Field	XML Tag
Output Group > Adobe HDS > Advanced > Ad Markers	output_group/hds_group_settings/ad_signaling
Output Group > MS Smooth > Enable Sparse Track	output_group/ms_smooth_group_settings/enable_sparse_track
Output Group > MS Smooth > Acquisition Point ID	output_group/ms_smooth_group_settings/acquisition_point_id

Ad Avail Blanking and Blackout

Field	XML Tag
Advanced Avail Controls > Ignore no_regional_blackout_flag	ignore_no_regional_blackout_flag
Advanced Avail Controls > Ignore web_delivery_allowed_flag	ignore_web_delivery_allowed_flag
Processors > Global Processors > Ad Avail Blanking > On/Off	avail_blanking/enabled/
Processors > Global Processors > Ad Avail Blanking > Browse	avail_blanking/avail_blanking_image/certificate_file
Processors > Global Processors > Ad Avail Blanking > Browse	avail_blanking/avail_blanking_image/interface
Processors > Global Processors > Ad Avail Blanking > Credentials icon > Password	avail_blanking/avail_blanking_image/password
Processors > Global Processors > Ad Avail Blanking > Browse	avail_blanking/avail_blanking_image/uri
Processors > Global Processors > Ad Avail Blanking > > Credentials icon > Username	avail_blanking/avail_blanking_image/username

Field	XML Tag
Processors > Global Processors > Blackout Image Insertion > On/Off	blackout_slate/enabled/
Processors > Global Processors > Blackout Image Insertion > Enable Network End Blackout > Network ID	blackout_slate/network_id
Processors > Global Processors > Blackout Image Insertion > Browse	blackout_slate/blackout_slate_image/certificate_file
Processors > Global Processors > Blackout Image Insertion > Browse	blackout_slate/blackout_slate_image/interface
Processors > Global Processors > Blackout Image Insertion > Browse	blackout_slate/blackout_slate_image/password
Processors > Global Processors > Blackout Image Insertion > Browse	blackout_slate/blackout_slate_image/uri
Processors > Global Processors > Blackout Image Insertion > Browse	blackout_slate/blackout_slate_image/username
Processors > Global Processors > Blackout Image Insertion > Enable Network End Blackout > Network End Blackout Image > Browse	blackout_slate/network_end_blackout_image/certificate_file
Processors > Global Processors > Blackout Image Insertion > Enable Network End Blackout > Network End Blackout Image > Browse	blackout_slate/network_end_blackout_image/interface
Processors > Global Processors > Blackout Image Insertion > Enable Network End Blackout > Network End Blackout Image > Credentials > Password	blackout_slate/network_end_blackout_image/password

Field	XML Tag
Processors > Global Processors > Blackout Image Insertion > Enable Network End Blackout > Network End Blackout Image > Browse	blackout_slate/network_end_blackout_image/uri
Processors > Global Processors > Blackout Image Insertion > Enable Network End Blackout > Network End Blackout Image > Credentials > Username	blackout_slate/network_end_blackout_image/username

Passthrough or Removal

Field	XML Tag
Archive Output Group > Output > MPEG-2 TS > PID Control > SCTE-35	output_group/output/scte35_passthrough
Archive Output Group > Output > MPEG-2 TS > PID Control > SCTE-35 PID	output_group/output/m2ts_settings/scte35_pid
Apple HLS Output Group > Output > PID Control > SCTE-35	output_group/output/scte35_passthrough
Apple HLS Output Group > Output > PID Control > SCTE-35 PID	output_group/output/m3u8_settings/scte35_pid
UDP/TS Output Group > Output > SCTE-35	output_group/output/scte35_passthrough
UDP/TS Output Group > Output > SCTE-35 PID	output_group/output/ts_settings/scte35_pid

POIS Conditioning

Field	XML Tag
Advanced Avail Controls > Ad Avail Trigger > Acquisition Point Identifier	esam/acquisition_point_id/
Advanced Avail Controls > Ad Avail Trigger > Asset URI Identifier	esam/asset_uri_id/
Advanced Avail Controls > Ad Avail Trigger > Signal Conditioner Endpoint	esam/scc_uri/certificate_file
Advanced Avail Controls > Ad Avail Trigger > Signal Conditioner Endpoint	esam/scc_uri/interface
Advanced Avail Controls > Ad Avail Trigger > Signal Conditioner Endpoint	esam/scc_uri/password
Advanced Avail Controls > Ad Avail Trigger > Signal Conditioner Endpoint	esam/scc_uri/uri
Advanced Avail Controls > Ad Avail Trigger > Signal Conditioner Endpoint	esam/scc_uri/username
Advanced Avail Controls > Ad Avail Trigger > Alternate Signal Conditioner Endpoint	esam/alternate_scc_uri/certificate_file
Advanced Avail Controls > Ad Avail Trigger > Alternate Signal Conditioner Endpoint	esam/alternate_scc_uri/interface
Advanced Avail Controls > Ad Avail Trigger > Alternate Signal Conditioner Endpoint	esam/alternate_scc_uri/password
Advanced Avail Controls > Ad Avail Trigger > Alternate Signal Conditioner Endpoint	esam/alternate_scc_uri/uri
Advanced Avail Controls > Ad Avail Trigger > Alternate Signal Conditioner Endpoint	esam/alternate_scc_uri/username

Field	XML Tag
Advanced Avail Controls > Ad Avail Trigger > Manifest Conditioner Endpoint	esam/mcc_uri/certificate_file
Advanced Avail Controls > Ad Avail Trigger > Manifest Conditioner Endpoint	esam/mcc_uri/interface
Advanced Avail Controls > Ad Avail Trigger > Manifest Conditioner Endpoint	esam/mcc_uri/password
Advanced Avail Controls > Ad Avail Trigger > Manifest Conditioner Endpoint	esam/mcc_uri/uri
Advanced Avail Controls > Ad Avail Trigger > Manifest Conditioner Endpoint	esam/mcc_uri/username
Advanced Avail Controls > Ad Avail Trigger > Alternate Manifest Conditioner Endpoint	esam/alternate_mcc_uri/certificate_file
Advanced Avail Controls > Ad Avail Trigger > Alternate Manifest Conditioner Endpoint	esam/alternate_mcc_uri/interface
Advanced Avail Controls > Ad Avail Trigger > Alternate Manifest Conditioner Endpoint	esam/alternate_mcc_uri/password
Advanced Avail Controls > Ad Avail Trigger > Alternate Manifest Conditioner Endpoint	esam/alternate_mcc_uri/uri
Advanced Avail Controls > Ad Avail Trigger > Alternate Manifest Conditioner Endpoint	esam/alternate_mcc_uri/username
Advanced Avail Controls > Ad Avail Trigger > Response Signal Preroll	esam/response_signal_preroll/

Example Manifests for Apple HLS

This section lists example manifests for the Apple HLS manifest styles that AWS Elemental Server supports. These manifests include a range of types.

Example Manifest for Adobe Ad Marker

Inserts a CUE: DURATION for each ad avail. Does not insert any CUE-OUT CONT (continuation tags) to indicate to a player joining mid-break that there is a current avail. Does not insert a CUE-IN tag at the end of the avail.

Structure

Segment	Tag	Tag Count
Segment in which the ad avail starts.	1 CUE: DURATION tag	1

Tag Contents

- CUE:DURATION containing:
  - `duration`: Duration in fractional seconds.
  - `id`: An identifier, unique among all ad avails CUE tags.
  - `type`: SpliceOut.
  - `time`: The PTS time for the ad avail in fractional seconds.

Example

The following is the tag for an ad avail lasting 414.171 PTS.

```
#EXT-X-CUE:DURATION="201.467",ID="0",TYPE="SpliceOut",TIME="414.171"
```

Example Manifest for AWS Elemental Ad Marker

Structure

Segment	Tag	Tag Count
Segment in which the ad avail starts.	CUE-OUT	1
Each succeeding segment.	CUE-OUT-CONT	0-n

Segment	Tag	Tag Count
Segment in which the ad avail ends.	CUE-IN	1

Tag Contents

- CUE-OUT contains `Duration`.
- CUE-OUT-CONT contains `Elapsed time` and `Duration`.
- CUE-IN has no content.

Example

```
#EXT-X-CUE-OUT:30.000
.
.
.
# EXT-X-CUE-OUT-CONT: 8.308/30
.
.
.
# EXT-X-CUE-OUT-CONT: 20.391/30
.
.
.
# EXT-X-CUE-IN
```

Example Manifest for SCTE-35 Enhanced Ad Marker

Structure

Segment	Tag	Tag Count
Segment in which the ad avail starts.	OATCLS-SCTE35	1
Segment in which the ad avail starts.	ASSET	1

Segment	Tag	Tag Count
Segment in which the ad avail starts.	CUE-OUT	1
Each succeeding segment.	CUE-OUT-CONT	0-n
Segment in which the ad avail ends.	CUE-IN	1

Tag Contents

- OATCLS-SCTE35 containing the base-64 encoded raw bytes of the original SCTE-35 ad avail message.
- ASSET containing the CAID or UPID as specified in the original SCTE-35 message.
- 1 CUE-OUT per ad avail.
- CUE-OUT-CONT containing:
  - The elapsed time of the avail.
  - The duration declared in the original SCTE-35 message.
  - SCTE35 containing the base-64 encoded raw bytes of the original SCTE-35 ad avail message.

    These lines repeat until the ad avail ends.
- CUE-IN to indicate the end of the avail.

Example

```
#EXT-OATCLS-SCTE35:/DA0AAAAAAAAAAAABQb+ADAQ6QAeAhxDVUVJQAAAO3/PAAEUrEoICAAAAAAg
+2UBNAAANvrtoQ==
#EXT-X-ASSET:CAID=0x0000000020FB6501
#EXT-X-CUE-OUT:201.467
.
.
.
#EXT-X-CUE-OUT-CONT:ElapsedTime=5.939,Duration=201.467,SCTE35=/DA0AAAA+…AAg
+2UBNAAANvrtoQ==
.
.
```

```
.
#EXT-X-CUE-IN
```

Tuning Your Video Quality with AWS Elemental Server

The quality of your video output, given a fixed output resolution and bitrate, depends on the settings your choose for encoding.

Topics

- Image Processing Controls
- Encoding Controls

Image Processing Controls

Topics

- Image Processing – Scaling Content
- Image Processing – Color Correction
- Image Processing – Scan Type – Key Controls
- Image Processing – Scan Type – Secondary Fields
- Image Processing – Noise Reduction
- Image Processing – framerate Conversion

Image Processing – Scaling Content

Description

Scaling content is typically applied to adjust source content to better match the intended output device screen size or to optimize the resolution of a video output for a particular bitrate. Typically, the lower the bitrate, the smaller the resolution. These settings relate to scaling.

- **Resolution** (width, height): Controls the number of pixels encoded (e.g. 1280x720, 640x480)
- **Stretch to Output**: Controls the aspect ratio of video content itself. For example, if Stretch to Output is enabled and source content with a resolution of 1280x720 (16:9) is transcoded to 640x480 (4:3), the resulting output video appears skewed as the aspect ratio of the video content is modified.

- **Anti-alias**: Choose Bilinear Interpolation or the variable-tap Lanczos filter. In almost all cases, the Lanczos filter provides much better quality when scaling video content, with a small impact on performance.

Recommendations

Enable **Anti-alias** unless speed is of utmost importance and video quality is not.

Location of Fields

Stream – Video > Resolution	stream_assembly/video_description/resolution
Stream – Video > Stretch to output	stream_assembly/video_description/stretch_to_output
Stream – Video > Anti-alias	stream_assembly/video_description/anti_alias

Image Processing – Color Correction

Description

In some situations, color correction can be used to adjust the visual color representation of content:

- **Brightness / Contrast / Hue / Saturation**: Provide basic pixel luma and chroma adjustment.
- **Video Range**: Expands the pixel value range from 16-235 vs 0-255 (full-swing encoding). Set to true to set to full-swing encoding or set to false to pass through the encoding.

  Set to "true" only if you are sure the range of the input is not full-swing. If it is full-swing and you choose "true", the blacks and whites in the output are clipped.
- **Color Space Conversion**: Adjusts pixel values from input to output color space (e.g. REC-601).
  - Set to "None" to perform no conversion.
  - Set to "Force 601" or "Force 709" to convert inputs with differing colorspaces. When choosing either of these options, either the metadata must specify the colorspace of the input or you must manually specify that colorspace via the Color Space field in the Video Selector section. If the input colorspace is not specified in one of these ways, the encoder ignores the selected value and does not do any conversion.

Recommendations

Color adjustment does not affect output quality so there are no specific recommendations.

Location of Fields

The following table lists each field by its location on the web interface and shows the location of the corresponding tag in the XML.

Location of Field on Web Interface	Location of Tag in XML
Input > Video Selector > Color Space	input/video_selector/color_space
Stream – Video > Advanced > Preprocessors > Color Corrector > Brightness	stream_assembly/video_description/video_preprocessor/ color_corrector/brightness
Stream – Video > Advanced > Preprocessors > Color Corrector > Contrast	stream_assembly/video_description/video_preprocessor/ color_corrector/contrast
Stream – Video > Advanced > Preprocessors > Color Corrector > Hue	stream_assembly/video_description/video_preprocessor/ color_corrector/hue
Stream – Video > Advanced > Preprocessors > Color Corrector > Saturation	stream_assembly/video_description/video_preprocessor/ color_corrector/saturation
Stream – Video > Advanced > Preprocessors > Color Corrector > Video Range	stream_assembly/video_description/video_preprocessor/ color_corrector/full_swing
Stream – Video > Advanced > Preprocessors > Color Corrector > Color Space Conversion	stream_assembly/video_description/video_preprocessor/

Location of Field on Web Interface	Location of Tag in XML
	color_corrector/color_space_conversion

Image Processing – Scan Type – Key Controls

Description

You can convert the scan type of the input to a different scan type: progressive, interlaced, hard telecine, or soft telecine. You can configure to leave the scan type as is or to convert from one incoming type (or a mix of incoming scan types) to another single type. Configuring for scan type conversion involves setting fields in specific ways. The three key fields to convert the scan type of the input are **Configuration - Deinterlace Mode**, **Configuration - Interlace Mode**, and **Configuration - Telecine**. The following table describes how to set these three key fields to convert a given input to a given output.

Input	Output	Configuration - Deinterlace Mode	Configuration - Interlace Mode	Configuration - Telecine
Progressive	Progressive	Off	Progressive	None
Interlaced	Progressive	Deinterlace	Progressive	None
Interlaced	Progressive	Adaptive	Progressive	None
Hard telecine	Progressive	Inverse telecine	Progressive	None
Hard telecine	Progressive	Adaptive	Progressive	None
Soft telecine	Progressive	Off	Progressive	None
Mixed	Progressive	Adaptive	Progressive	None
Progressive	Hard telecine	Off	One of the other options	Hard telecine
Hard telecine	Hard telecine	Off	One of the other options	None

Input	Output	Configuration - Deinterlace Mode	Configuration - Interlace Mode	Configuration - Telecine
Soft telecine	Hard telecine	Off	One of the other options	Hard telecine
Mixed	Hard telecine	Off	One of the other options	Hard telecine
Interlaced	Interlaced	Off	One of the other options	None
Mixed	Interlaced	Off	One of the other options	None
Progressive	Soft telecine	Off	One of the other options	Soft telecine
Hard telecine	Soft telecine	Inverse telecine	One of the other options	Soft telecine
Hard telecine	Soft telecine	Adaptive	One of the other options	Soft telecine
Soft telecine	Soft telecine	Off	One of the other options	Soft telecine
Mixed	Soft telecine	Adaptive	One of the other options	Soft telecine

* Deinterlace Mode is an image processing control. Interlace Mode and Telecine are encoding controls.

Note: Converting the Scan Type to Progressive

If content is not being converted to a higher framerate, the deinterlacer outputs one frame for every two fields in the source content (i.e., 1080i30 content is converted to 1080p30). If the

framerate is being doubled (e.g. 29.97 fps to 59.94 fps, 29.97 to 60, or 25 to 50), the deinterlacer converts each field into a frame.

Deinterlace Mode

This field applies an initial conversion for certain from/to conversions (as shown in the table above).

- **Deinterlace**: Applies a deinterlace algorithm to content. If the AWS Elemental system detects that the source content is already progressive, no deinterlacing is applied.
- **Inverse Telecine**: Converts hard telecine 29.97i to progressive 23.976p.
- **Adaptive**: Analyzes source content to determine whether to apply the deinterlace or inverse telecine algorithm on source content.

Interlace Mode

This field controls video field order and how the scan type is represented in the output bitstream.

- **Progressive**: Encodes output as "progressive."
- **Top Field First** or **Bottom Field First**: Forces field polarity (top or bottom first) to the specified value, reordering fields if the source has a different order and encodes the result as interlaced.
- **Follow (Default Top)** and **Follow (Default Bottom)**: Produces interlaced output, with the output having the same field polarity as the source. Therefore:
  - If the source is "interlaced", the output is interlaced with the same polarity as the source (it follows the source). The output could therefore be a mix of “top field first” and “bottom field first.”
  - If the source is "progressive", the output is interlaced with “top field first” or “bottom field first” polarity (depending on which Follow option you chose).

Note: If the output codec is Microsoft VC-1, then the interlace mode is always set to "progressive."

Telecine

This field appears for MPEG-4 AVC and MPEG-2 only if the Streams > Advanced > framerate field is set to 29.970.

- **Hard**: Produce 29.97i output from 23.976 input.
- **Soft**: Produce 23.976; the player converts this output to 29.97i.

Recommendations

- Converting to progressive output always improves output quality and should be enabled in any use case where progressive output is required or acceptable.
- Interlace coding is inherently less efficient than progressive coding so use interlace coding only for content that has already been interlaced.
- The choice of deinterlacing algorithm is very subjective. **Motion Adaptive Interpolation** is generally recommended as the sharper image quality tends to provide the best perceived quality across a broad set of users. Use the **Force Mode** option for deinterlacing only when the input is known to be interlaced content incorrectly flagged as "progressive."
- Use the **Force Mode** option for **Inverse Hard Telecine** when the input is known to consist entirely of Hard Telecine content.

Location of Fields

Location of Field on Web Interface	Location of Tag in XML
Streams > Advanced > Telecine	stream_assembly/video_description/*codec*/telecine where *codec* is one of the following: • **`h264_settings`** • **`mpeg2_settings`** • **`h265_settings`** • **`prores_settings`**
Streams > Advanced > Interlace Mode	stream_assembly/video_description/*codec*/interlace_mode where *codec* is one of the following: • **`vc1_settings`** • **`h264_settings`** • **`mpeg2_settings`** • **`h265_settings`**

Location of Field on Web Interface	Location of Tag in XML
	• `prores_settings`
Streams > Advanced >Preprocessors > Deinterlacer > Deinterlace Mode	stream_assembly/video_description/video_preprocessors/deinterlacer/deinterlace_mode
Streams > Advanced >Preprocessors > Deinterlacer > Deinterlace Algorithm	stream_assembly/video_description/video_preprocessors/deinterlacer/algorithm
Streams > Advanced >Preprocessors > Deinterlacer > Force Mode	stream_assembly/video_description/video_preprocessors/deinterlacer/force

Image Processing – Scan Type – Secondary Fields

Description

The scan type of the input can be converted to a different scan type: progressive, interlaced, hard telecine, or soft telecine. You can configure to leave the scan type as is or to convert from one incoming type (or a mix of incoming scan types) to another single type. Configuring for scan type conversion involves setting fields in specific ways.

Force Deinterlace

The field applies only when the Deinterlacer Preprocessor is turned on. It deals with issues of badly tagged frames.

- When the **Deinterlace Mode** is Adaptive, set **Force Mode** to Off.
- When the **Deinterlace Mode** is Deinterlace, use **Force Mode** as follows:
  - **Off**: The processor does not convert frames that are tagged in metadata as "progressive." It only converts those that are tagged as some other type.
  - **On**: The processor converts every frame to "progressive" – even those that are already tagged as "progressive." Turn **Force Mode** on only if the input frames are incorrectly marked as "progressive." Do not turn otherwise; processing frames that are already tagged as "progressive" degrade video quality.
- When the **Deinterlace Mode** is Inverse Telecine, use **Force Mode** as follows:

- Off: The processor monitors presence/absence of the hard telecine field repeat cadence and applies only to hard telecine to progressive conversion on frames that have a distinct cadence.
- On: The processor still monitors for hard telecine cadence and adapts to cadence, but all frames are converted from hard telecine to progressive using the last detected cadence.

Deinterlace Algorithm

The field applies only when the Deinterlacer Preprocessor is turned on and when the **Deinterlace Mode** is set to **Deinterlace** or **Adaptive**. Set it to the desired value:

- Motion adaptive interpolation: Provides for better spatial quality (i.e. produces sharper images).
- Motion adaptive blend: Provides for better temporal quality (i.e. produces smoother motion).
- Low latency interpolation: Performs interpolated line-doubling to allow for lower latency applications.

Location of Fields

Location of Field on Web Interface	Location of Tag in XML
Streams > Advanced >Preprocessors > Deinterlacer > Deinterlace Algorithm	stream_assembly/video_description/video_preprocessors/deinterlacer/algorithm
Streams > Advanced >Preprocessors > Deinterlacer > Force Mode	stream_assembly/video_description/video_preprocessors/deinterlacer/force

Image Processing – Noise Reduction

Description

In some applications, you can apply the Noise Reducer Preprocessor to improve output quality. It works by reducing spatial noise, which makes images compress better. But it changes the visual quality of the video.

- The **Filter** field has four options:

- **Mean / Gaussian / Lanczos**: All of these algorithms allow for varying blur strengths. Mean is the strongest filter (it operates on a smaller group of pixels) while Lanczos is the mildest (it operates on a larger group of pixels).
- **Sharpen**: This algorithm sharpens the edges instead of softening them.
- **Conserve**: This algorithm limits the pixel values to within the minimum and maximum values of the neighboring pixel values. It is designed to reduce speckle noise. This filter does not seem to be very valuable with video.
- **Bilateral**: This algorithm tends to preserve strong edges and is the best compromise between noise reduction and visual quality.

- **Strength**: The strength field of the filtering has its greatest effect at 3.

Recommendations

In most cases, enabling the Noise Reducer is not required, but can help output quality if the content will be compressed heavily. When enabled, the recommended algorithm is Bilateral, but the other algorithms may produce better results in certain use cases. Testing the different algorithms using the expected source content is the recommended method to determine the best option.

Location of Fields

Location of Field on Web Interface	Location of Tag in XML
Streams > Advanced >Preprocessors > Noise Reducer > Filter	stream_assembly/video_description/video_preprocessors/ noise_reducer/filter
Streams > Advanced >Preprocessors > Noise Reducer > Strength	stream_assembly/video_description/video_preprocessors/ noise_reducer/strength

Image Processing – framerate Conversion

Description

framerate conversion is typically used when producing content for devices that use different standards (e.g. NTSC vs. PAL) or different content playback scenarios (e.g. film at 24 fps vs. television at 25 fps or 29.97 fps). There are a few different encoding settings that can be adjusted when performing framerate conversion:

- **framerate**: Defines the framerate of the output. The AWS Elemental system has some common built-in settings, but you can define custom settings.
- **Interpolated**: If Interpolated is disabled, the AWS Elemental engine drops or repeats frames as needed. This results in sharp individual frames. If Interpolated is enabled, a weighted average is applied between frames when “new” frames need to be added. This results in smoother motion. For example, when converting from a 24 fps input to 29.97 fps output, the AWS Elemental system uses an algorithm to average the 4th and 5th frames of the source content to produce the additional frame needed in the output.
- **Slow PAL**: This field appears only when framerate specifies 25 and applies when you are converting content from 23.976 fps to 25 fps frame rates. Slow PAL may be used to re-label the content as 25 fps and speed up the audio to compensate for the slower playback.

Recommendations

- If possible, try to avoid framerate conversion if you want to provide the best video quality. However, given workflow requirements or playback devices, it may not always be possible to avoid framerate conversion.
- Enable **Interpolation** if input and output frame rates are close (e.g. 24 fps inputs to 25 fps outputs).

Location of Fields

Location of Field on Web Interface	Location of Tag in XML
Stream – Video > Advanced > Framerate	stream_assembly/video_description/*codec*/framerate_numerator

Location of Field on Web Interface	Location of Tag in XML
	stream_assembly/video_description/*codec*/framerate_denominator where *codec* is one of the following: • **h264_settings** • **vc1_settings** • **mpeg2_settings** • **h265_settings** • **prores_settings**
Stream – Video > Advanced > Interpolated	stream_assembly/video_description/*codec*/interpolate_frc where *codec* is: • **h264_settings** • **vc1_settings** • **mpeg2_settings** • **h265_settings** • **prores_settings**
Stream – Video > Advanced > Slow PAL	stream_assembly/video_description/*codec*/slow_pal where *codec* is: • **h264_settings** • **vc1_settings** • **mpeg2_settings** • **h265_settings** • **prores_settings**

Encoding Controls

Topics

- Encoding – Group of Pictures (GOP)
- Encoding – Rate Control
- Encoding – Rate Control Modes
- Encoding – Rate Control Tuning
- Encoding – Statmux Rate Control
- Encoding – Quantization Controls
- Encoding – Scan Type
- Encoding – MPEG-4 AVC (H.264) Controls
- Encoding – HEVC (H.265) Controls

Encoding – Group of Pictures (GOP)

Description

The Group of Pictures (GOP) settings define the basic pattern of the video stream itself in terms of how the encoding engine uses I-, P-, and B- frames. A few encoding settings control the GOP structure are as follows:

- **GOP Mode**: Select **Fixed**.
- **GOP Size**: Defines the interval between I-frames.
- **B-Frames**: Defines the maximum run of B-frames. (**Note:** The encoding engine may make the decision to use a smaller run of B- frames in specific instances within the GOP if it determines this will produce higher quality content.)
- **Closed GOP Cadence**: Defines the number of GOPs across which P- or B-frames are allowed to predict for encoding purposes.
- **Scene Change Detect**: Enables an algorithm that determines when a scene change occurs and inserts an I-frame.
- **Min I-interval**: Specifies a minimum number of frames between GOP Cadence I-frames and Scene Change Detect I-frames. I-frames require more bits than P- or B-frames, so encoding two in quick succession can hurt quality, particularly with small buffer sizes.

- **GOP Reference B-Frame** (H.264 and H.265 only): Enables the use of reference B-frames for GOP structures that have B- frames greater than 1.

Recommendations

- **GOP Mode**: Always choose **Fixed**.The **Follow** mode is obsolete and not recommended.
- **GOP Size**: When using the MPEG-2 codec, the recommended **GOP Size** is up to 30 (15 is also very common). For H.264 or VC-1 codecs, our recommendation is to make this as large as possible while still meeting other encoding requirements.

  For example, for adaptive bitrate delivery in which a segment size of 6 seconds is used for 29.97 fps outputs, the largest GOP size should be 180 frames.
- **B Frames and GOP Reference B-Frames**: When using H.264 or H.265, enable **GOP Reference B-Frame** to obtain the best quality and set B-frames to a value from 3 to 5 (3 is recommended). For other codecs, there is no quality benefit to setting the B-frames to more than 2. For high-motion content, use 0 or 1 to produce the best quality.
- **Closed GOP Cadence**: For segmented outputs (e.g. for adaptive bitrate content, such as HLS, Smooth, HDS, DASH, etc.), set the **Closed GOP Cadence** to 1. For non-segmented outputs, this can be set to 0 to allow for an open GOP.
- **Scene Change Detect**; Always enable this for the best quality. The only scenario where this might be disabled is if a STB or playback device is unable to accommodate an additional I-frame within the normal GOP pattern. (This is rare.)

  Some service providers, encoding vendors, or manufacturers may state that **Scene Change Detect** should be disabled during encoding of content. This recommendation is typically based on the fact that these providers have systems that require a consistent GOP structure and some encoders "reset" the GOP structure when an I-frame is inserted for a scene change.

  On AWS Elemental systems, **Scene Change Detect** can be enabled in almost all cases as the default behavior is to simply insert an additional I-frame on a scene change but not disrupt the normal GOP structure defined in the encoding settings. The intent behind this approach is to ensure that adaptive bitrate outputs are always GOP-aligned, and, as a side effect, allow for compatibility with these third-party systems even with **Scene Change Detect** enabled.
- **Min I-interval** is enforced by shifting the GOP cadence; so, for segmented outputs that require a fixed cadence of I-frames, it cannot be used and should be set to 0. For non-segmented outputs, a Min I-Interval of 5 is recommended.

Location of Fields

Location of Field on Web Interface	Location of Tag in XML
Streams – Video > Advanced > GOP Size	stream_assembly/video_description/*codec*/gop_size where codec is one of the following: • **`h264_settings`** • **`vc1_settings`** • **`mpeg2_settings`** • **`h265_settings`**
Streams – Video > Advanced > B Frames	stream_assembly/video_description/*codec*/ gop_num_b_frames where *codec* is one of the following: • **`h264_settings`** • **`vc1_settings`** • **`mpeg2_settings`** • **`h265_settings`**
Streams – Video > Advanced > Closed GOP Cadence	stream_assembly/video_description/*codec*/ gop_closed_cadence where *codec* is one of the following: • **`h264_settings`** • **`vc1_settings`** • **`mpeg2_settings`** • **`h265_settings`**
Streams – Video > Advanced > Scene Change Detect	stream_assembly/video_description/*codec*/

Location of Field on Web Interface	Location of Tag in XML
	transition_detection where *codec* is one of the following: • **h264_settings** • **vc1_settings** • **mpeg2_settings** • **h265_settings**
Streams – Video > Advanced > Min I-interval	stream_assembly/video_description/*codec*/ min_i_interval where *codec* is one of the following: • **h264_settings** • **vc1_settings** • **mpeg2_settings** • **h265_settings**
Streams – Video > Advanced > GOP Reference B-Frame	stream_assembly/video_description/*codec*/ gop_b_reference where *codec* is one of the following: • **h264_settings** • **h265_settings**

Encoding – Rate Control

Description

For AWS Elemental encoding, a buffer model (such as VBV or HRD) is used to manage rate control. The buffer model is a conceptual model for specifying both short-term and long-term constraints on encoding stream bitrates. The concept is that bits flow into the buffer at a fixed rate and picture

are extracted instantaneously. In a "compliant" stream, the buffer cannot overflow or underflow. The following are several settings that allow the user to adjust the rate control settings tied to this buffer model:

- **Bitrate**: Defines the long-term average bitrate, in bits/second. This field does not appear when Rate Control Mode is set to CQ.
- **Buffer Size**: Defines the total buffer size in bits.
- **Max Bitrate**: Defines the buffer fill rate, in bits/second. This field appears only when Rate Control Mode is set to VBR or Statmux.
- **Initial Buffer Fill**: Defines the percentage of the buffer filled with bits before the decode begins.

These fields work with the Rate Control Mode field, which is discussed in the section called "Encoding – Rate Control Modes".

Recommendations

- For **Bitrate**, more is better. The value used will depend more on other workflow constraints and will likely be different for each application.
- In general, **Buffer Size** is commonly set to 1x to 2x the bitrate (again, more is typically better).
- **Max Bitrate** is commonly set to 1x to 2x the bitrate. Although more is typically better, this value must also fit within the other encoding requirements of your specific application.
- For **Initial Buffer Fill**, the default value (90%) typically provides the best video quality, so leave it blank to use the default.

Location of Fields

Location of Field on Web Interface	Location of Tag in XML
Streams – Video > Advanced > Bitrate	stream_assembly/video_description/*codec*/bitrate where *codec* is one of the following: • **`h264_settings`** • **`vc1_settings`** • **`mpeg2_settings`**

Location of Field on Web Interface	Location of Tag in XML
	• **`h265_settings`**
Streams – Video > Advanced > Buffer Size	stream_assembly/video_description/*codec*/buf_size where *codec* is one of the following: • **`h264_settings`** • **`vc1_settings`** • **`mpeg2_settings`** • **`h265_settings`**
Streams – Video > Advanced > Max Bitrate	stream_assembly/video_description/*codec*/max_bitrate where *codec* is one of the following: • **`h264_settings`** • **`vc1_settings`** • **`mpeg2_settings`** • **`h265_settings`**
Streams – Video > Advanced > Initial Buffer Fill	stream_assembly/video_description/*codec*/buf_fill_pct where *codec* is one of the following: • **`h264_settings`** • **`vc1_settings`** • **`mpeg2_settings`** • **`h265_settings`**

Encoding – Rate Control Modes

For **Rate Control Mode**, you will generally get the best video quality per bit by using the Quality Variable Bitrate (**QVBR**) rate control mode. For more information, see Using QVBR Rate Control Mode.

Description

Rate control modes define how the encoding engine uses the buffer model and how bits flow into the engine.

- The **Rate Control Mode** field has the following options.
  - **Constant Bitrate** (CBR) mode: Uses the buffer model described above where Max Bitrate equals the defined (Average) Bitrate. In this mode, the system adds fill bits to the stream to ensure a constant bitrate video encoding.
  - **Variable Bitrate (VBR)** mode: Uses the buffer model described above where Max Bitrate is greater than or equal to the (Average) Bitrate. In this mode, the system adds no fill bits for VBR video encoding.
  - **Average Bitrate (ABR)** mode: Does not use the buffer model but allows the bitrate to vary as needed while maintaining an overall average bitrate for the entire video encoding.
  - **Constant Quantizer (CQ)** mode: Disables rate control completely. The system encodes frames using a constant **Quantization Parameter** (**QP**), which you can set using the **Start QP** setting.
  - **Statmux**: See the section called “Encoding – Statmux Rate Control”.
- **Start / Min / Max QP**: This field specifies the level of compression to start at when performing rate control and the minimum and maximum levels of compression.

Recommendations

- **CBR** mode provides the lowest quality at a given bitrate but has the benefit of providing minimal bitrate variation. It is supported by the widest variety of playback devices.
- **VBR** mode provides better quality than CBR but has more bitrate variation (though is still limited). VBR is supported by many modern devices but is not as widely supported as CBR, particularly with older playback devices.
- **ABR** mode provides the best quality but should only be used if bitrate variation is not critical.
- **CQ Mode** is a legacy control mode which does not typically provide any notable benefits for video quality tuning. Use of CQ mode is not recommended.

- **QP Mode** has an encoder which adjusts QP values optimally: leave all fields blank. Use of QP is not recommended.

Location of Fields

Location of Field on Web Interface	Location of Tag in XML
Streams – Video > Advanced > Rate Control Mode	stream_assembly/video_description/*codec*/rate_control_mode where *codec* is one of the following: • **`h264_settings`** • **`vc1_settings`** • **`mpeg2_settings`** • **`h265_settings`**
Streams – Video > Advanced > Start QP	stream_assembly/video_description/*codec*/qp where *codec* is one of the following: • **`h264_settings`** • **`vc1_settings`** • **`mpeg2_settings`**
Streams – Video > Advanced > Min QP	stream_assembly/video_description/*codec*/min_qp where *codec* is one of the following: • **`h264_settings`** • **`vc1_settings`** • **`mpeg2_settings`**
Streams – Video > Advanced > Max QP	stream_assembly/video_description/*codec*/max_qp

Location of Field on Web Interface	Location of Tag in XML
	where *codec* is one of the following: • **`h265_settings`** • **`vc1_settings`** • **`mpeg2_settings`**

Encoding – Rate Control Tuning

Description

Following are encoding settings that can be used to provide additional tuning of video quality.

- **Passes**: When this field is set to 2-pass and **Rate Control Mode** is set to CBR, VBR, or ABR, the system analyzes the entire source video stream before encoding in order to better distribute bits to more- or less-complex portions of the video. The tradeoff is that encoding time is increased as the system needs to decode/analyze the source stream prior to starting the encode process.
- **Lookahead**: This setting indicates the system should analyze a few frames in the future of the currently encoded frame (higher values mean more frames) and allow the encoder to take future frame data into account during rate control logic.

  For example, if future frames are more complex, the encoder can allocate fewer bits to encode the current frame to allow those bits to be used to encode those future frames. The tradeoff is that processing and latency are increased slightly to allow those future frames to be analyzed by the encoding engine.

Recommendations

- Use 2-pass encoding for VOD unless minimize encoding time is critical.
- Set **Lookahead** to "medium" for use with 1-pass encoding unless latency is critical.

Location of Fields

Location of Field on Web Interface	Location of Tag in XML
Streams – Video > Advanced > Passes	stream_assembly/video_description/*codec*/passes where *codec* is one of the following: • **`h264_settings`** • **`vc1_settings`** • **`mpeg2_settings`** • **`h265_settings`**
Streams – Video > Advanced > Lookahead	stream_assembly/video_description/*codec*/look_ahead_rate_control where *codec* is one of the following: • **`h264_settings`** • **`vc1_settings`** • **`mpeg2_settings`** • **`h265_settings`**

Encoding – Statmux Rate Control

Description

Statistical multiplexing (statmux) rate control applies only to an event created on an AWS Elemental Server node that has the Statmux option or a combination of an AWS Elemental Server node and a Statmux node.

The statmux controls are divided between the stream assembly of the event or profile and several fields on the MPTS output. The event is always created on the AWS Elemental Server node. The MPTS output is created on the AWS Elemental Server node or the Statmux node.

Statistical multiplexing is performed on the STPS channels that make up an MPTS output when the **Rate Control Mode** of the video stream is set to Statmux. In terms of video quality, all the controls described in the other sections of this chapter apply, along with the following special controls.

SPTS Channel (Event) Controls

In the event (which is called an SPTS channel in an MPTS output) the following controls apply:

- **Bitrate (Nominal Bitrate).**
- **Minimum Bitrate**. The bitrate allocated to a given SPTS channel, which will never go below this number.
- **Maximum Bitrate**. The bitrate allocated to a given SPTS channel, which will never exceed this number.

These settings guide the distribution of bitrate among the channels in the multiplex as described below.

MPTS Output Controls

The MPTS output has the following controls:

- **Transport Stream Bitrate**: The total size of the MPTS output.
- **Video Allocation**: The portion of the **Transport Stream Bitrate** that is allocated to the video of all the SPTS channels.

These settings determine the overall bitrate "pool" that is distributed among the channels in the multiplex as described below.

Statmux Bitrate Allocation

At runtime, each SPTS channel sends per-frame complexity information to the multiplexer and receives corresponding bitrate allocations. The allocations for each frame in channel are computed as follows.

- The **Nominal Bitrates** for all channels are scaled proportionately; such sum of the scaled nominal bitrates matches the Video Allocation for the multiplex. This is bitrate distribution if all the channels have the same complexity.
- The complexity of each channel is examined (relative to the other channels) and the **Nominal Bitrate** of each channel is adjusted. In this adjustment, the spread between the Min and Max

of a given channel affects how much that channel's **Nominal Bitrate** is adjusted: the bigger the range, the bigger the adjustment.

- The **Nominal Bitrate** of each channel is adjusted again, if necessary, to stay within the Min and Max range.
- This last adjustment may result in “leftovers.” These leftovers are distributed among channels that did not get adjusted.
- The final bitrate allocation is sent to each SPTS channel.

Recommendations

- **Transport Stream Bitrate**: The total size of the MPTS output; this number is set based on the bandwidth characteristics of the intended network.
- **Video Allocation**: This number is typically calculated as follows:

  VA = Useable bitrate - (the maximum anticipated audio of all SPTS channels) - (the maximum anticipated data of all SPTS channels).

  where the useable bitrate is typically 95-97% of the **Transportation Stream Bitrate**.
- **Nominal** bitrate is set for each SPTS channel relative to other channels depending on resolution, framerate, and codec used to encode the video. Typically the nominal bit rate is set to a value that provides the desired video quality in an non-statmuxed application.
- **Minimum** bitrate sets a minimum allocation for a channel regardless of how low its relative complexity. A typical value for each SPTS channel is:

  (Nominal) ÷ 2

  The combined minimum bitrates for all channels in the multiplex is less than the **Video Allocation (VA)**. An alert is triggered if it ever equals or exceeds the VA.
- **Maximum** bitrate sets a maximum allocation for a channel, regardless of how high its relative complexity is. A typical value for each SPTS channel is:

  Nominal x 2

  The combined maximum bitrate is typically greater than the combined **Video Allocation (VA)**: if it is less than the VA, then all channels receive their maximum allocation (they are encoded at constant bitrates).

The allocation of bitrates in the MPTS can be monitored in real time via the MPTS Performance screen on the web interface.

Location of Fields

Event or Profile API

Location of Field on Web Interface	Location of Tag in XML
Streams – Video > Advanced > Bitrate	stream_assembly/video_description/bitrate
Streams – Video > Advanced > Min Bitrate	stream_assembly/video_description/min_bitrate
Streams – Video > Advanced > Max Bitrate	stream_assembly/video_description/max_bitrate

MPTS API

Location of Field on Web Interface	Location of Tag in XML
MPTS > Transportation Stream Bitrate	bitrate
MPTS > Video Allocation	video_allocation

Encoding – Quantization Controls

Description

- **Adaptive Quantization** (**AQ**): Allows the encoder to vary compression within a frame to improve subjective visual quality. It can distribute bits to provide more data to areas of a frame that are more complex for the encoding process. It can also reduce "smear" in high motion and sports content.

  Note that although it may seem counter-intuitive, areas of solid color are considered more complex as human perception is more likely to notice small variations in smooth surfaces or gradients as opposed to more varied areas. For this reason, with **Adaptive Quantization**, more bits are allocated to smooth surfaces to minimize the perceptual variation between frames.

- **Framing Quantization**: An extension of **Adaptive Quantization** that compresses the edges of the video slightly more than the center. The effect shifts bits, and thus quality, from the boundary of the image to the middle of the image, where the action and viewers' attention is typically focused. This field appears only when the output codec is MPEG-2.
- **Softness**: Adjusts the quantization matrices used in the encoder, which determine the relative compression of high vs. low spatial frequency components of the video. Higher softness settings compress high frequencies more, reducing bitrate at the cost of image sharpness. This field appears only when the output codec is H.264 or MPEG-2.

Recommendations

- **Adaptive Quantization**: For high bitrate outputs, we recommendthat you always set **Adaptive Quantization** to "low." For moderate bitrate outputs, our recommendation is "medium." For low bitrate outputs, our recommendation is "high" to "medium" or "high" for h.264 content. We generally recommend "high " , but, particular for low bitrate use cases, this setting can result in some use cases having too many bits be distributed to complex areas of the picture, resulting in more noticeable, lower quality in less complex areas. In those cases, "medium " may be more appropriate.
- **Framing Quantization**: For low bitrate encodes, we recommend using **Framing Quantization** (e.g. MPEG-2 1080i at 10 Mbps) and set based on subjective tuning at values between 1.0 and 2.0. . (Note: The visual effect of framing quantization is intentionally subtle.)
- **Softness** For low bitrate encodes softness can be used (e.g. MPEG-2 1080i at 10 Mbps) and set based on subjective tuning at values between 24 and 32.

Location of Fields

Location of Field on Web Interface	Location of Tag in XML
Streams – Video > Advanced > Adaptive Quantization	stream_assembly/video_description/*codec*/adaptive_quantization where *codec* is one of the following: • **`h264_settings`** • **`vc1_settings`** • **`mpeg2_settings`**

Location of Field on Web Interface	Location of Tag in XML
	• **`h265_settings`**
Streams – Video > Advanced > Framing Quantization	stream_assembly/video_description/*codec*/framing_quantization where *codec* is: **`meg2_settings`**
Streams – Video > Advanced > Softness	stream_assembly/video_description/*codec*/softness where *codec* is one of the following: • **`h264_settings`** • **`mpeg2_settings`**

Encoding – Scan Type

Description

The scan type of content can affect the video quality. The following are the settings and internal algorithms tied to the scan type:

- The encoding controls that deal with scan type are dealt with in the section called "Image Processing – Scan Type – Key Controls".
- **Picture Adaptive Field Frame (PAFF)**: This control is automatically enabled on Graphics Processing Unit (GPU)-enabled versions of the software and automatically disabled on Central Processing Unit (CPU)-only versions.
- **Macroblock Adaptive Field Frame (MBAFF)**: This control is automatically enabled on CPU-only versions of the software and automatically disabled on GPU-enabled versions.
- **Force Field Pictures**: This field appears only if the codec is H.264 and only affects GPU-enabled versions of the software.
  - **Enabled**: All outputs are forced to use PAFF field picture encoding.
  - **Disabled**: The encoder switches between PAFF and MBAFF, depending on the content.

Recommendations

- **Force Field Pictures** results in a significant reduction in quality so it should only be used if required for compatibility with specific decoders or playback devices.

Location of Fields

Location of Field on Web Interface	Location of Tag in XML
Streams – Video > Advanced > Force Field Pictures	stream_assembly/video_description/*codec*/force_field_pictures where *codec* is: **`h264_settings`**

Encoding – MPEG-4 AVC (H.264) Controls

Description

A few h.264-specific controls are available on AWS Elemental systems that affect video quality:

- **CABAC**: This control enables arithmetic coding and can compress the same data with ~15% fewer bits.
- **Slices**: This control improves speed of encoding. Using a higher number of slices can improve speed optimization but results in slightly less quality.
- **Flicker Reduction**: This control reduces flicker in the video. It enables an additional encoding algorithm that compensates for visual differences when I-frames have occurred (often referred to as I-frame "pop"). The AWS Elemental system uses this approach to encode I-frames as if they were P-frames (thus creating a "PI"-frame), identify macroblocks that are prone to flicker, merge pixels from the PI-frame for the flicker-prone MBs into the I-frame, and then encode the PI-frame. This method carries some of the visual quality from the end of one GOP to the start of the next GOP, preventing the abrupt change in detail that gives the effect of a flicker in the video.
- **Reference Frames**: This control defines the number of frames that can be used to define B- and P- frames.

Recommendations

- Use **High Profile** with H.264 to improve quality over Baseline Profile and Main Profile.
- Always enable **CABAC** unless the intended decoder or playback device doesn't support it.
- Set **Slices** to 2 (or higher) for all HD resolution outputs or high bitrate outputs. (AWS Elemental presets typically use 2 slices for 720p content and 4 slices for 1080p content.) For resolutions below 720p, set **Slices** to 1.
- Set **Flicker Reduction** to "high" for low-motion content. Disable it for high-motion content.
- Set **Reference Frames** to 2 or more for flash compensation.

Location of Fields

Location of Field on Web Interface	Location of Tag in XML
Streams – Video > Advanced > Profile	stream_assembly/video_description/h264_settings>/cabac
Streams – Video > Advanced > Level	stream_assembly/video_description/h264_settings>/level
Streams – Video > Advanced > CABAC	stream_assembly/video_description/h264_settings>/cabac
Streams – Video > Advanced > Slices	stream_assembly/video_description/h264_settings/slices
Streams – Video > Advanced > Flicker Reduction	stream_assembly/video_description/h264_settings/flicker_reduction

Encoding – HEVC (H.265) Controls

Description

The following HEVC-specific control can affect video quality:

- **Slices**: This control improves speed of encoding. Using a higher number of slices can improve speed optimization but results in slightly less quality.

Recommendations

The AWS Elemental HEVC encoder performance is less sensitive to changes in slices than the MPEG-4 AVC encoder (the section called "Encoding – MPEG-4 AVC (H.264) Controls"), so the benefit of using more slices is reduced and having more slices reduces video quality. For these reasons, the recommendation is to use half as many slices with HEVC as with MPEG-4 AVC for the same resolution. In other words, set **Slices** to 2 (or higher) for all 1080p (or above) resolution outputs or high bitrate outputs. Set Slices to 1 for Resolutions below 1080p .

Location of Fields

Location of Field on Web Interface	Location of Tag in XML
Streams – Video > Advanced > Profile	stream_assembly/video_description/h265_settings>/cabac
Streams – Video > Advanced > Slices	stream_assembly/video_description/h265_settings/slices

Setting Up Audio Channel Mapping with AWS Elemental Server

About this manual

This guide is intended for users who set up transcoding jobs that require moving input audio channels to a different track or channel on the output.

Assumptions

To use this guide, you should be familiar with or understand:

- How to use AWS Elemental Server web interface to set up and run jobs.
- How to include audio in your AWS Elemental Server outputs.
- How to use the REST interface to set up and run AWS Elemental Server jobs when you already know how the REST interface to use the audio mapping feature.

About Audio Mapping

With AWS Elemental Server, you can map audio tracks and channels from your input file to different audio tracks and channels on your output files. You can map any input channel on any input track to any output channel on any output track.

Relevant Terminology

Throughout this document and on the AWS Elemental Server web interface, we use terminology as defined below.

Coding mode (or audio type): The phrases “coding mode” or “audio type” refer to how the audio was recorded and is intended to be played. Supported types of audio are mono, dual mono, stereo, and 5.1 Dolby Digital.

Channels: The smallest unit of audio. For example, a stereo pair consists of left and right *channels.*

Tracks: A set of channels grouped together is a *track*.

Audio Stream: All the audio tracks together make up the *audio stream*.

Stream Assembly: All the streams together (including any of the following: video stream, audio stream, captions, and metadata) make up the *stream assembly*.

In the AWS Elemental Server web interface, the Stream section contains the encoding instructions that define the outgoing stream assembly. So the Stream section is more correctly the “Stream Assembly” section.

AWS Elemental Server Foundational Audio Concepts

Audio Selectors

AWS Elemental Server manages audio at the track level with Audio Selectors. When you set up your input, you create Audio Selectors to select tracks from the input that are used in a given output.

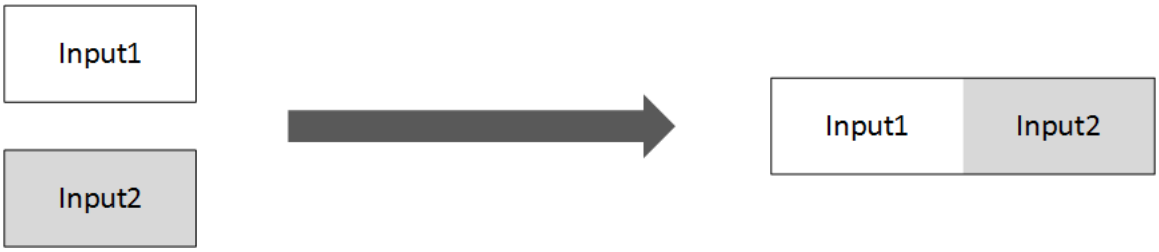
Input and Output Mapping Matrices

AWS Elemental Server manages audio at the channel level with input and output mapping matrices.

- You can use an input mapping matrix to reorder the audio channels of one input to match those of another input. This allows you to combine the two files into a single output, one after the other.
- You can use an output mapping matrix to select a subset of channels from the tracks selected in an Audio Selector and to reorder the audio channels from the input to the output.

Using Multiple Input Files

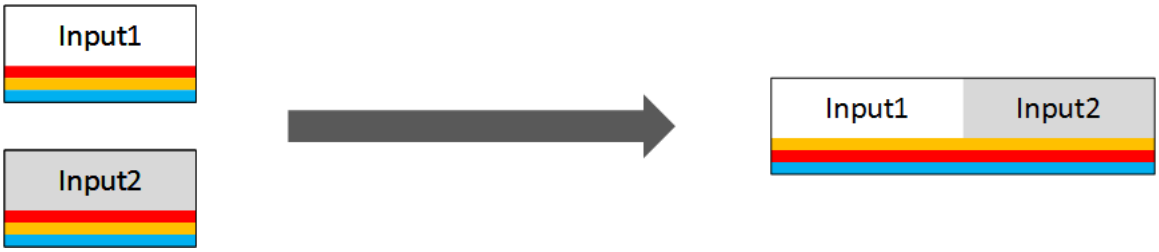
You can provide multiple input files, which AWS Elemental Server combines, one after the other, into a single output file. In the following figure, the two inputs are combined into a single output file that starts with Input 1 and ends with Input 2.



Reordering Audio Channels, Uniform Input - Output Mapping

In versions 2.5 and later of AWS Elemental Server, you can map audio with multiple inputs, provided that all inputs have the same type of audio on the same tracks and channels. You do this by using an output mapping matrix for each of your outputs.

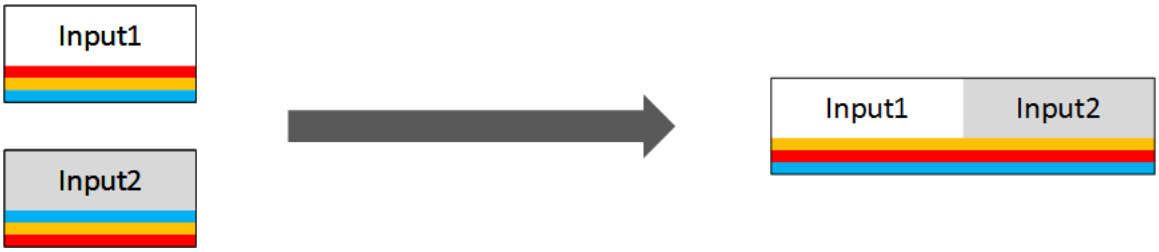
In the following figure, notice the colored bars, which represent channels. Each input file has the same three audio channels in the same position (channel 1, channel 2, and channel 3). The audio on each channel is mapped to a different position in the output: channel 1 on the input becomes channel 2 on the output; channel 2 on the input becomes channel 1 on the output, and channel 3 on the input remains channel 3 on the output.



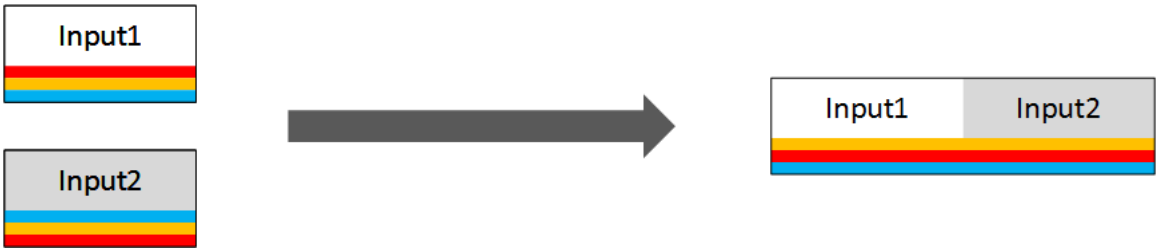
Reordering Audio Channels, Different Inputs - Input Mapping

In version 2.11 and later, you can also map audio with multiple inputs that have different audio tracks and channels. You do this first by mapping the input tracks and channels into a uniform set using input mapping matrices, then by using the output mapping matrices to specify how you want to audio set up in your output.

In the following figure, the red channel (channel 1 on Input1 and channel 3 on Input2) is mapped to channel 2 on the output. The yellow channel (channel 2 on Input1 and Input2) is mapped to channel 1 on the output. The blue channel (channel 3 on Input1 and channel 1 on Input 2) is mapped to channel 3 on the output.



You can also use input mapping to exclude a channel from a track. In the following figure, the red channel is present in Input1 but not Input2. For this, you use input mapping matrices, to exclude the red channel from Input1 and to reorder the channels in Input2.

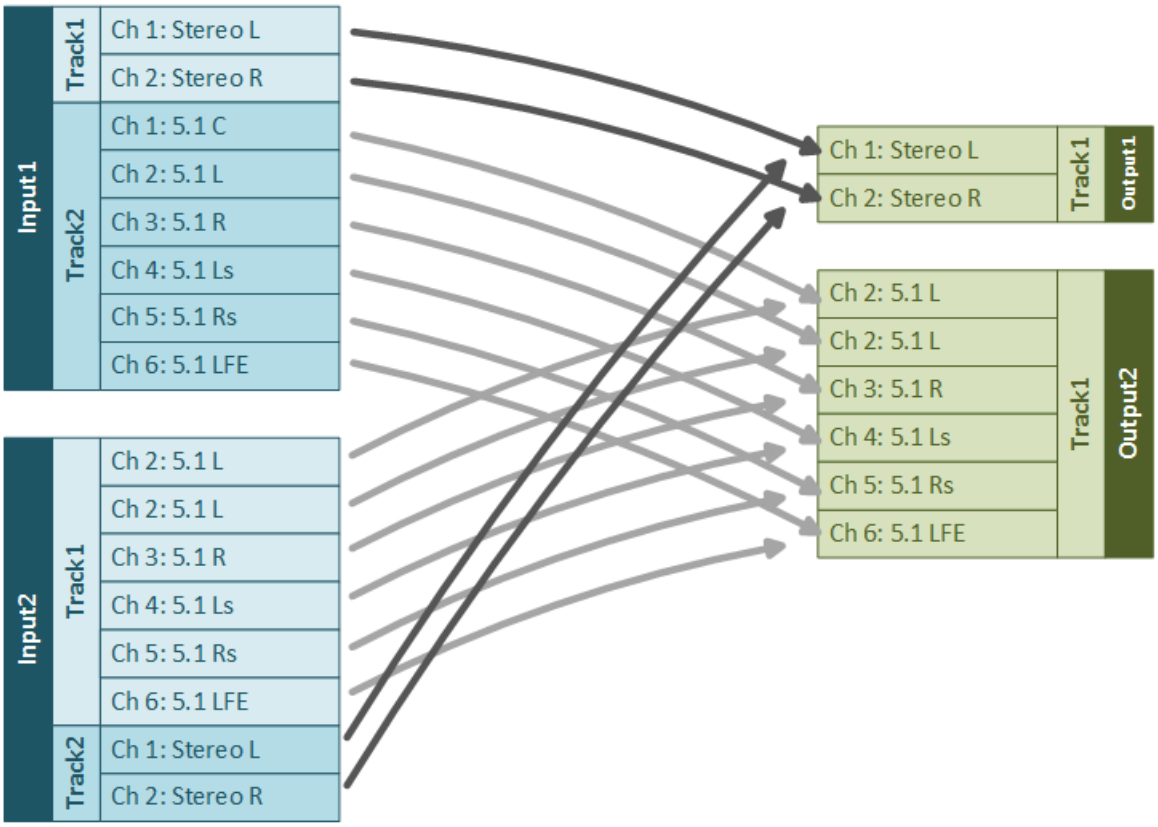


For conceptual descriptions of these options, see Audio Mapping Workflow Examples. For detailed steps to create the mappings using the web interface, see Audio Mapping Procedures.

Prerequisite Information to Setting Up Audio Mapping

Before you set up your audio mapping, plan for it. Know what type of audio you have coming in on your input tracks and channels, for example, stereo or Dolby digital 5.1. Also, identify the tracks and channels of your outputs where you want each type of audio to go.

The following figure shows a plan for a mapping with two inputs and two outputs. Of the two inputs, each with two tracks—one containing a stereo pair and one containing 5.1 audio. Each input has the same audio, but in different tracks. Of the two outputs, one has one track containing the stereo pair and the other has one track containing 5.1 audio. Make a similar plan for your own audio inputs and outputs before you begin working with mapping matrices.



Feature Limitations

As you plan your audio output, keep in mind the following restrictions:

- All channels on each output track must be encoded with the same audio coding mode. For example, your stereo channels must be on a different track than your 5.1 audio. Your input, though, can have multiple audio types on a single track.
- You can have a maximum of 16 channels per input track and eight channels per output track.
- You cannot use audio mapping with audio selector groups. If you apply an input mapping matrix to an audio selector that is part of an audio selector group, the matrix is ignored in any output that uses the audio selector group.

Audio Mapping Workflow Examples

This topic shows common mapping use cases and their solutions.

Workflow Example - Identical Input Audio Channels, One Output

Problem

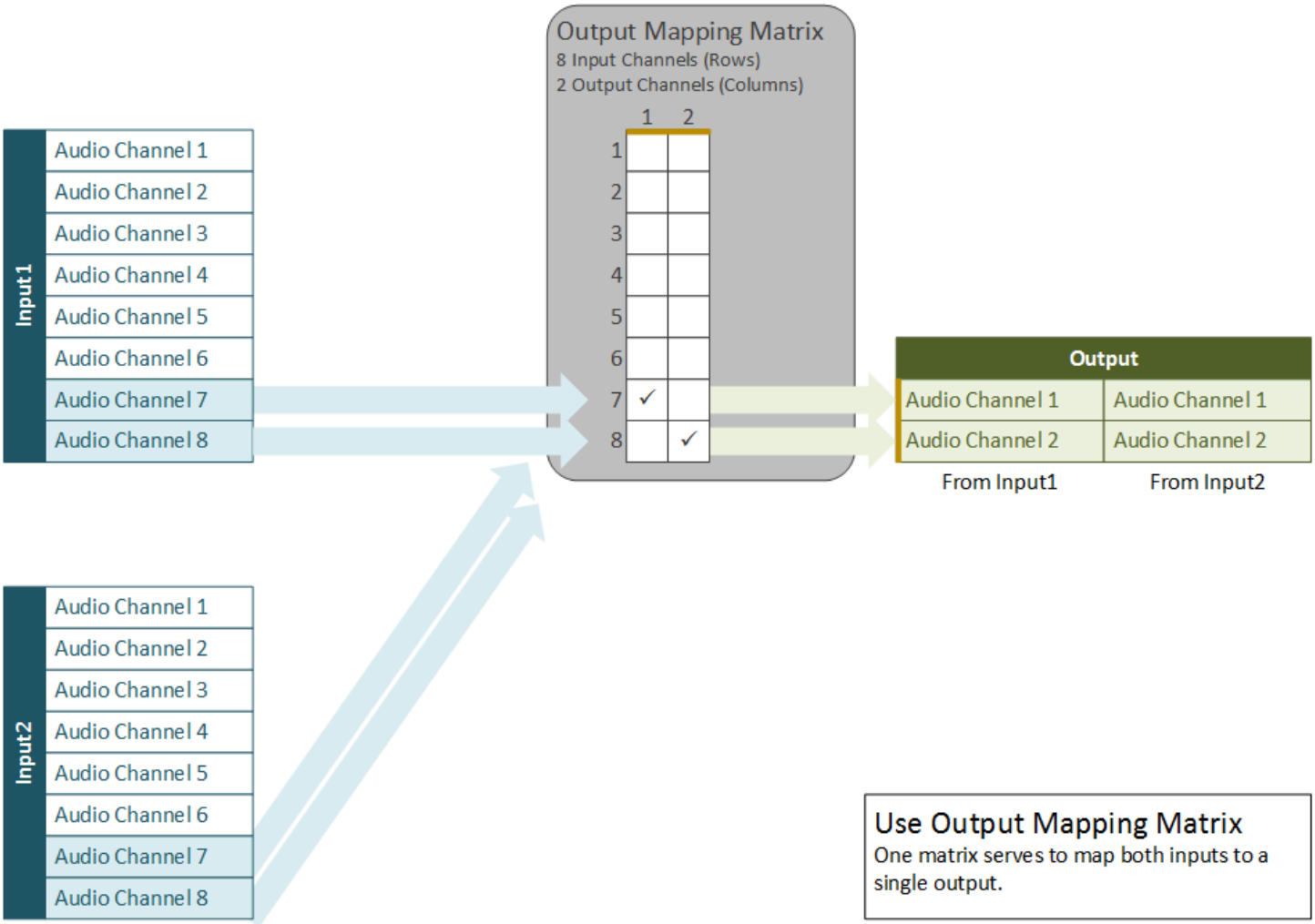
You have two inputs that you want transcoded into a single output, one after the other. The input files have the same type of audio on the same channels. You want the audio channels in the output to be different from the audio channels of the input.

Solution

Use an output mapping matrix to specify how to map the input channels to the output channels.

For example, suppose that, in both inputs, you have eight channels coming in on audio track #1. Channels 1-6 are 5.1 audio and channels 7 and 8 are a stereo pair. In your output, you want a single track that contains the stereo pair. To do this, use the following output mapping matrix.

In the mappings, the eight input channels are represented by eight matrix rows and the two output channels are represented by two matrix columns. Notice the yellow bars in the figure below illustrating the relationship between matrix columns and output channels. There are no checkmarks in rows 1 through 6, so the audio on those input channels is ignored and is not used in the output. Row 7 has a checkmark in column 1, so input audio channel 7 is mapped to output audio channel 1. Row 8 has a checkmark in column 2, so input audio channel 8 is mapped to output audio channel 2.



Workflow Example - Identical Input Audio Channels, Two Outputs

Problem

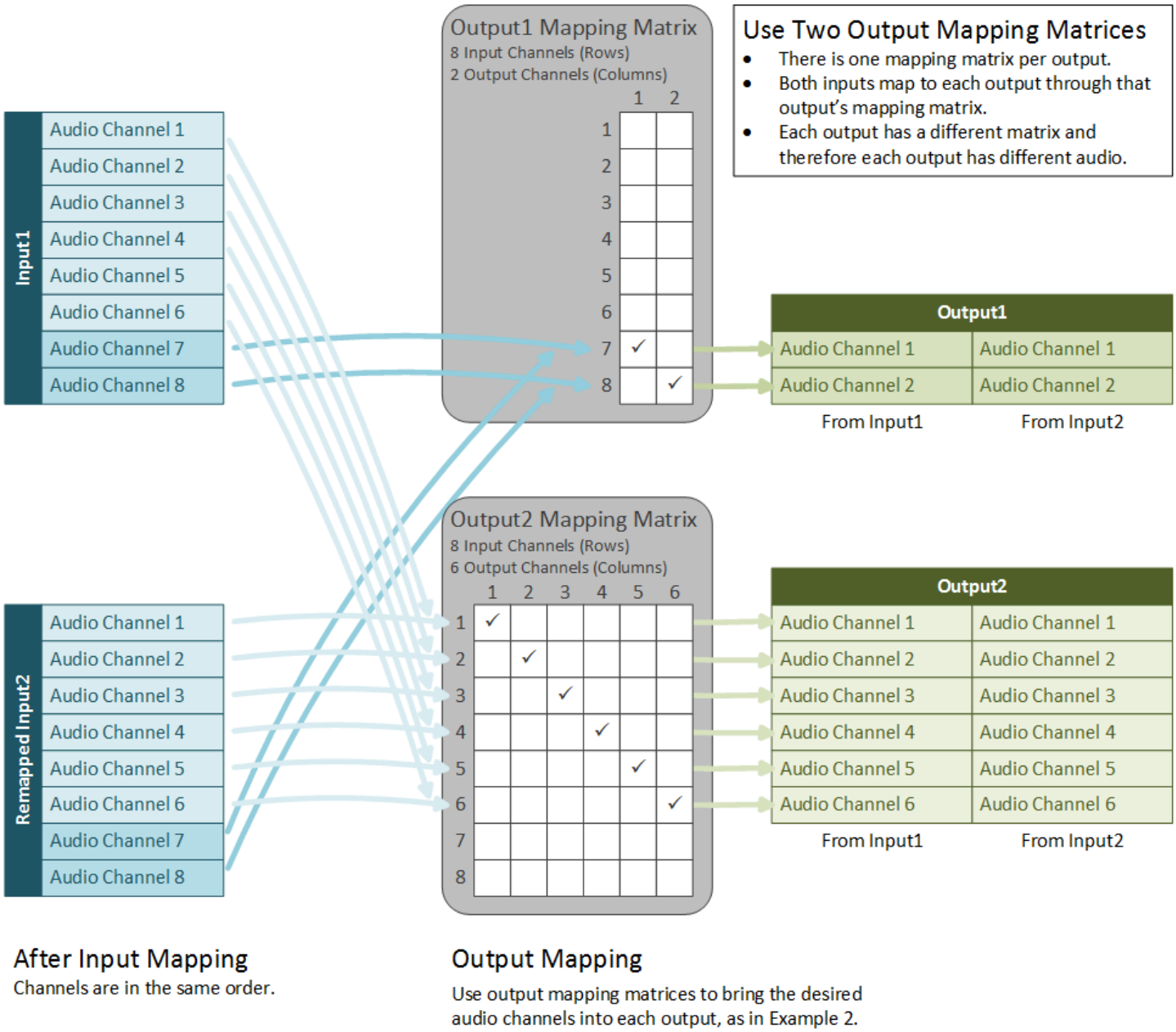
You have two inputs that you want transcoded one after the other into multiple output files. Each output has a different type of audio on each channel. Both inputs have the same type of audio on the same channels.

Solution

Use a different output matrix for each output.

For example, say that, in both inputs, you have eight channels coming in on audio track 1. Channels 1-6 are for 5.1 and channels 7 and 8 form a stereo pair. You want one output with a single track that contains the stereo pair and a second output with a single track that contains six channels for 5.1.

To do this, use two output mapping matrices as shown in the following figure. The mapping matrix for Output1 works exactly as in the example above, with input channels 7 and 8 mapping to output channels 1 and 2, respectively. In the mapping matrix for Output2, eight input channels are represented by eight matrix rows; six output channels are represented by six matrix columns. Input channel 1 maps to output channel 1, Input2 maps to Output2, and so on, through channel 6. Matrix rows 7 and 8 do not have checkmarks, so the audio in these input channels is ignored and does not appear in the output.



Workflow Example - Inputs Have Audio Channels in Different Order

Problem

You have two inputs that you want transcoded into a single file one after the other. Each input has a different type of audio on each channel. Each output has a different type of audio on each channel.

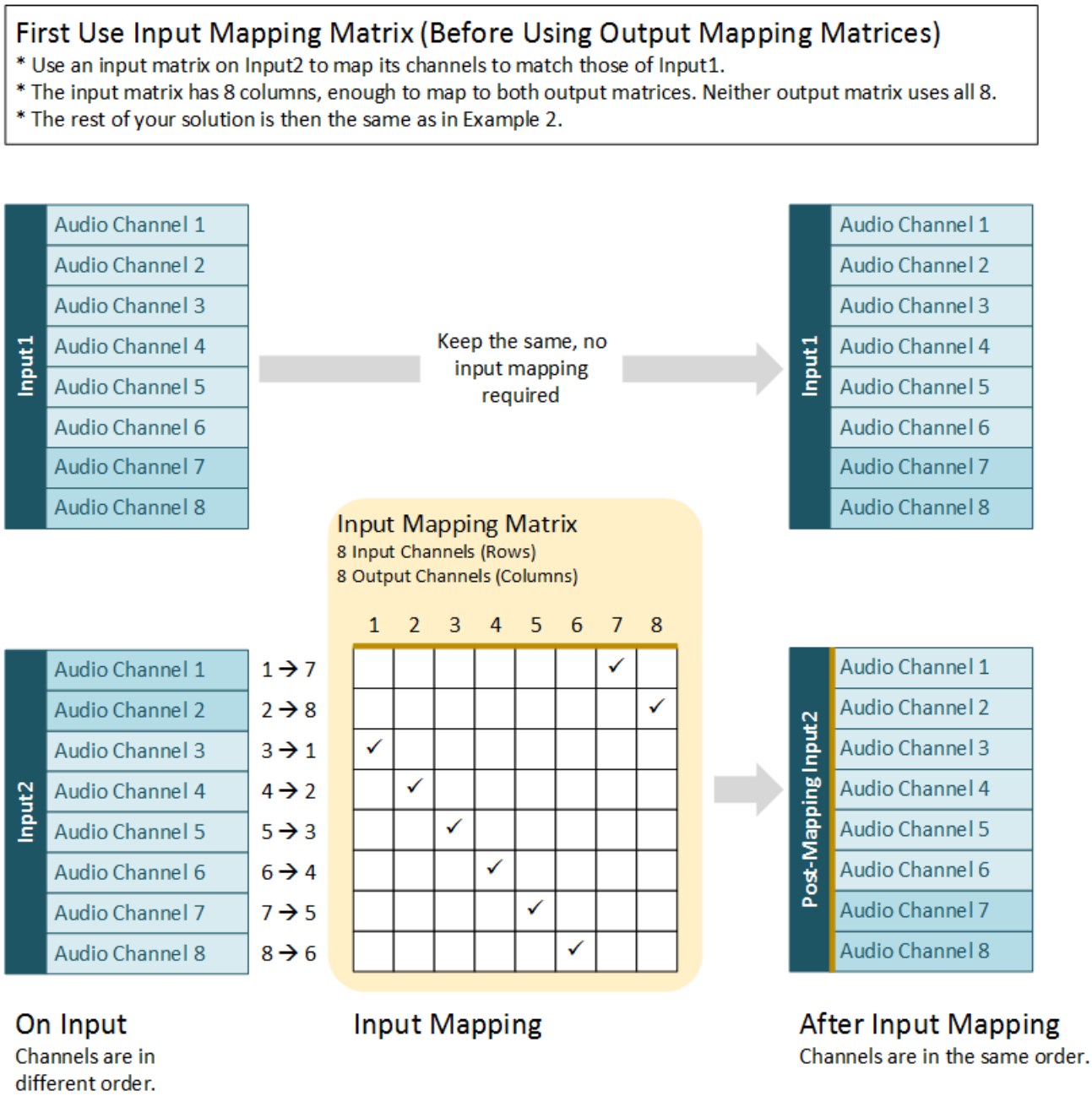
Solution

Use input matrices to map all input channels to the same configuration, then use an output matrix for each output.

For example, suppose that, in both inputs, you have eight channels coming in on audio track 1. In the first input, channels 1-6 are for 5.1 and channels 7 and 8 form a stereo pair. In the second input, channels 1 and 2 form a stereo pair and channels 3-8 are for 5.1. You want one output with a single track that contains the stereo pair and a second output with a single track that contains six channels for 5.1.

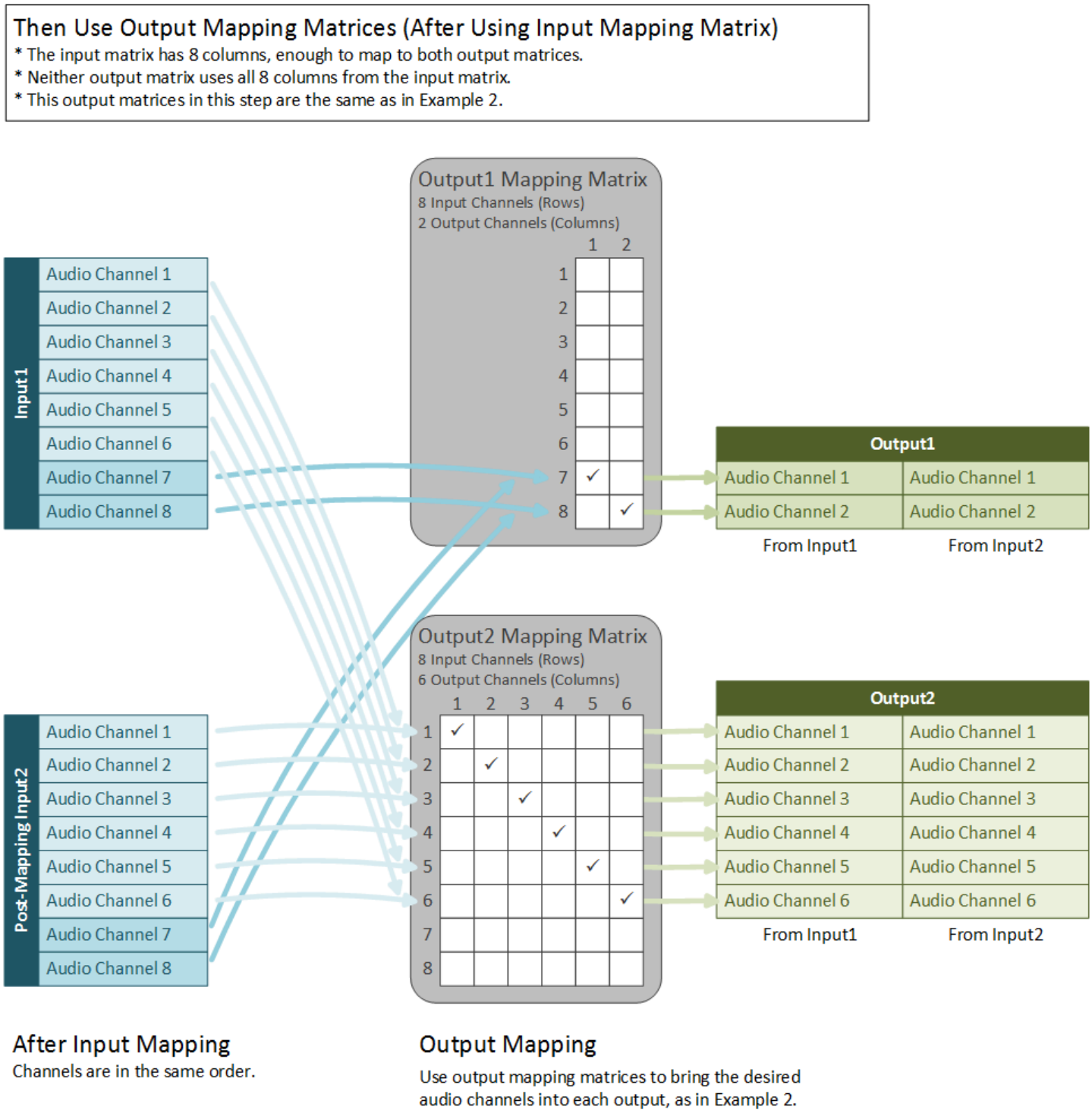
Create a mapping matrix for the second input so that its channels appear in the same order as the first input: The stereo pair maps to channels 7 and 8, and the 5.1 audio maps to channels 1 through 6. You don’t have to create a map for the first input because its channels are already in that order.

In the following figure, notice the yellow bars indicating the relationship between the columns of the input mapping matrix and the channels of the input after mapping.



After you have correctly remapped Input2, set up your output matrices as in Workflow Example - Identical Input Audio Channels, Two Outputs. Output1 takes channels 7 and 8 from both Input1 and Input2 and Output2 takes channels 1 through 6 from both Input1and Input2.

The “output” (columns) of the input mapping matrix becomes the “input” (rows) of the output mapping matrix.



Workflow Example - Inputs Have a Different Number of Channels

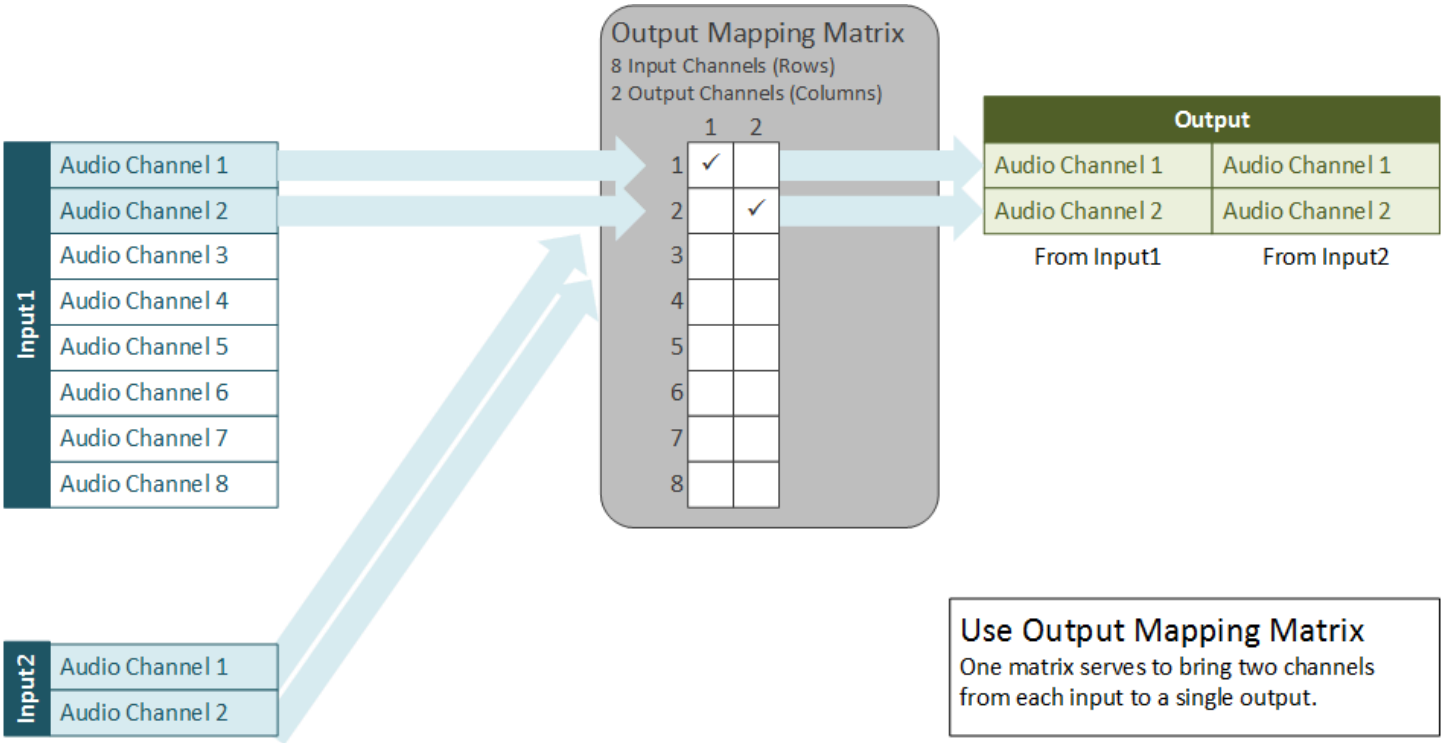
Problem

You have two inputs that you want transcoded into a single file one after the other. Each input has one track, but with a different number of channels in the track.

Solution

Specify an output matrix in order to select only the desired channels from the input with more channels and to select all the channels from the input with fewer channels. You do not need an input matrix because the channels you do want to use are the same in each input.

For example, suppose that, in one input, you have eight channels coming in on audio track 1. Channels 1 and 2 form a stereo pair and channels 3-8 contain 5.1 audio. In the second input, channels 1 and 2 form a stereo pair. You want one output with a single track that contains a stereo pair. You would use the mapping shown in the following figure.



When to Use Mapping Matrices

Only use an input matrix when you have multiple inputs and the audio channel configurations on the inputs are not the same.

Use an output matrix when you need to do any of the following:

- Exclude some of your input channels from your output.

- Reorder the channels in a track, so that the order in the output track is different than in the input track.
- Split the channels from one input track into more than one output track.
- Pull individual channels from multiple input tracks into an output track.

Audio Mapping Procedures

This section describes how to set up audio mapping matrices using the web interface. For information on using the REST API to set up audio mapping, see Audio Mapping Using the REST API.

> **Note**
>
> In the examples at Audio Mapping Workflow Examples, mappings are marked with checkmarks. In your actual matrices, use a zero (0) in place of a checkmark. This represents zero gain or passing the full audio from the pre-mapping input channel to the post-mapping input channel.

Map Input Tracks to Output Tracks

Before setting up your input and output mapping matrices, provide information about your incoming audio tracks and specify which of these tracks to include in which output:

1. Create one Audio Selector for each incoming audio track you are using.
2. Associate the Audio Selector with a specific input track by providing the track number or numbers.
3. For each output with a distinct audio setup, create a Stream and add Audio tabs (one tab per track on the output).
4. Select an Audio Selector from the dropdown list on each tab.
5. Create at least one Output and apply the Stream to it.

Create Input Matrices

Only use an input matrix when you have multiple inputs and the audio channel configurations on the inputs are not the same.

The purpose of input matrices is to make the channels in each input match each other, as shown in Workflow Example - Inputs Have Audio Channels in Different Order. After mapping, each channel in each input will have the same type of audio information, like an audio pair on channels 7 and 8.

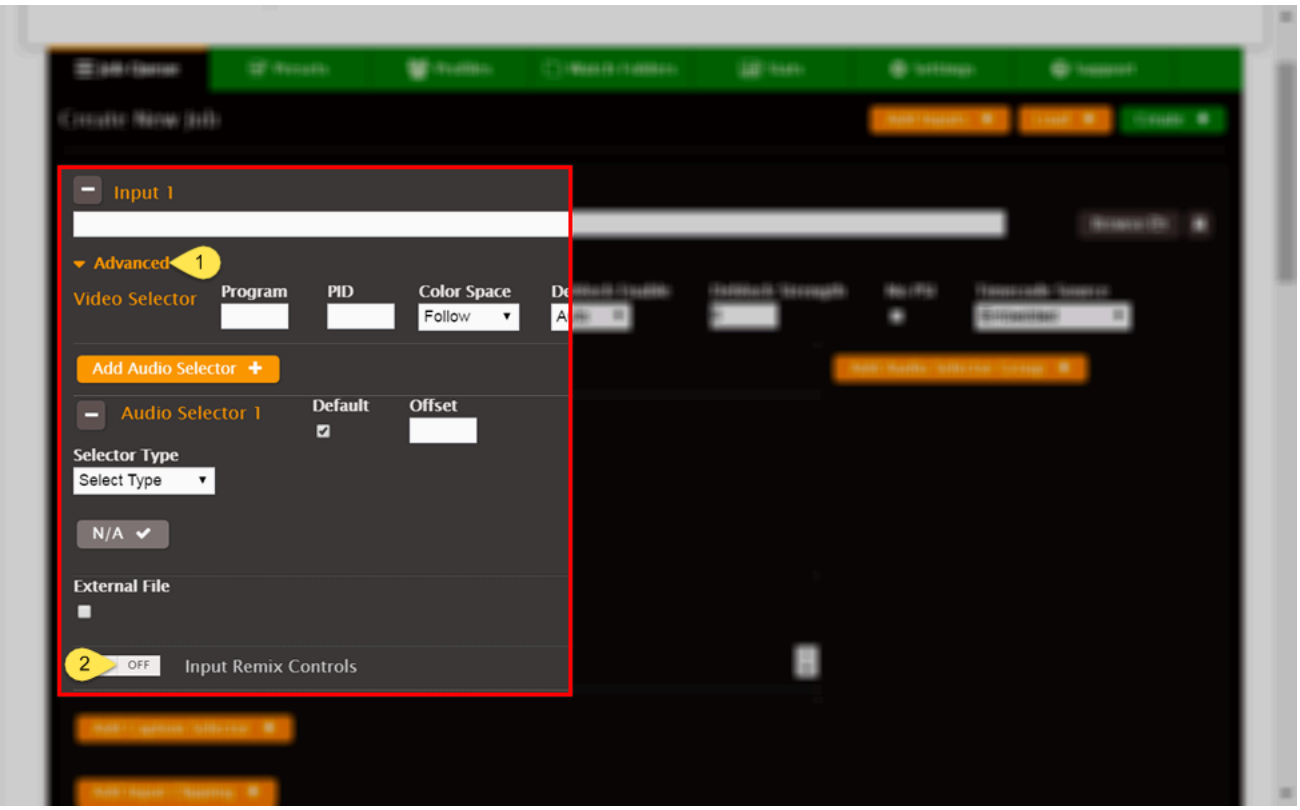
Perform this step in the Input section of the web interface, in the **Audio Selector** subsection.

Notes on Input Matrices

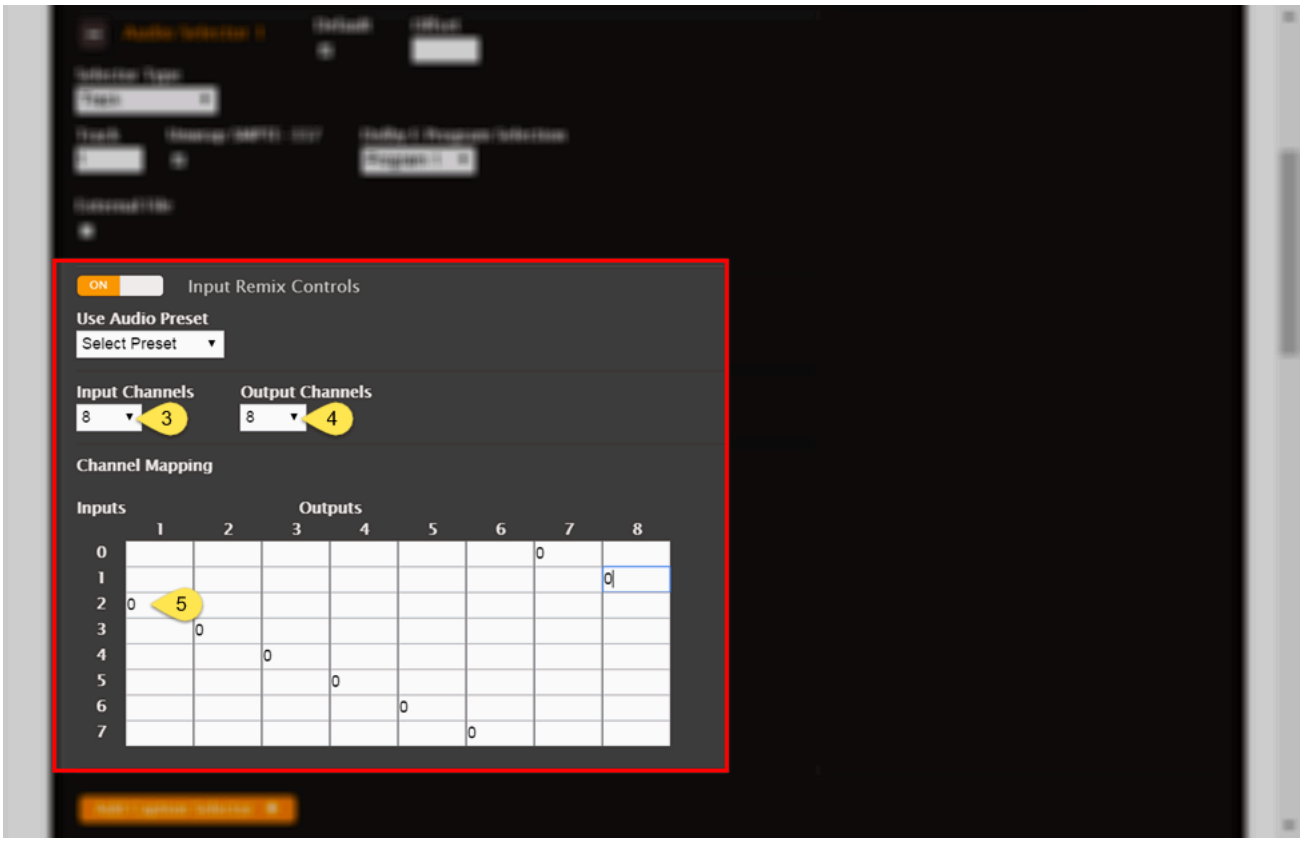
The following requirements apply to all input matrices:

- Each input matrix must have the same number of columns. That is, the set of channels being mapped *to* must be the same for each input. This provides a uniform set of inputs for the output matrices.
- Each input matrix must have at least enough columns to accommodate the output matrix with the most number of rows. For example, if you have an output matrix with two rows and an output matrix with six rows, each input matrix must have at least six columns.

Input Matrix Procedure - Inputs Section



Number in the graphic	Description
1	If the Advanced section of the Input is collapsed, click **Advanced** to open it.
2	Click the **Input Remix Controls** to access the input Channel Mapping matrix.



Number in the graphic	Description
3	Choose the number of input channels in the track from the Input Channels dropdown.
4	Choose the number of channels that will be passed into the output from the Output Channels dropdown.

Number in the graphic	Description
5	In each row of the matrix (which corresponds to an input channel before mapping), use a zero to mark a column. Each column correspon ds to an input channel after mapping. In the example pictured above, pre-mappi ng input channel 3 is being mapped to post-mapping input channel 1.

> **Note**
>
> On input mapping matrices, rows are labeled starting at zero. Therefore, you map channel 1 on row 0, channel 2 on row 1, and so forth.

Create Output Matrices

Use an output matrix when you need to do any of the following:

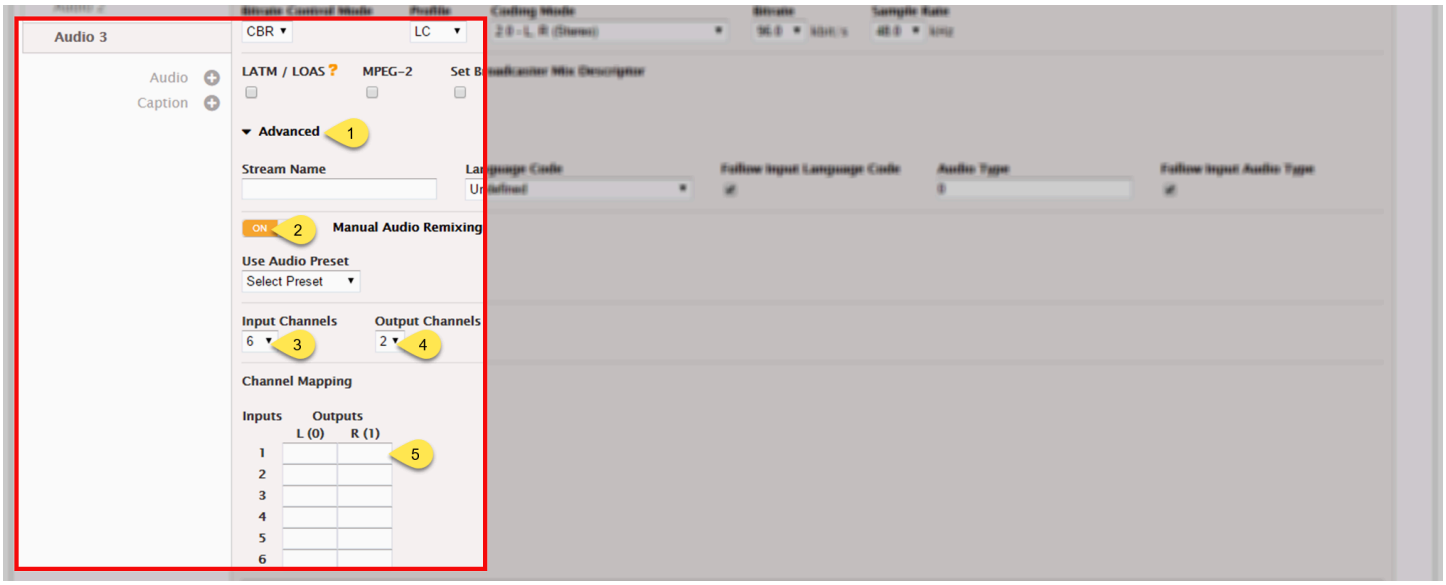
- Exclude some of your input channels from your output.
- Reorder the channels in a track, so that the order in the output track is different than in the input track.
- Split the channels from one input track into more than one output track.
- Pull individual channels from multiple input tracks into an output track.

If you have multiple inputs with channels that are numbered differently, before you map them to the outputs, map them to uniformity following the guidance in Create Input Matrices. Use output matrices just to map uniformly numbered input channels to output channels.

Output Matrix Procedure - Streams Section

In output mapping matrices, rows are labeled starting at 1 and columns are labeled starting at 0. So you map input channel 1 in row 0, input channel 2 in row 1, and so on. You map to output channel 1 in column 1, output channel 2 in column 2, and so on.

The following screenshot and UI element descriptions describe what to do to fill in an output matrix.



Number in the graphic	Description
1	From the Audio tab corresponding to the track you are working with, click **Advanced**.
2	Click the **Manual Audio Remixing** slider.
3	Select the number of channels coming from your input. In the example of a 5.1 audio track, you would pick 6. Channels 1–6 correspond to the numbers 0–5 on the matrix.
4	Select the number of channels you want in your output track. For example, to map the first two channels of the 5.1 audio to a stereo pair, you would pick 2. Channels 1 and 2 correspond to 0 and 1 on the matrix.
5	In each row of the matrix (which correspon ds to an input channel) use a zero to mark a column (which corresponds to an output channel). Zero refers to zero db of gain

Number in the graphic	Description
	or passing through the full audio. You can do audio remixing using other values. Audio remixing is beyond the scope of this document. In the example shown, input channel 1 (row 1) is mapped to output channel 1 (column 0) and input channel 2 (row 1) is mapped to output channel 2 (column 1). Input channels 3 through 6 are muted out and not passed to the output.

Audio Mapping Using the REST API

This section provides information for implementing audio mapping using the API.

To use this guidance, you should have a basic understanding of the following:

- The conceptual information provided in the main body of this document.
- Creating and modifying jobs using XML.

Audio Mapping XML Reference Tables

The XML element for audio mapping, `<remix_settings>`, is structurally the same for input mapping and output mapping. The differences are the location of the element and the valid range for the child element, `<channels_out>`.

<job><input> elements

Element	Notes
`audio_selector`	Corresponds to the Audio Selector section of the UI, under **Input** > **Advanced**

Element		Notes
	`order`	This is the number of the audio selector within the input. It is not unique and does not function as an ID. The value of *<order>* increments from one within each *<audio_selector>* element.
	`name`	The name used for assigning an Audio Selector to an *<audio_description>* element.
	`selector_type`	The selector type used for the value "*track*".
	`track`	The track numbers of the input tracks being selected. Provide these as a string of comma-separated integers.
	`remix_settings`	The settings used to create an input mapping matrix. Place *<remix_settings>* here, as a child of *<audio_selector>*.

<job><stream_assembly> elements

Element	Notes
`name`	The element that is used to map a stream assembly to an output. The value

Element		Notes
		of this element must match the value of the child element *<stream_assembly_name>* of the associated output.
`audio_description`		The description of the one *<audio_description>* element per output track.
	`<codec_settings>`	Use the codec name in place of "*codec*". Supported options are: `aac`, `mp2`, *wma2*, *wav*, *aiff*, *ac3*, *ec3*, *pass through*, and *dtse*.

Element			Notes
		`coding_mode`	Metadata on how the audio is encoded on this track. AWS Elemental Server supports one type of audio coding per output track. Valid range: 1_0, 1_1, 2_0, 5_1, ad_receiver_mix 1_0: Mono 1_1: Dual Mono 2_0: Stereo 5_1: 5.1 Dolby Digital
	`remix_settings`		Placement of `<remix_settings>` here, as a child of `<audio_description>`, creates an output mapping matrix.
	`audio_source_name`		The audio source name to use to associate the output audio track with an Audio Selector.

<job><output_group> elements

Element		Notes
output		The setting which represents the actual set of streams delivered to a destination address.
	stream_assembly_name	The name to use to associate a stream with an output.

<remix_settings> in Output Mapping

For output mapping, include the <remix_settings> element as a child of <audio_description>.

<job><stream_assembly> elements

Element		Notes
audio_description		There is one <audio_description> element per output track.
	remix_settings	Placement <remix_settings> here creates an output mapping matrix

<remix_settings> elements

Element	Type	Description	Notes
channels_in	integer	Number of channels in input track.	Valid range: 1 – 16

Element	Type	Description	Notes
			This number is the same for all inputs.
`channels_out`	integer	Number of channels in output track.	Valid range: 1 – 8 AWS Elemental Server supports up to eight channels per output track. You must specify the correct number of output channels for the <coding_mode> value you provide. For example, 5.1 audio accepts six channels.
`channel_mapping`	XML	Element containing all the mapping matrix data.	Corresponds to the table matrix in the UI.

Element		Type	Description	Notes
	out_ch_*n*	Audio data for one output channel.	Each <out_ch_*n*> element represents an output channel.	Each <out_ch_*n*> element corresponds to a column in the UI table. The number of <out_ch_*n*> elements in <channel_mapping> should equal the value of <channels_out> . *n* is an integer that represents the matrix column number. **NOTE:***n* counts from zero, so the channel number is (*n* + 1).

Element			Type	Description	Notes
		`in_ch_m`	integer	The amount of audio from the input channel that is passed into the output channel in dB gain.	Valid range: -60 to 60 0: Pass through audio at same level as input -60: Mute channel Each `<in_ch_m>` element corresponds to the cell in the *nth* column and *mth* row of the UI table. *m* is an integer that represents the matrix row number. The number of `<in_ch_m>` elements in `<out_ch_n>` should equal the value of

Element	Type	Description	Notes
			`<channels_in>` . **NOTE:***m* counts from zero, so the channel number is (*m* + 1).

<remix_settings> Input Mapping

For input mapping, include the `<remix_settings>` element as a child of `<audio_selector>`. The `<audio_selector>` corresponds to the **Audio Selector** section of the web UI. Both represent an input audio track.

<job><input> elements

Element	Notes
`audio_selector`	The setting which represents the audio information for a single track from the input. Placement of the `<remix_settings>` element here creates an input mapping matrix.

<remix_settings> elements

Element	Type	Description	Notes
`channels_in`	integer	Integer which shows the number of pre-mappi	Valid range: 1 - 16

Element	Type	Description	Notes
		ng input channels.	
`channels_out`	integer	Integer which shows the number of post-mapp ing input channels.	Valid range: 1 – 16 Each output may use a different subset of these channels.
`channel_mapping`	Mapping data	Element which contains all the mapping matrix data.	Corresponds to the table matrix in the UI.

Element		Type	Description	Notes
	`out_ch_n`	Audio data for one post-mapped channel.	Each <`out_ch_n`> element represents an input channel after it has been mapped.	Each <out_ch_*n*> element corresponds to a column in the UI table. *n* is an integer that represents the column number. Increment from zero to one less than the value of <channels_out>.

Element			Type	Description	Notes
		`in_ch_m`	integer	The amount of audio from a pre-mapping input channel that is passed into the new post-mapping input channel.	Valid range: -60 to 60 Each `<in_ch_m>` element corresponds to the cell in the *nth* column and *mth* row of the UI table. *m* is an integer that represents the row number. Increment from zero to one less than the value of `<channels_in>` In each out_ch_*n* element, should be one of these for each channel in the incoming audio track.

Example XML

Examples in this section correspond to the examples provided in Audio Mapping Workflow Examples.

XML Example - Identical Input Audio Channels, One Output

This example shows the relevant sections of the XML body for the job in Workflow Example - Identical Input Audio Channels, One Output.

This job uses an output matrix to select channels 7 and 8 only from an 8-channel track. Two inputs have this same track. The output has a single, 2-channel track.

The following shows the `<remix_settings>` element, which contains the elements required for output audio mapping and audio remixing.

In this example, `<remix_settings>` is a child of `<job>/<stream_assembly>/<audio_description>` because it represents an output mapping matrix.

```
<remix_settings>
   <channels_in>8</channels_in>                                          //8 channels
 coming in
   <channels_out>2</channels_out>                                        //2 channels
 going out
```

This is the `<channel_mapping>` element, which corresponds to the output mapping matrix.

```
 <channel_mapping>
   <out_ch_0>
  <in_ch_0>-60</in_ch_0>
  <in_ch_1>-60</in_ch_1>
  <in_ch_2>-60</in_ch_2>
  <in_ch_3>-60</in_ch_3>
  <in_ch_4>-60</in_ch_4>
  <in_ch_5>-60</in_ch_5>
  <in_ch_6>0</in_ch_6> //Input channel 7 is passed into output channel 1
  <in_ch_7>-60</in_ch_7>
   </out_ch_0>
   <out_ch_1>
  <in_ch_0>-60</in_ch_0>
  <in_ch_1>-60</in_ch_1>
  <in_ch_2>-60</in_ch_2>
```

```
  <in_ch_3>-60</in_ch_3>
  <in_ch_4>-60</in_ch_4>
  <in_ch_5>-60</in_ch_5>
  <in_ch_6>-60</in_ch_6>
  <in_ch_7>0</in_ch_7> //Input channel 8 is passed into output channel 2
   </out_ch_1>
 </channel_mapping>
</remix_settings>
```

XML Example - Identical Input Audio Channels, Two Outputs

This example shows the relevant sections of the XML body for the job in Workflow Example - Identical Input Audio Channels, Two Outputs.

This job uses two output matrices in two separate stream assemblies to set up audio for two outputs. The first mapping matrix is the same as the one in XML Example - Identical Input Audio Channels, One Output. The second mapping matrix takes only channels 1-6 from the eight input channels and maps them to a 6-channel track on the second output.

The following shows the first `<stream_assembly>` element, which is applied to an output element. It is a child of the top-level element, `<job>`.

```
<stream_assembly>
    <name>stream_assembly_0</name>
      <audio_description>
      .
      .
      .
            <aac_settings>
              .
              .
              .
              <coding_mode>2_0</coding_mode>
              .
              .
              .
            </aac_settings>
            <remix_settings>
               .   //Same as in Example 1
               .
               .
            </remix_settings>
            .
```

```
            .
            .
            <audio_source_name>Audio Selector 1</audio_source_name>
            .
            .
            .
       </audio_description>
</stream_assembly>
```

The following is the second `<stream_assembly>` element, which is applied to a different output element.

```
<stream_assembly>
    <name>stream_assembly_1</name>
      <audio_description>
            .
            .
            .
            <aac_settings>
              .
              .
              .
              <coding_mode>5_1</coding_mode>
              .
              .
              .
            </aac_settings>
            <remix_settings>
              <channels_in>8</channels_in> //8 channels coming in
              <channels_out>6</channels_out> //6 channels going out
```

The following is the `<channel_mapping>` element that corresponds to the second output mapping matrix. The stereo pair (`<in_ch_6>` and `<in_ch_7>`) are muted out on all output channels.

```
              <channel_mapping>
                <out_ch_0>
                  <in_ch_0>0</in_ch_0> //Input channel 1 is passed into output channel
 1
                  <in_ch_1>-60</in_ch_1>
                  <in_ch_2>-60</in_ch_2>
                  <in_ch_3>-60</in_ch_3>
```

```
                  <in_ch_4>-60</in_ch_4>
                  <in_ch_5>-60</in_ch_5>
                  <in_ch_6>-60</in_ch_6>
                  <in_ch_7>-60</in_ch_7>
                </out_ch_0>
                <out_ch_1>
                  <in_ch_0>-60</in_ch_0>
                  <in_ch_1>0</in_ch_1> //Input channel 2 is passed into output channel
2
                  <in_ch_2>-60</in_ch_2>
                  <in_ch_3>-60</in_ch_3>
                  <in_ch_4>-60</in_ch_4>
                  <in_ch_5>-60</in_ch_5>
                  <in_ch_6>-60</in_ch_6>
                  <in_ch_7>-60</in_ch_7>
                </out_ch_1>
                <out_ch_2>
                  <in_ch_0>-60</in_ch_0>
                  <in_ch_1>-60</in_ch_1>
                  <in_ch_2>0</in_ch_2> //Input channel 3 is passed into output channel
3
                  <in_ch_3>-60</in_ch_3>
                  <in_ch_4>-60</in_ch_4>
                  <in_ch_5>-60</in_ch_5>
                  <in_ch_6>-60</in_ch_6>
                  <in_ch_7>-60</in_ch_7>
                </out_ch_2>
                <out_ch_3>
                  <in_ch_0>-60</in_ch_0>
                  <in_ch_1>-60</in_ch_1>
                  <in_ch_2>-60</in_ch_2>
                  <in_ch_3>0</in_ch_3> //Input channel 4 is passed into output channel
4
                  <in_ch_4>-60</in_ch_4>
                  <in_ch_5>-60</in_ch_5>
                  <in_ch_6>-60</in_ch_6>
                  <in_ch_7>-60</in_ch_7>
                </out_ch_3>
                <out_ch_4>
                  <in_ch_0>-60</in_ch_0>
                  <in_ch_1>-60</in_ch_1>
                  <in_ch_2>-60</in_ch_2>
                  <in_ch_3>-60</in_ch_3>
```

```
                  <in_ch_4>0</in_ch_4> //Input channel 5 is passed into output channel
 5
                  <in_ch_5>-60</in_ch_5>
                  <in_ch_6>-60</in_ch_6>
                  <in_ch_7>-60</in_ch_7>
                </out_ch_4>
                <out_ch_5>
                  <in_ch_0>-60</in_ch_0>
                  <in_ch_1>-60</in_ch_1>
                  <in_ch_2>-60</in_ch_2>
                  <in_ch_3>-60</in_ch_3>
                  <in_ch_4>-60</in_ch_4>
                  <in_ch_5>0</in_ch_5> //Input channel 6 is passed into output channel
 6
                  <in_ch_6>-60</in_ch_6>
                  <in_ch_7>-60</in_ch_7>
                </out_ch_5>
              </channel_mapping>
            </remix_settings>
            .
            .
            .
            .
      </audio_description>
</stream_assembly>
```

The following is the first `<output>` element, which we associate with the first stream assembly, so the stereo pair ends up on this output. In this example, both outputs are children of the same `<output_group>` element. `<output_group>` is a child of `<job>`.

```
<output_group>
  .
  .
  .
  <output>
            .
            .
            .
    <stream_assembly_name>stream_assembly_0</stream_assembly_name>
            .
            .
            .
```

```
  </output>
```

The following is the second `<output>` element, which we associate with the second stream assembly, so the 5.1 audio ends up on this output.

```
  <output>
            .
            .
            .
    <stream_assembly_name>stream_assembly_1</stream_assembly_name>
            .
            .
            .
  </output>
</output_group>
```

XML Example - Inputs Have Audio Channels in Different Order

This example shows the relevant sections of the XML body for the job in Workflow Example - Inputs Have Audio Channels in Different Order.

This job takes two inputs, both with stereo and 5.1 audio. Each input has the audio on different channels. To bring the inputs together, this job uses an input mapping matrix on the second input that reorders its channels to match the first input. This job creates two outputs, each with different audio, by using an output mapping matrix for each output, like XML Example - Identical Input Audio Channels, Two Outputs.

The following shows the first `<input>` element, which does not have any input mapping elements. This element is a child of the top-level element, `<job>`.

```
<input>
    .
    .
    .
    <order>1</order>
    .
    .
    .
    <name>input_1</name>
    .
    .
    .
```

```
</input>
```

The following is the second `<input>` element, which does have input mapping elements.

```
<input>
    .
    .
    .
    <order>2</order>
    .
    .
    .
    <name>input_2</name>
        .
        .
        .
```

The following is the `<remix_settings>` element that is a child of the second `<input element>`. This `<remix_settings>` element contains all the input mapping elements. In this case, `<remix_settings>` is a child of `<job>/<input>/<audio_selector>` because it represents an input mapping matrix.

```
      <remix_settings>
        <channels_in>8</channels_in> //8 original input channels
        <channels_out>8</channels_out> //8 remapped input channels, in a new order
        <channel_mapping>
          <out_ch_0>
            <in_ch_0>-60</in_ch_0>
            <in_ch_1>-60</in_ch_1>
            <in_ch_2>-60</in_ch_2>
            <in_ch_3>-60</in_ch_3>
            <in_ch_4>-60</in_ch_4>
            <in_ch_5>-60</in_ch_5>
            <in_ch_6>0</in_ch_6> //Input channel 7 is being passed into new input
 channel 1
            <in_ch_7>-60</in_ch_7>
          </out_ch_0>
          <out_ch_1>
            <in_ch_0>-60</in_ch_0>
            <in_ch_1>-60</in_ch_1>
            <in_ch_2>-60</in_ch_2>
            <in_ch_3>-60</in_ch_3>
```

```
            <in_ch_4>-60</in_ch_4>
            <in_ch_5>-60</in_ch_5>
            <in_ch_6>-60</in_ch_6>
            <in_ch_7>0</in_ch_7> //Input channel 8 is being passed into new input
 channel 2
          </out_ch_1>
          <out_ch_2>
            <in_ch_0>0</in_ch_0> //Input channel 1 is being passed into new input
 channel 3
            <in_ch_1>-60</in_ch_1>
            <in_ch_2>-60</in_ch_2>
            <in_ch_3>-60</in_ch_3>
            <in_ch_4>-60</in_ch_4>
            <in_ch_5>-60</in_ch_5>
            <in_ch_6>-60</in_ch_6>
            <in_ch_7>-60</in_ch_7>
          </out_ch_2>
          .
          .
          .
          <out_ch_7>
            <in_ch_0>-60</in_ch_0>
            <in_ch_1>-60</in_ch_1>
            <in_ch_2>-60</in_ch_2>
            <in_ch_3>-60</in_ch_3>
            <in_ch_4>-60</in_ch_4>
            <in_ch_5>0</in_ch_5> //Input channel 6 is being passed into new input
 channel 8
            <in_ch_6>-60</in_ch_6>
            <in_ch_7>-60</in_ch_7>
          </out_ch_7>
        </channel_mapping>
      </remix_settings>
    .
    .
    .
    </audio_selector>
</input>
```

The following is the first `<stream_assembly>` element, which is applied to an output element in the following listing. It contains the same audio channel mapping instructions in the remix settings as Workflow Example - Identical Input Audio Channels, One Output. It is a child of the top-level element, `<job>`.

```
<stream_assembly>
    <name>stream_assembly_0</name>
      <audio_description>
      .
      .
      .
            <aac_settings>
              .
              .
              .
              <coding_mode>2_0</coding_mode>
              .
              .
              .
            </aac_settings>
            <remix_settings>
               .
               .
               .
            </remix_settings>
            .
            .
            .
            <audio_source_name>Audio Selector 1</audio_source_name>
            .
            .
            .
       </audio_description>
</stream_assembly>
```

The following is the second `<stream_assembly>` element, which is applied to a different output element. It contains the same audio channel mapping instructions and remix settings as in XML Example - Identical Input Audio Channels, Two Outputs.

```
<stream_assembly>
    <name>stream_assembly_1</name>
      <audio_description>
            .
            .
            .
            <aac_settings>
              .
```

```
              .
              .
              <coding_mode>5_1</coding_mode>
              .
              .
              .
            </aac_settings>
            <remix_settings>
               .
               .
               .
            </remix_settings>
            .
            .
            .
            <audio_source_name>Audio Selector 1</audio_source_name>
            .
            .
            .
          </audio_description>
</stream_assembly>
```

The following is the first `<output>` element, which we associate with the first stream assembly, so the stereo pair ends up on this output. In this example, both outputs are children of the same `<output_group>` and `<output_group>` is a child of `<job>`.

```
<output_group>
  .
  .
  .
  <output>
            .
            .
            .
    <stream_assembly_name>stream_assembly_0</stream_assembly_name>
            .
            .
            .
  </output>
```

The following is the second `<output>` element, which we associate with the second stream assembly, so the 5.1 audio ends up on this output.

```
  <output>
            .
            .
            .
    <stream_assembly_name>stream_assembly_1</stream_assembly_name>
            .
            .
            .
  </output>
</output_group>
```

Working with Dolby Metadata

Audio encoded with a Dolby codec always includes Dolby metadata, as per the ATSC A/52 2012 standard. This Dolby metadata is used by AWS Elemental Server in two ways when the stream is encoded with Dolby codec:

- It is used to manipulate the audio just before encoding the output.
- It is included in the metadata for the output stream.

This document describes how to set up an AWS Elemental Server profile or job to use Dolby metadata in these ways.

Dolby metadata is supported in the output only when the audio codec for the output is Dolby Digital (also known as AC3) or Dolby Digital Plus (also known as Enhanced AC3).

Topics

- Categories of Metadata: Delivered and Encoder Control
- Source of AWS Elemental Server Metadata
- Impact of the Metadata on the Output Audio
- Combinations of Input and Output Codec
- Setting Up the Profile or Event Using the Web Interface
- Output with the Dolby Digital Codec
- Output with Dolby Digital Plus (EC2, EAC3) Codec

Categories of Metadata: Delivered and Encoder Control

There are two categories of parameters in the Dolby metadata, characterized by how AWS Elemental Server uses it:

- Delivered: AWS Elemental Server does not read these parameters, so they have no effect on the audio produced by AWS Elemental Server. Instead, they are included as metadata in the output in order to **deliver** them to the downstream decoder.

  “Delivered” metadata is also called *Consumer* metadata because it is intended to be used by the end consumer’s home decoder.

- Encoder Control: AWS Elemental Server uses these parameters to manipulate the audio just before encoding the stream and producing the output. They provide a mechanism for AWS Elemental Server to control the transcoding performed by AWS Elemental Server. These parameters are never included in the output metadata.

  “Encoder Control” metadata is also called *Professional* metadata because it is intended to be used by a professional device – in our case AWS Elemental Server. It is never intended for the end consumer's home decoder.

Source of AWS Elemental Server Metadata

The metadata that AWS Elemental Server emits can come from one of two sources:

- Metadata that is already in the source. Only audio sources that use a Dolby codec can include this metadata. Different Dolby codecs include different categories of metadata as shown in this table.

Codec	Categories Present
Dolby Digital or Dolby Digital Plus	Delivered only
Dolby E	Delivered and Encoder Control

- Metadata that is specified by completing metadata fields in the profile or event. You can specify this metadata in any audio whose output codec is a Dolby codec. In other words, you can add it when the audio source is not a Dolby codec as long as the output audio uses a Dolby codec.

  Both categories of metadata can be specified when specifying this source.

You specify the source when setting up the profile or event.

Impact of the Metadata on the Output Audio

Regardless of the source of the metadata, it affects the audio (either by manipulating encoder control or by being included in the output metadata) but only if the output codec is Dolby Digital or Dolby Digital Plus.

Combinations of Input and Output Codec

The possible input and output codec combinations (in which at least one codec is a Dolby codec) are as follows. All these combinations support including metadata in the output.

Input Codec	Output Codec
Dolby Digital or Dolby Digital Plus	Dolby Digital or Dolby Digital Plus
Dolby Digital	Dolby Digital Passthrough (so Dolby Digital audio is passed through; it is not transcoded)
Dolby Digital Plus	Dolby Digital Passthrough (so Dolby Digital Plus audio is passed through; it is not transcoded)
Mix of Dolby Digital Plus and another codec	Dolby Digital Plus (with the Automatic Passthrough field checked)
Dolby E	Dolby Digital
Dolby E	Dolby Digital Plus
Dolby E	Dolby E (passthrough)
A non-Dolby codec	Dolby Digital or Dolby Digital Plus

The sample rate when encoding with a Dolby codec is always 48000.

Setting Up the Profile or Event Using the Web Interface

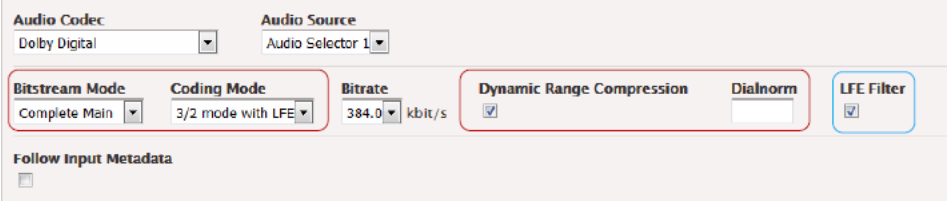
This section describes how to set up the project or event using the web interface. To set up using the REST API, see the section called "Output with the Dolby Digital Codec" and the section called "Output with Dolby Digital Plus (EC2, EAC3) Codec" to map the fields to their XML tags according to the following steps.

1. In the Output > Stream section, click the Audio tab to display the fields for audio.

2. Choose one of these Audio Sources as appropriate and complete the Audio Codec field: Dolby Digital, Dolby Digital Plus or Dolby Digital Pass Through. The fields for metadata appear.
3. Complete the remaining fields for the audio source that you selected. See the following to determine how to achieve the desired effect.

Dolby Digital

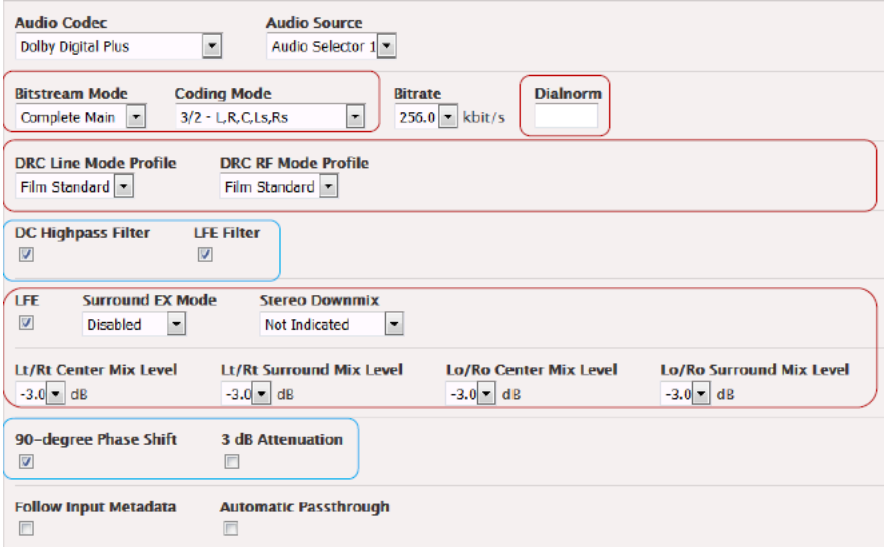
For Dolby Digital, encoder control fields are circled in blue and delivery fields are circled in red. Note that the LFE Filter field appears only when the Coding Mode is 3/2 mode.



Dolby Digital Plus

Encoder Control fields are circled in blue. Delivery fields are circled in red. Note that the Automatic Pass-through field does not relate to metadata.

Note that the Surround Mode field appears only when Coding Mode is 2/0.



Dolby Digital Passthrough

There are no fields for metadata.

Use the Metadata in the Audio Source – Case 1

Input Codec	Output Codec	Handling of Audio
Dolby Digital or Dolby Digital Plus	Dolby Digital or Dolby Digital Plus	You are transcoding the audio.

- **Metadata Parameters** fields: Complete only AWS Elemental Server Control fields, as required for your workflow.
- **Follow Input Metadata** field: Check this field after completing the Metadata Parameter fields.

Result for Metadata

AWS Elemental Server Control parameters from the profile are applied during transcoding (given that the input does not include these parameters). If a given parameter is not exposed in the profile, a default value is always applied; see the section called "Output with the Dolby Digital Codec" and the section called "Output with Dolby Digital Plus (EC2, EAC3) Codec".

The Delivery parameters from the input metadata are included in the output.

Use the Metadata in the Audio Source – Case 2

Input Codec	Output Codec	Handling of Audio
Dolby Digital or Dolby Digital Plus	Dolby Digital or Dolby Digital Plus (Passthrough)	You are passing through the audio.

- **Metadata Parameters** fields: Not applicable.
- **Follow Input Metadata** field: No Encoder Control parameters are applied (because no transcoding occurs).

Result for Metadata

The Delivery parameters from the input metadata will be included in the output.

Use the Metadata in the Audio Source – Case 3

Input Codec	Output Codec	Handling of Audio
Mix of Dolby Digital Plus and another codec	Dolby Digital Plus	You are passing through the Dolby Digital Plus audio and transcoding the remainder (Automatic Passthrough field is checked).

- **Metadata Parameters** field: Complete all the parameters.
- **Follow Input Metadata** field: Check this field after completing the metadata fields.

Result for Metadata

- AWS Elemental Server Control parameters from the profile will be applied when transcoding the non-Dolby Digital Plus audio.
- No Encoder Control parameters will be applied when passing through the Dolby Digital Plus audio.
- The Delivery parameters from the profile will be used when transcoding the non-Dolby Digital Plus audio.
- The Delivery parameters from the audio source will be used for the passed-through Dolby Digital audio.

Use the Metadata in the Audio Source – Case 4

Input Codec	Output Codec	Handling of Audio
Dolby E	Dolby Digital or Dolby Digital Plus	You are transcoding the audio.

- **Metadata Parameters** fields: Ignore.
- **Follow Input Metadata** field: Check.

Result for Metadata (Versions up to 2.9)

- AWS Elemental Server Control parameters from the profile are applied during transcoding.
- The Delivery parameters from the profile are included in the output.
- This behavior is unintentional and has been corrected in version 2.10.

Result for Metadata (Versions 2.10 and later)

- AWS Elemental Server Control parameters from the input metadata are applied during transcoding.
- The Delivery parameters from the input metadata are included in the output.

Override the Metadata with New Values – Case 5

Input Codec	Output Codec	Desired Effect
Any codec	Dolby Digital or Dolby Digital Plus	To override the metadata in the audio source.

- **Metadata Parameters** field: Complete as desired.
- **Follow Input Metadata** field: Leave unchecked.

Result for Metadata

The values from the profile are used.

- With all parameters except Dialnorm, the values from the profile are used. If a given parameter is not exposed in the profile, a default value is always applied; see the section called "Output with the Dolby Digital Codec" and the section called "Output with Dolby Digital Plus (EC2, EAC3) Codec".
- With Dialnorm, the value from the profile is used. If the profile has no value and the source is a Dolby file, the value from the input metadata is used. If the profile has no value and the source is *not* a Dolby file, a default value is used; see the section called "Output with the Dolby Digital Codec" and the section called "Output with Dolby Digital Plus (EC2, EAC3) Codec".

AWS Elemental Server Control parameters are applied during transcoding. The Delivery parameters are included in the output.

Output with the Dolby Digital Codec

N M P s	C	F	A T (a st se \a d ip \a 3 s)	D
D L	D	D	d	Not set
C M	D	C M	co d	2/0_mo
LI C	D	C M C M se to “3 w LI m LI is er		Disabled ode d.

N M P s	C	F	A T (a st se \a d ip \a 3 s)	D
		A o o m L is d		s d.
B M	D	B M	b _	Complete Main
Li M C o	D	N u c		Film Std.
R M C o	D	N u c		Film Std.
R O a P n	D	N u c		

N M P s	C	F	A T (a st se \a d ip \a 3 s)	D
C D L	D	N u c		-3dB
S D L	D	N u c		Not indicated
D S M	D	N u c		Disabled
A P n Ir o	D	N u c		0 (does not exist)
M L	D	N u c		Not set
R T	D	N u c		Not set

N M P s	C	F	A T (a st se \a d ip \a 3 s)	D
C B	D	N u c		0
O B	D	N u c		0
P S D	D	N u c		Not indicated
L R C D L	D	N u c		-3.0 dB
L R S D L	D	N u c		-3.0 dB

N M P s	C	F	A T (a st se \a d ip \a 3 s)	D
L R C D L	D	N u c		-3.0 dB
L R S D L	D	N u c		-3.0 dB
D S E M	D	N u c		Disabled
A D C T	D	N u c		0 (standard)
D Fi	E	N u c		Enabled

N M P s	C	F	A T (a st se \a d ip \a 3 s)	D
LL Lo Fi	E	W C M is 3 LL Fi cl ap at th fa ri	lf r	Disabled ox s
S 3 d A o	E	N u c		Enabled
S P S	E	N u c		Disabled

Output with Dolby Digital Plus (EC2, EAC3) Codec

N M P s	C	F	A T (s ss \ a c \ a n	D
D L	D	D	d	Norm set
C M	D	C M	co d	3/2_mo – L,R,C,LS, Rs
L C	D	W C M is 7 o 3 th L cl ap th li b th	lf	Enabled ox s

N M P s	C	F cl	A T (s ss \ a cr \ a n	D ox.
B M	D	B M	b _	Complete Main
Li M C o	D	D Li M P	d	Film Std.
R M C o	D	D R M P	d	Film Std.
R O a P n	D	N u c	-	
C D L	D	N u c	-	-3dB

N M P s	C	F	A T (s ss \ a cr \ a n	D
S D L	D	S D	st w	Not indicated
D S M	D	N u c	-	Disabled
A P n Ir o	D	N u c	-	0 (does not exist)
M L	D	N u c	-	Not set
R T	D	N u c	-	Note set
C B	D	N u c	-	0

NMPs	C	Fi	AT(ss\ac\an	D
OB	D	Nu co	-	0
PSD	D	Nu co	-	Not indicated
LtRCDLo	D	LtRCMLo	lte ev	-3.0 dB_mix_l
LtRSDLo	D	LtRSMLo	lt rc _l	-3.0 dB_mix_ad
LoRCDLo	D	LoRCMLo	lc te ev	-3.0 dB_mix_l

N M P s	C	Fi	A T (s ss \ au cr \ ac n	D
Lo R S D Lo	D	Lo R S M Lo	lo ro _l	-3.0 dB
D S E: M	D	S E: M	su ex	Disabled
A D C Ty	D	N us co		0 (standard)
D Fi	E	C H Fi	d	Enabled
Ll Lo Fi	E	Ll Fi	lf r	Enabled

NMPs	C	Fi	AT(ss\ac\an	D	
S3dAo	E	3dAo	at_3	Disabled db ati	
SPSI	E	9dPSI	pftre	Enabled se_shid 0_deg	
SM	D	WCM is 2 th SM cl ap	su m	Not_ indicated nd ox s.	

Setting up HLS Rendition Groups

In AWS Elemental Server, you can set up an HLS output group to support an audio rendition group.

In setting up an HLS output group to support an audio rendition group, each HLS output you create contains a “set” consisting of one video stream and several audio streams. All the audio streams in the set are associated with that one video stream. The HLS output group can contain more than one of these outputs. For example, one set consisting of high bitrate video and audio in four languages and another set consisting of low bitrate video and audio in the same four languages.

With this setup, the manifest that is created provides options for video. The logic of the manifest allows the player to select one of those video options and then to select audio that is valid for that video option.

For example:

1. The client player reads the manifest and selects the desired video, such as a high bitrate video.
2. The client player then selects an audio group from among the groups associated with that video, such as the Dolby Digital group instead of the AAC group.
3. The client player then selects an audio from that group, such as Spanish.

   Typically, the player makes its audio selection based on rules on the player side, such as selecting the language that corresponds to the operating system language, or based on rules defined in the manifest, such as when the manifest identifies one audio as the default.

Standards Compliance

This implementation of audio rendition groups is compliant with the “HTTP Live Streaming draft-pantos-http-live-streaming-18” section 4.3.4.1.1.

Note that AWS Elemental Server does not support rendition groups for video. They do support rendition groups for captions since AWS Elemental Server automatically creates one captions rendition group to hold all caption stream assemblies in a given output.

Topics

- How Video Is Associated with Audio Rendition Groups

- Rules for Rendition Groups
- Examples of HLS Rendition Groups
- Creating HLS Rendition Groups
- Sample HLS Output Group with Audio Rendition Group Event Manifest

How Video Is Associated with Audio Rendition Groups

The different “sets” of media are created as follows:

- Create one “video-only” stream assembly containing only one video stream.
- Create two or more “audio-only” stream assemblies, each containing only one audio stream.
- Assign “audio group IDs” to the audio-only streams. To group several audio streams into one rendition group, assign the same audio group ID to the relevant audio streams. To group other audio streams into another rendition group, define a different audio group ID and assign it to the relevant audio streams.
- Associate each video-only stream with its corresponding audio rendition group by assigning the desired audio group ID to that stream.

For example:

- To group stream 3, 4 and 5 to one audio rendition group, set the audio group ID for each of these streams to “audio 1” or some other name of your choosing.
- To group streams 6, 7 and 8 to another audio rendition group, set the ID for each of these streams to “audio 2” or some other name.
- To associate video 1 with the first rendition group, set the “audio rendition sets ID” of that video to “audio 1”.
- To associate video 2 with the other group, set the audio rendition sets ID to “audio 2.”

Rules for Rendition Groups

Rules exist for associating both audio and video streams in their respective rendition groups. These are described following.

- A given audio stream can belong to only one audio rendition group.

- Any given video stream can be associated with more than one rendition group. (For example, “video high” can be associated with both “Dolby audio streams” and “AAC audio streams.” You do not need to create two video streams.)

  With this setup, all the rendition groups associated with the same video stream must contain the same audio streams.(For example, “Dolby audio streams” and “AAC audio streams” must contain the same audio streams (perhaps English, French and Spanish)).
- Any given audio rendition group can be associated with more than one video stream.(For example, “Dolby audio streams” rendition group can be associated with “video high” and “video low.” You do not need to create two rendition groups, one for each video.)
- Any video stream can be associated with more than one output group. (For example, “video high” can appear in two different HLS output groups).

You can use a combination of these rules. For more information, see Examples of HLS Rendition Groups.

Examples of HLS Rendition Groups

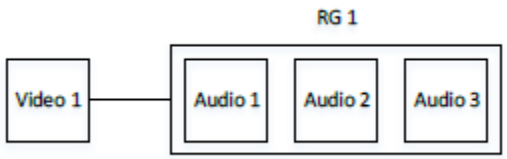
Example 1

The outputs in an HLS output group consist of:

- One video stream.

This video is associated with an audio rendition group that contains:

- One English stream.
- One French stream.
- One Spanish stream.



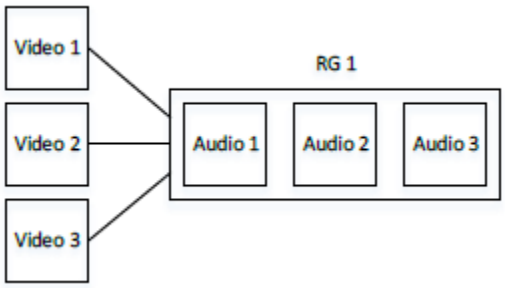
Example 2

The outputs in an HLS output group consist of:

- One “video high” stream.
- One “video medium” stream.
- One “video low” stream.

Each of these videos is associated with the same audio rendition group that contains:

- One English stream.
- One French stream.
- One Spanish stream.



Example 3

The outputs in an HLS output group consist of:

- One video stream.

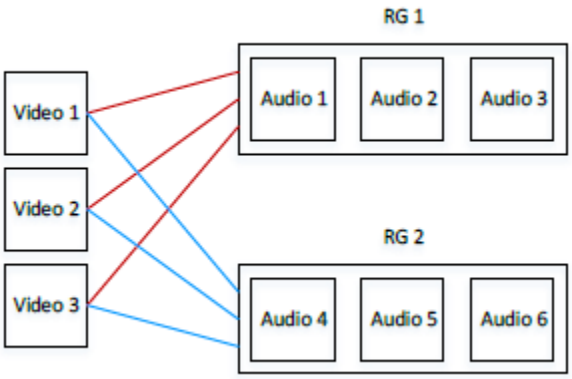
This video is associated with two audio rendition groups.

The first audio rendition group contains:

- One English stream in AAC codec.
- One French stream in AAC codec.
- One Spanish stream in AAC codec.

The second audio rendition group contains:

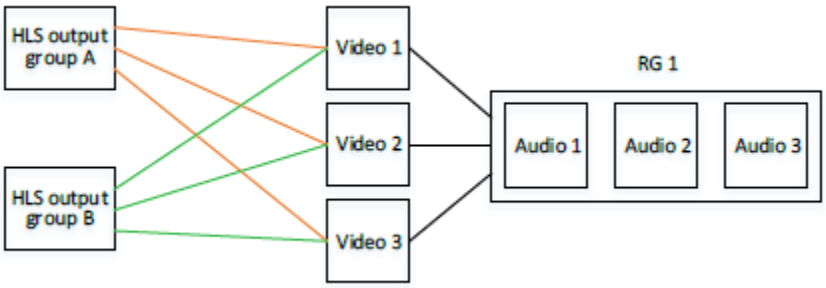
- One English stream in Dolby Digital.
- One French stream in Dolby Digital.
- One Spanish stream in Dolby Digital.



Example 4

There are two output groups, one that pushes to a WebDAV server and the other that delivers to an Akamai server.

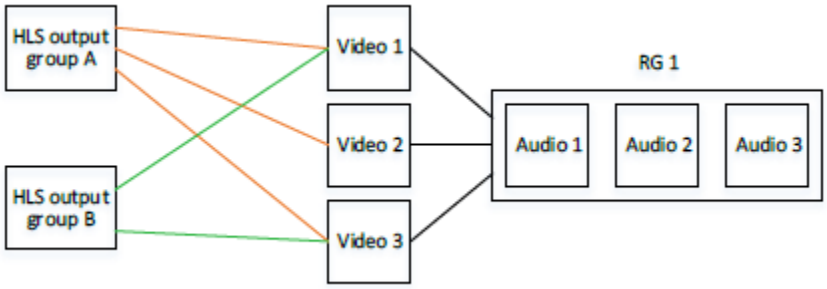
Each output group is identical in terms of its video and rendition groups. For example, each output group produces the video and rendition group from Example 2. You do not need to encode the streams twice; do it only once for each output group. So long as the two output groups are in the same event, each can be associated with the same streams.



Example 5

There are two output groups, one that pushes to a WebDAV server and the other that delivers to an Akamai server.

Each output group is similar in terms of its video and rendition groups. For example, the first output group produces the video and rendition group from Example 2. The second output group produces the only “video high” and “video low” but it is associated with the same audio rendition group as the first output group.



Creating HLS Rendition Groups

The key to creating rendition groups is that each output you create must contain only one stream. Therefore, for each video to include in the output group, you create a stream assembly that contains only one video (no audio or captions). For each audio to include in a rendition group, you create a stream assembly that contains only one audio (no video or captions).

This means that when rendition groups are present in the HLS output group, an output is identical to a stream. (Usually an output contains a mix of several streams and several stream types.)

Topics

- Getting Ready to Create HLS Rendition Groups
- Creating HLS Rendition Groups (Web Interface)
- Creating HLS Rendition Groups (REST API)

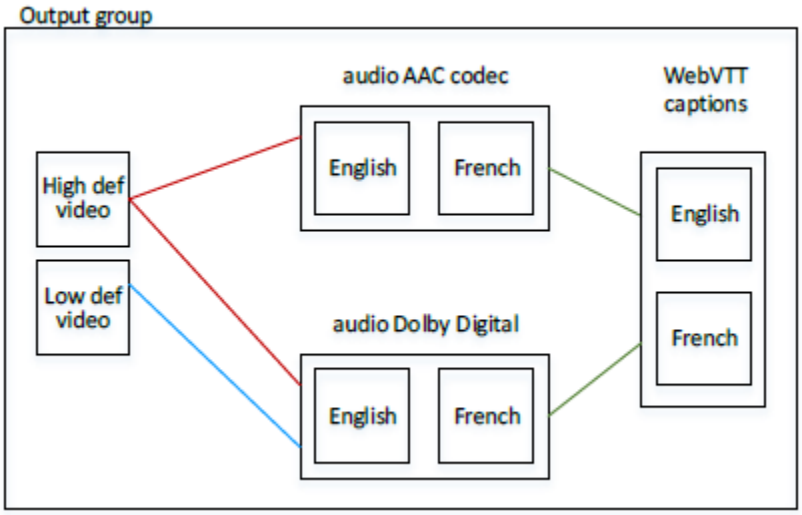
Getting Ready to Create HLS Rendition Groups

Step 1. Create a Mapping

Identify the video, audio, audio rendition groups and captions you require. Review the the section called “Rules for Rendition Groups” to ensure you design an output that is valid. For example:

- Video “high definition.”
- Video “low definition.”

- A rendition group named “AAC group” for AAC audio.
- A rendition group named “Dolby group” for Dolby Digital audio.
- Audio English AAC in “AAC group” rendition group.
- Audio English Dolby Digital in “Dolby group” rendition group.
- Audio French AAC in “AAC group” rendition group.
- Audio French Dolby Digital in “Dolby group” rendition group.
- Video “high definition” to be associated with both rendition groups.
- Video “low definition” to be associated with the “Dolby group” rendition group.
- Captions in English and French in WebVTT format, to be associated with both rendition groups.



Step 2. Determine Defaults and Auto-Selection Behavior

For each audio rendition group, decide which audio will be the default and how auto-selection works for the non-defaults. Setting up this information is useful if:

- The user has specified an audio preference on the client player but that preference is not available, or
- If the user has not specified an audio preference.

(Obviously, if the user has specified a preference and that preference is available, the client player will select that preference.)

Determine Defaults and Auto-Selection Behavior Up to Version 2.9.x

Set the **Alternate Audio Track Selection** field. The options for this field for each audio stream are:

- **Default Audio**: The client player *should* select this stream. Only one stream in the rendition group should be set as the default; otherwise, the client player may behave unexpectedly.
- **Alternate Audio, Auto Select**: The client player *may* select this stream. Any number of streams in the rendition group can be set this way. The client player typically selects a stream based on the chosen system language or some other rule.
- **Alternate Audio, not Auto Select**: The client player *should never* select this stream. Any number of streams in the rendition group can be set this way.

Set the **Alternate Audio Track Selection** as follows.

Desired Result	How to Set
There is a default. The player can auto-select any of the other audios.	• Set only one audio stream to “Default Audio.” • Set every other audio stream to “Alternate Audio, Auto-Select.”
There is a default. The player cannot auto-select any of the other audios.	• Set only one audio stream to “Default Audio.” • Set every other audio stream to “Alternate Audio, not Auto-Select.”
There is a default. There are specific audios that the player can auto-select.	• Set only one audio stream to “Default Audio.” • Set some of the other audio streams to “Alternate Audio, Auto-Select.” • Set some of the other audio streams to “Alternate Audio, not Auto-Select.”
There is no default. The player can auto-select any audio it chooses.	• Set every audio stream to “Alternate Audio, Auto-Select.”

Desired Result	How to Set
There is no default. The player cannot auto-select any audio.	• Set every audio stream to “Alternate Audio, not Auto-Select.”
There is no default. There are specific audios that the player can auto-select.	• Set some audio streams to “Alternate Audio, Auto-Select.” • Set some audio streams to “Alternate Audio, not Auto-Select.”

Determine Defaults and Auto-Selection Behavior

Set the Audio Track Type field. The options for this field for each audio stream follow.

Value	Client Player Behavior	Representation in HLS Manifest
Alternate Audio, Auto Select, Default	The client player should *select* this stream. Only one stream in the rendition group should be set as the default; otherwise, the client player may behave unexpectedly.	EXT-X-MEDIA with DEFAULT=YES, AUTOSELECT=YES
Alternate Audio, Auto Select, Not Default	The client player *may* select this stream. Any number of streams in the rendition group can be set this way.	EXT-X-MEDIA with DEFAULT=NO, AUTOSELECT=YES
Alternate Audio, not Auto Select	The client player *should never* select this stream. Any number of streams in the rendition group can be set this way.	EXT-X-MEDIA with DEFAULT=NO, AUTOSELECT=NO
Audio-Only Variant Stream	The client can play back this audio-only stream instead	EXT-X-STREAM-INF

Value	Client Player Behavior	Representation in HLS Manifest
	of video in low-bandwidth scenarios.	

1. Set the **Alternate Audio Track Selection** as follows:

Desired Result	How to Set
There is a default. The player can auto-select any of the other audios.	• Set only one audio stream to “Alternate Audio, Auto-Select, Not Default, Default.” • Set every other audio stream to “Alternate Audio, Auto-Select, Not Default.”
There is a default. The player cannot auto-select any of the other audios.	• Set only one audio stream to “Alternate Audio, Auto-Select, Not Default, Default.” • Set every other audio stream to “Alternate Audio, not Auto-Select.”
There is a default. There are specific audios that the player can auto-select.	• Set only one audio stream to “Alternate Audio, Auto-Select, Not Default, Default.” • Set some of the other audio streams to “Alternate Audio, Auto-Select, Not Default.” • Set some of the other audio streams to “Alternate Audio, not Auto Select.”
There is no default. The player can auto-select any audio it chooses.	• Set every audio stream to “Alternate Audio, Auto-Select, Not Default.”
There is no default. The player cannot auto-select any audio.	• Set every audio stream to “Alternate Audio, not Auto-Select.”

Desired Result	How to Set
There is no default. There are specific audios that the player can auto-select.	• Set some audio streams to “Alternate Audio, Auto-Select, Not Default.” • Set some audio streams to “Alternate Audio, not Auto-Select.”

2. In addition, if you have an audio that is intended as the audio to play when the bandwidth is so low that the video cannot be delivered, then set that audio to “**Audio-Only Variant Stream**.”

Creating HLS Rendition Groups (Web Interface)

Topics

- Step 1. Create Video-Only Outputs
- Step 3. Create Audio-Only Outputs
- Step 4. Caption-Only Streams
- Step 5. Verify Outputs for the HLS Rendition Group
- Summary of the Steps to Create an HLS Rendition Group
- Example of the Event Output: Creating Caption-Only Streams for an HLS Rendition Group

Step 1. Create Video-Only Outputs

You must create “video-only” outputs. Follow these steps for each video-only output you need:

1. In the AWS Elemental Server web interface, display the **Apple HLS** output group tab.
2. Click **Add Output** in order to create an output.
3. Select or create a stream to be associated with that output. For example, Stream 1.
4. In that stream, delete the **Default Audio** tab. This stream now contains only a video stream.
5. Go back to the Output section associated with this stream and click **Advanced**. The **Audio Rendition Sets** field now appears, with a default value of “audio_program.” This field shows in an output only when the associated stream contains only one video stream.
6. Change the **Audio Rendition Sets** field to specify the rendition group or groups to associate with this video:

   - To associate the video with one rendition group, enter the name of the rendition group.

- To associate the video with several rendition groups, enter a comma-separated list of the rendition group names. Do not put a space after each comma.

Step 3. Create Audio-Only Outputs

Follow these steps for each audio-only output you need:

1. Click **Add Output** in order to create an output.
2. Select or create a stream to be associated with that output. For example, Stream 3.
3. In that stream, delete the default **Video** and **Captions** tabs.This stream is now an audio stream.
4. Complete the following fields in the **Advanced** section:

   - **Stream Name**: The wording for the NAME parameter in the manifest, as described in Audio Information for an HLS Output Group with Audio Rendition Group Event . This is the audio description that the client player user interface displays. If the description is a language, it should be in that language. For example, “Deutsch ”, not “German”.
   - **Language Code**: Optional; complete only if the audio is a language. The wording that is to appear in the LANGUAGE parameter in the manifest should be the language code as per RFC 5646, as described in Audio Information for an HLS Output Group with Audio Rendition Group Event . This is the language code that the client player reads.

     You can also leave this field blank and check **Follow Input Language Code**; the language of the audio (specified in **Audio Source**, a bit higher up on the screen) is detected.
5. Go back to the Output section associated with the first audio stream and click **Advanced**.

   The **Audio Group ID** field and Alternate **Audio Track Type** field (named **Audio Track Selection** in earlier versions) now show. These fields show in an output only when the associated stream contains only one audio stream. The **Audio Group ID** field shows the default value “audio_program.”

   (Note that the **Audio Only Image** field also appears in an audio-only stream. This field has nothing to do with audio rendition groups; it is used to assign an image in a “regular stream that has no video.”)

   - Set the **Audio Group ID** field to specify the audio rendition group that this audio will belong to. For example, “AAC group” or “Dolby group.”

- Set up the **Alternate Audio Track Selection** field (**Audio Track Type** field), as described in Step 2. Determine Defaults and Auto-Selection Behavior.

Step 4. Caption-Only Streams

If your output includes captions, you must create “captions-only” outputs. Follow these steps for each captions-only output you need:

1. Click **Add Output** in order to create an output.
2. Select or create a stream to be associated with that output.For example, Stream 4.
3. In that stream, delete the default **Video** tab and the default **Audio** tab. This stream now contains only a **captions** stream.

For more information on setting up captions, see Setting Up Captions with AWS Elemental Server.

Step 5. Verify Outputs for the HLS Rendition Group

- Finally, check all your outputs for the HLS output groups and make sure you do not have an output that contains both audio and video. Including such an output may produce a manifest that the client player cannot interpret.

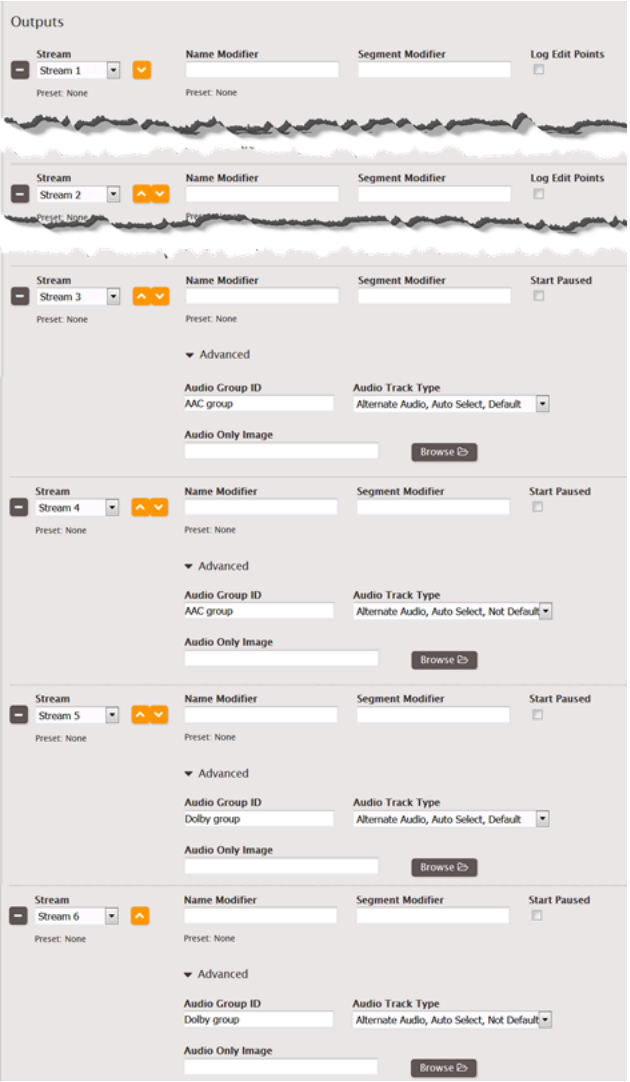
Summary of the Steps to Create an HLS Rendition Group

After these steps, you have:

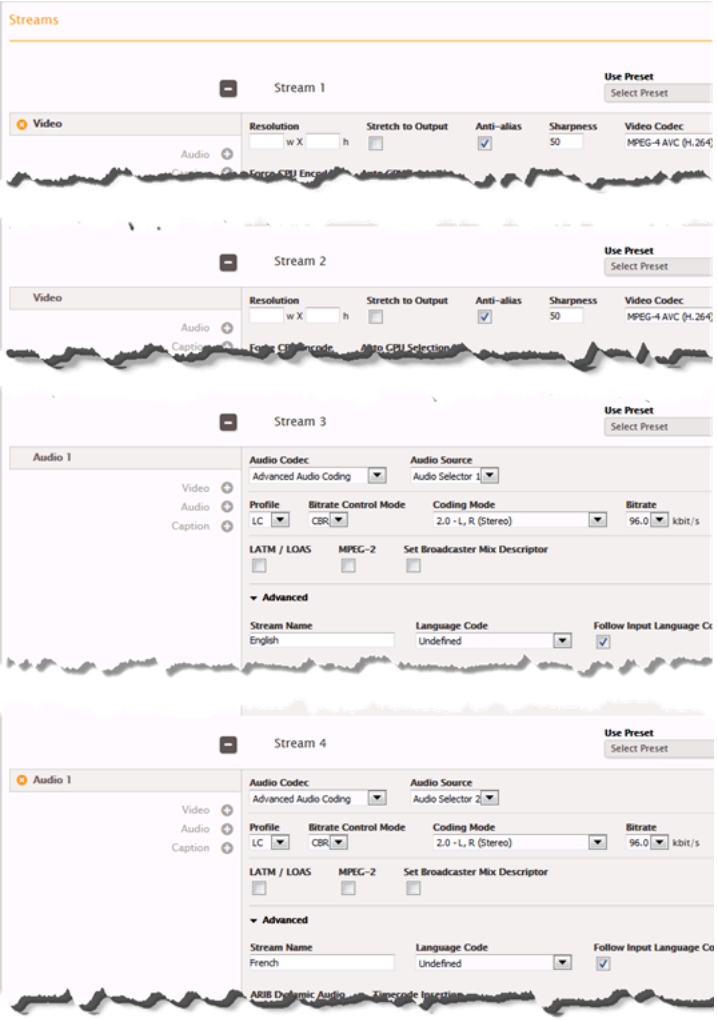
- One or more video-only outputs. Each output is associated through its **Audio Rendition Sets** field to one or more audio rendition groups.
- Two or more audio-only outputs. Each output belongs to an audio rendition group based on the value in the **Audio Group ID** field.
- Optionally, one or more captions-only outputs.

Example of the Event Output: Creating Caption-Only Streams for an HLS Rendition Group

Here is the Output section.



Here is the Streams section.



Creating HLS Rendition Groups (REST API)

The following information assumes that you have read the section called "Creating HLS Rendition Groups (Web Interface)" and are therefore familiar with the construction and association of an output containing video and rendition groups.

Via the REST API, create or modify the event to include the elements and tags in the XML body as described in the following sections.

Topics

- Creating Streams for HLS Rendition Groups in the REST API
- Creating Output Groups for HLS Rendition Groups in the REST API
- Creating Outputs for HLS Output Groups in the REST API
- Sample XML Body For an HLS Output Group with Audio Rendition Group Event

Creating Streams for HLS Rendition Groups in the REST API

- Create as many stream_assembly elements as you require, one for each unique video stream, one for each unique audio stream, and one for each caption stream.
- Each stream_assembly element must contain only of these:
  - One video_description element (plus an optional preset_id tag and name tag), or
  - One audio_description element (plus an optional preset_id tag and name tag), or
  - One caption_descriptoin element (plus an optional preset_id tag and name tag).

Creating Output Groups for HLS Rendition Groups in the REST API

- Create as many HLS output groups as desired by creating one output group that has the value “apple_live_group_settings” in its type tag and that contains one apple_live_group_settings element. Set other tags as desired.

Creating Outputs for HLS Output Groups in the REST API

- Within each HLS output group, create as many output elements as required, one for each video stream (plus captions), one for each audio stream, and one for each captions stream.
- Each **video** output element must contain:
  - container: m3u8
  - extension: m3u8
  - stream_assembly_name: The name of the one stream_assembly to associate with this output.This value matches the value of the name tag in the corresponding stream_assembly_name element.
  - apple_live_settings element that contains:
    - audio_rendition_sets tag: A comma-separated list of the names of the audio rendition groups to associate with this video output to create a set. This value matches the value of the audio_group_id tag in each of the associated audio outputs. For example, “audio_1” in the audio_rendition_sets of this video output matches the “audio_1” in the audio_group_id tag of the associated audio output.
    - Other tags as you require.
- Each **audio** output element must contain:
  - container: m3u8

- extension: m3u8
- stream_assembly_name: The name of the one stream_assembly to associate with this output.This value matches the value of the name tag in the corresponding stream_assembly_name element.
- apple_live_settings element that contains:
  - audio_group_id: The name of the audio rendition group this audio output belongs to. Specifying a value here creates the rendition group and puts this audio output into that rendition group.
  - Up to version 2.9.x: alternate_audio_track_selection: Either “default_audio” or “alternate_audio_auto_select” or “alternate_audio_not_auto_select”. See the section called “Step 2. Determine Defaults and Auto-Selection Behavior” for information.
  - Version 2.10.0 and later: audio_track_type: Either “alternate_audio_auto_select_default” or “alternate_audio_auto_select” or “alternate_audio_not_auto_select” or “audio_only_variant_stream”. See the section called “Step 2. Determine Defaults and Auto-Selection Behavior”for information.
  - Other tags as you require.
- Each **captions** output element must contain:
  - container: m3u8
  - extension: m3u8
  - stream_assembly_name: The name of the one stream_assembly to associate with this output.This value matches the value of the name tag in the corresponding stream_assembly_name element.
  - apple_live_settings element that contains the usual tags as required.

Sample XML Body For an HLS Output Group with Audio Rendition Group Event

This example shows the XML body for an event that contains an HLS output group that includes audio rendition groups.

Following is the `<input>` element. There are no special rendition group requirements that affect this element.

```
<live_event>
<name>Multi Audio - one video</name>
<input>
```

```
.
.
.
</input>
.
.
.
```

Following is the `<stream_assembly>` element for one video. This stream_assembly has the name tag set to “stream_assembly_0” (assigned by default).

```
<stream_assembly>
    <name>stream_assembly_0</name>
    .
    .
    .
    <video_description>
    .
    .
    .
    <h264_settings>
    .
    .
    .
    </h264_settings>
    <codec>h.264</codec>
    .
    .
    .
    </video_description>
    <caption_description>
      <language_code>eng</language_code>
      <language_description>English</language_description>
    .
    .
    .
    </caption_description>
</stream_assembly>
```

Following is the `<stream_assembly>` for the first audio. This stream_assembly has the name tag set to “stream_assembly_1” (assigned by default).

```
<stream_assembly>
    <name>stream_assembly_1</name>
    <audio_description>
    <follow_input_language_code>false</follow_input_language_code>
    <language_code>eng</language_code>
    <stream_name>English</stream_name>
    .
    .
    .
    <aac_settings>
    .
    .
    .
    .
    </aac_settings>
    .
    .
    .
    <codec>aac</codec>
    <audio_source_name>Audio Selector 1</audio_source_name>
    </audio_description>
</stream_assembly>
```

Following are the `<stream_assembly>` elements for three more audios: stream_assembly_2, stream_assembly_3, and stream_assembly_4.

```
<stream_assembly>
    <name>stream_assembly_2</name>
    <audio_description>
    <follow_input_language_code>false</follow_input_language_code>
    <language_code>eng</language_code>
    <stream_name>English</stream_name>
    .
    .
    .
    <aac_settings>
    .
    .
    .
    </aac_settings>
    .
    .
```

```
    .
    <codec>aac</codec>
    <audio_source_name>Audio Selector 1</audio_source_name>
    </audio_description>
</stream_assembly>

<stream_assembly>
    <name>stream_assembly_3</name>
    <audio_description>
    .
    .
    .
    </audio_description>
</stream_assembly>

<stream_assembly>
    <name>stream_assembly_4</name>
    <audio_description>
    .
    .
    .
    </audio_description>
</stream_assembly>
```

Following is the `<stream_assembly>` for the first caption. This stream_assembly has the name tag set to “stream_assembly_5” (assigned by default).

```
<stream_assembly>
    <name>stream_assembly_5</name>
    <caption_description>
        <destination_type>WebVTT</destination_type>
        <language_code>eng</language_code>
        <language_description>English</language_description>
        <order>1</order>
        <caption_source_name>Caption Selector 1</caption_source_name>
    </caption_description>
</stream_assembly>
```

Following are the `<stream_assembly>` elements for three more captions: stream_assembly_6, stream_assembly_7, and stream_assembly_8.

```
<stream_assembly>
```

```
    <name>stream_assembly_6</name>
    <caption_description>
    <destination_type>WebVTT</destination_type>
    <language_code>eng</language_code>
    <language_description>English</language_description>
    <order>1</order>
    <caption_source_name>Caption Selector 1</caption_source_name>
    </caption_description>
</stream_assembly>
<stream_assembly>
    <name>stream_assembly_7</name>
    .
    .
    .
</stream_assembly>
<stream_assembly>
    <name>stream_assembly_8</name>
    .
    .
    .
</stream_assembly>
```

Following is the `<output_group>` of type apple_live_group_settings.

```
<output_group>
<apple_live_group_settings>
.
.
.
</apple_live_group_settings>
<type>apple_live_group_settings</type>
```

Following is the `<output>` (nested in the HLS output_group element) that is associated with stream_assembly_0 and is therefore a video output. This video is associated with the rendition groups “Audio_aac_hi” and “Audio_aac_lo.”

```
    <output>
        <extension>m3u8</extension>
        .
        .
        .
```

```
        <apple_live_settings>
        <audio_rendition_sets>Audio_aac_hi,Audio_aac_lo</audio_rendition_sets>
        .
        .
        .
        </apple_live_settings>
        <m3u8_settings>
        .
        .
        .
        </m3u8_settings>
        <stream_assembly_name>stream_assembly_0</stream_assembly_name>
        <container>m3u8</container>
    </output>
```

Following is the `<output>` (nested in the HLS output_group element) that is associated with stream_assembly_1 and is therefore an audio output. This audio is part of the rendition group "Audio_aac_hi."

```
    <output>
        <extension>m3u8</extension>
        .
        .
        .
        <apple_live_settings>
        <alternate_audio_track_selection>default_audio</
alternate_audio_track_selection>
        <audio_group_id>Audio_aac_hi</audio_group_id>
        .
        .
        .
        </apple_live_settings>
        <m3u8_settings>
        .
        .
        .
        </m3u8_settings>
        <stream_assembly_name>stream_assembly_1</stream_assembly_name>
        <container>m3u8</container>
    </output>
```

More outputs follow, one for each audio stream assembly. Each is part of a rendition group.

```
    <output>
    .
    .
    .
    </output>
    <output>
    .
    .
    .
    </output>
    <output>
    .
    .
    .
    </output>
```

Following is the `<output>` (nested in the HLS output_group element) that is associated with stream_assembly_5 and is therefore a caption output.

```
    <output>
        <extension>m3u8</extension>
        .
        .
        .
        .
        <stream_assembly_name>stream_assembly_5</stream_assembly_name>
        <container>m3u8</container>
    </output>
```

More outputs follow, one for each caption stream assembly and one for each caption assembly.

```
    <output>
          .
          .
          .
    </output>
    <output>
          .
          .
          .
    </output>
    <output>
```

```
            .
            .
            .
    </output>
            .
            .
            .
</output_group>
</live_event>
```

Sample HLS Output Group with Audio Rendition Group Event Manifest

Video Information for an HLS Output Group with Audio Rendition Group Event

- There are two video streams, as indicated by the presence of two EXT-STREAM-INF lines.
  - The first video stream has a low bandwidth. As indicated by the AUDIO parameter, it is associated with “audio1.”
  - The second video stream has a higher bandwidth. As indicated by the AUDIO parameter, it is associated with “audio2.”

Audio Information for an HLS Output Group with Audio Rendition Group Event

- There are four audio streams as indicated by the presence of four EXT-X-MEDIA lines with TYPE=AUDIO.
- There are two audio rendition groups, as indicated by the values for the GROUP-ID in each line. The first two lines belong to audio1, the second two to audio2.
- In each audio stream, the values for the various parameters come from these fields in the web interface:
  - TYPE: Always Audio.
  - GROUP-ID: from Audio Group ID field in Output > Advanced.
  - LANGUAGE: from the Language Code field in Stream > Advanced.
  - NAME: from the Stream Name field in Stream > Advanced.

- AUTOSELECT: from the Alternate Audio Track Type field (named Audio Track Selection in earlier versions) in Output > Advanced.
- DEFAULT: from the Alternate Audio Track Selection field in Output > Advanced.
- URI: from the combined Destination field (in Output Group) and Name Modifier field (in Stream).

Captions Information for an HLS Output Group with Audio Rendition Group Event

- There are two captions streams, as indicated by the presence of two EXT-X-MEDIA lines with TYPE=SUBTITLES.

```
#EXTM3U
#EXT-X-MEDIA:TYPE=AUDIO,GROUP-ID="audio1",LANGUAGE="eng",NAME="English",AUTOSELECT=YES,
 \
DEFAULT=YES,URI="eng1/prog_index.m3u8"
#EXT-X-MEDIA:TYPE=AUDIO,GROUP-
ID="audio1",LANGUAGE="fre",NAME="français",AUTOSELECT=YES, \
DEFAULT=NO,URI="fr1/prog_index.m3u8"
#EXT-X-MEDIA:TYPE=AUDIO,GROUP-ID="audio2",LANGUAGE="eng",NAME="English",AUTOSELECT=YES,
 \
DEFAULT=YES,URI="eng2/prog_index.m3u8"
#EXT-X-MEDIA:TYPE=AUDIO,GROUP-ID="audio2",LANGUAGE="fr",NAME="français",AUTOSELECT=YES,
 \
DEFAULT=NO,URI="fr2/prog_index.m3u8"

#EXT-X-MEDIA:TYPE=SUBTITLES,GROUP-ID="subs",LANGUAGE="eng",NAME="English",
DEFAULT=YES,AUTOSELECT=YES,FORCED=NO,URI="1c1.m3u8"
#EXT-X-MEDIA:TYPE=SUBTITLES,GROUP-ID="subs",LANGUAGE="fra",NAME="French",
DEFAULT=YES,AUTOSELECT=YES,FORCED=NO,URI="1c2.m3u8"

#EXT-X-STREAM-INF:PROGRAM-
ID=1,BANDWIDTH=195023,CODECS="avc1.42e00a,mp4a.40.2",AUDIO="audio1"
lo/prog_index.m3u8,SUBTITLES="subs",URI="1c2.m3u8"
#EXT-X-STREAM-INF:PROGRAM-
ID=1,BANDWIDTH=591680,CODECS="avc1.42e01e,mp4a.40.2",AUDIO="audio2"
hi/prog_index.m3u8,URI="1c2.m3u8"
```

Setting Up Captions with AWS Elemental Server

To include captions in your job, follow these steps in the order listed:

1. Set the timecode source settings.
2. Gather required captions information.
3. Choose a supported output captions format.
4. Create input captions selectors.
5. Set up captions in outputs.

For information about the files AWS Elemental Server generates from jobs that have captions in the outputs, see the section called "About Captions Handling in Outputs".

Setting the Timecode Source Settings

Before you start setting up the captions themselves, you need to make sure that the timecode settings you make result in correctly synchronized captions. The simplest way to make sure that your captions synchronize correctly with your video is to set both the input and job-wide timecode source to **Start at 0** or to set them both to **Embedded**.

> **Note**
>
> If you set both to **Embedded**, the timecodes in your captions files must begin at the same time as the timecodes that are embedded in your input video.

To set your input timecode source setting

1. On the **Create New Job** page, in the **Input** section, under **Input 1**, choose **Advanced** to display more settings.
2. For **Timecode Source**, choose **Start at 0** or **Embedded**.

To set your job-wide timecode source setting

1. On the **Create New Job** page, at the bottom of the **Input** section, find the **Timecode Config** section.

2. For **Source** choose, choose the same value that you set for the input timecode source setting.

Gathering Required Captions Information

To choose an appropriate output captions format and to set up your captions in your job, you need the following information:

- The *input video container*. You must have this information ahead of time; AWS Elemental Server does not read this from your input files. For a list of supported input containers and information about whether captions can be extracted from them, see Reference: Supported Input Containers.
- The *input captions format*. You must have this information ahead of time; AWS Elemental Server does not read this from your input files. For a list of supported input captions, see Reference: Supported Captions Formats.
- The *tracks* from the input captions that you intend to use in any of your outputs. Captions tracks often correspond to language, as in "a French captions track". You must have this information ahead of time; AWS Elemental Server does not read this from your input files.
- The *output packages and standalone files* that you intend to create with the job.

  Captions are supported in every output container type. For a list of supported output containers, see the **Reference** tab of the documentation on the web interface of your appliance. To go to the documentation, choose the **Support** tab at the top of the interface.
- The *output captions tracks* that you intend to include for each output.

  In most cases, the tracks that you include in an output might be a subset of the tracks that are available in the input. If you pass through Teletext-to-Teletext, all tracks in the input are available in the output. In this situation, you can't choose only a subset of the input tracks.

Choosing a Supported Output Captions Format

Before you set up captions in your job, make sure that the transcode you want to set up is supported. Support for a particular output caption format depends on the following factors:

- *Output container*. A given output caption can appear only in specific output containers.
- *Input container*. From a given input container, AWS Elemental Server can read certain caption formats.

- *Input captions format*. For a given caption format in the source, the AWS Elemental Server can create output captions in one or more formats.

To find the supported output captions formats, given your output container, input container and input captions format

1. Find the **Supported Caption Formats** table on the web interface of your AWS Elemental Server appliance. The URL for this table is <your-AWS Elemental Server-node>/help/reference#supported_captions.

   a. Choose the **Support** tab on the web interface. These top-level tabs are at the top of the web interface, just below the AWS Elemental logo.

   > **Note**
   >
   > Choose the word **Support**. Don't choose from the dropdown menu.

   b. Choose the **Reference** tab from the set of tabs just below the label **Table of Contents**.

   c. Choose **Supported Caption Formats** from the left navigation menu on the **Reference** page.

2. Find the table with the heading that corresponds to your output container.
3. In the **Original Input Container** column, find your input container.
4. Of the rows that show your input container, find the row that shows your input captions format in the **Original Caption Format** column.

   > **Note**
   >
   > If your input captions format isn't shown in any row that also shows your input container, your input captions format isn't supported.

5. Find your choices for output captions formats in the third column of that row under **Supported Output Caption Formats**.

Creating Input Captions Selectors

When you set up captions, you begin by creating input captions selectors. Captions selectors identify a particular captions asset on the input and associate a label with it. The captions asset

is either a single track or the set of all tracks contained in the input file, depending on your input captions format. For example, you might add **Captions selector 1** and associate the French captions with it. When you set up an output to include captions, you do so by specifying these input captions selectors in the streams in your outputs.

To create input captions selectors

1. On the **Create New Job** page, In the **Input** section, under **Input 1**, choose **Advanced** to display more settings.
2. Choose the **Add Caption Selector**, below the **Video Selector** and **Audio Selector** sections.
3. Under **Source**, choose the input captions format.
4. For most formats, more fields appear. Specify the values for these fields as described in the topic that relates to your input captions format. For more information about these fields, choose the appropriate topic from the list following this procedure.
5. Create more captions selectors as necessary. The number of captions selectors you need depends on your input captions format. For information on the number of captions selectors you should set up, see the topic from the list following this procedure that corresponds to your input captions format.

Detailed information by input captions format

- Ancillary (QuickTime Captions Track or Captions in MXF VANC Data)
- ARIB
- Embedded (CEA/EIA-608, CEA/EIA-708), SCTE-20, and Embedded+SCTE-20, and SCTE-20+Embedded
- DVB-Sub or SCTE-27 Formats
- Teletext
- SCC, SMI, SRT, STL, TTML (Sidecar)
- Setting Up Input Captions With 608 XDS Data
- Extracting VBI Data Included in Embedded Input Captions

Ancillary (QuickTime Captions Track or Captions in MXF VANC Data)

If your input captions are in either of the following formats, the service handles them as "ancillary" data:

- QuickTime captions track (format QTCC)
- MXF VANC data

AWS Elemental Server does not create output captions in these formats, but you can convert them to a supported output format..

> **Note**
>
> If your content includes 608 XDS data, see Setting Up Input Captions With 608 XDS Data

For ancillary captions

- Create one captions selector per track to use in your outputs.
- In each captions selector, for **Source**, choose **Ancillary**.
- In each captions selector, for **CC channel**, choose the channel number for the track that is associated with the selector.

  For example, the input captions have English in CC channel 1 and Spanish in CC channel 2. To use these captions, create Captions selector 1, and then choose 1 in the **CC channel** dropdown list. Next, create Captions selector 2, and then choose 2 in the **CC channel** dropdown list.

ARIB

For ARIB captions, create one input captions selector. For **Source**, choose **ARIB**.

Embedded (CEA/EIA-608, CEA/EIA-708), SCTE-20, and Embedded +SCTE-20, and SCTE-20+Embedded

If your input captions are in any of the following formats, AWS Elemental Server handles them as "embedded."

- CEA-608
- EIA-608
- CEA-708
- EIA-708

If your input captions have both embedded captions and SCTE-20 captions and you want both types in your outputs, set up separate input captions selectors for the SCTE-20 and the embedded captions tracks. Set up the SCTE-20 captions selectors the same way you set up the embedded selectors.

> **Note**
>
> If you are extracting embedded captions from the input and using embedded captions in the output, and if the input includes VBI data and you want to include all that data in the output, then do not follow this procedure. Instead, see Extracting VBI Data Included in Embedded Input Captions.

Number of Captions Selectors for Embedded and SCTE-20 Captions

- If all of your output captions are also an embedded format, create only one captions selector, even if you want to include multiple tracks in the output. With this setup, AWS Elemental Server automatically extracts all tracks and includes them in the output.
- If all of your outputs are in a format that is not embedded, create one captions selector for each track that you want to include in the output.
- If some of your outputs have captions in an embedded format and some of your outputs have captions in a different format, create one captions selector for the outputs with embedded captions. Also create individual selectors for the outputs with other captions that aren't embedded, one for each track that you want in your outputs.

Captions Selector Fields for Embedded, SCTE-20, Embedded+SCTE-20, and SCTE-20+Embedded Captions

- **Source**: Specify a value for the source format as follows:
  - Choose `embedded` if the source captions are embedded (EIA-608 or CEA-708) or embedded +SCTE-20, or SCTE-20+embedded.
  - Choose `SCTE-20` if the source captions are SCTE-20 alone.
- **CC channel number**: This field specifies the track to extract. Complete as follows:
  - If you are doing embedded-to-embedded captions (that is, you create only one captions selector for the input-embedded captions), AWS Elemental Server ignores this field, so keep the default value for **CC channel number**.

- If you are converting embedded captions to another format (that is, you create several captions selectors, one for each track), specify the captions channel number from the input that holds the track that you want. To do that, select the channel number from the dropdown list. For example, select **1** to choose CC1.

> **Note**
>
> AWS Elemental Server doesn't automatically detect which language is in each track (channel). You can specify that when you set up the output captions so that AWS Elemental Server passes the language code metadata for the captions channel into the output for downstream use.

- **Force 608 to 708 Upconvert**: The embedded source captions may be EIA-608 captions or CEA-708 captions or both EIA-608 and CEA-708. You can specify how you want these captions to be handled when the AWS Elemental encoder is ingesting content. The following table describes the behavior for various scenarios.

EIA-608 in Source	CEA-708 in Source	Upconvert Field	Result
Yes	No	Checked	CEA-708 data is created based on the EIA-608 data and EIA-608 data is added as 608-compatibility bits in the CEA-708 data.
Yes	No	Unchecked	Original EIA-608 is preserved.
No	Yes	Checked	Original CEA-708 is preserved.
No	Yes	Unchecked	Original CEA-708 is preserved.
Yes	Yes	Checked	**Not recommended.**

EIA-608 in Source	CEA-708 in Source	Upconvert Field	Result
			CEA-708 data is discarded. New CEA-708 data is created based on the EIA-608 data and EIA-608 data is added as 608-compatibility bits in the CEA-708 data. The new CEA-708 data does not include any CEA-708 formatting features.
Yes	Yes	Unchecked	Original EIA-608 is preserved and original CEA-708 is preserved.

- Use **SCTE-20 if Embedded Unavailable**: This field appears only if you set the Source to "Embedded." If the source captions combine embedded (EIA-608 or CEA-708) and SCTE-20, you may want to check this field: the encoder gives preference to the 608/708 embedded captions but switches to use the SCTE-20 captions when necessary. If you leave this field unchecked, the encoder never uses the SCTE-20 captions.

DVB-Sub or SCTE-27 Formats

AWS Elemental Server supports DVB-Sub and SCTE-27 formats only in TS inputs.

In most cases, create one captions selector per track. In each selector, specify which track you want by providing the PID or language code.

> **Note**
>
> Don't specify the captions in both the **PID** field and the **Language** dropdown list. Specify one or the other.

If you are doing DVB-sub-to-DVB-sub and you want to pass through all the captions tracks from the input to the output, create one captions selector for all tracks. In this case, keep the **PID** field blank and don't choose any language from the **Language** dropdown list.

Teletext

You can use Teletext captions in one of the following ways:

- Teletext can include more data than just captions. If you want to include the entire Teletext input, your input and output captions format must be Teletext. You can't convert the entire set of Teletext data to another captions format.

  AWS Elemental Server supports Teletext-to-Teletext only in MPEG-2 outputs.
- You can extract and convert individual captions pages (for example, the captions in a specific language) to another captions format. You can't extract individual captions pages and keep them in Teletext format. If you want to extract individual captions pages, you must convert them to another format.

Number of Captions Selectors for Teletext

- If you are doing Teletext-to-Teletext captions, create only one captions selector, even if you want to include multiple tracks in the output. In this case, AWS Elemental Server automatically extracts all tracks and includes them in the output.
- If you are doing Teletext-to-other, create one captions selector for each track that you want to include in the output.
- If you are doing Teletext-to-Teletext in some outputs and Teletext-to-other in other outputs, create one captions selector for the Teletext-to-Teletext, and then create individual selectors for the Teletext-to-other, one for each track that AWS Elemental Server converts.

Captions Selector Fields for Teletext Captions

- **Source**: Choose **Teletext**.
- **Page**: This field specifies the captions page you want. A captions page usually corresponds to a language. Complete as follows:
  - If you are doing Teletext-to-Teletext captions (that is, you create only one captions selector for the input embedded captions), keep this field blank. AWS Elemental Server ignores any value that you provide.
  - If you are converting Teletext to another format (that is, you create several captions selectors, one for each language), then specify the page for the language that you want. If you keep this field blank, you will get a validation error when you submit the job.

SCC, SMI, SRT, STL, TTML (Sidecar)

SCC, SMI, SRT, STL, and TTML are sidecar captions formats. With these formats, you provide input captions as a separate file. AWS Elemental Server handles all sidecar formats the same way. The service can pass them through to the output in the same format or convert them into another sidecar format. In all cases, you must create one captions selector for the entire set of captions tracks.

Provide the following values for the captions selector fields:

- **External captions file**: The URI to the captions file. AWS Elemental Server accepts captions files from Amazon S3.
- **Time delta**: (Optional) Use this setting if you need to adjust the sync between the captions and the video:
  - Type a positive number to add to the times in the captions file. For example, type **15** to add 15 seconds to all the times in the captions file.
  - Type a negative number to subtract from the times in the captions file. For example, type **-5** to subtract 5 seconds from the times in the captions file.

    The format of the times in the captions file doesn't have to match the value in the **Timecode config** field (in the input portion of your job). The number that you type in this field simply delays the captions or makes the captions play earlier, regardless of the timecode formats.

> **Note**
>
> To make sure that your captions are properly synchronized with your video, check that the value for **Timecode source** in the **Video selector** section matches the timecodes in your captions file. For example, if the timecodes in your captions file start at zero but your video has embedded timecodes starting at 01:00:00:00, change the default value for **Timecode source** from **Embedded** to **Start at 0**.
> If you use the API or an SDK, you can find this setting in your job XML file, called `TimecodeSource`, located in `Settings`, `Inputs`. When you use SCC, you must provide a value for `TimecodeSource`. Otherwise, AWS Elemental Server does not insert the captions.

Use Cases for Time Delta

SCC: The start time for the captions is not 00:00:00:00. For captions handling, AWS Elemental Server always treats the video and audio start time as 00:00:00, even if your input video file has embedded timecodes that start at a time other than 00:00:00:00. If your captions file assumes a start time other than 00:00:00, you might need to adjust the captions start time.

For example, your video file may have embedded timecodes that start at 00:05:00:00 and the first instance of dialogue that requires captions might be one minute into the video, at timecode 00:06:00:00. If your captions file is set to begin captions at 00:06:00:00, you must subtract five minutes from the captions. In this case, you would enter **`-300`** in the **Time delta** field.

SMI, SRT, STL, TTML: The start time in the captions file is slightly off. With these types of captions files, the start time for both the video file (containing video and audio), and the captions file is always 00:00:00.

For example, the first instance of dialogue that requires captions might be at 00:06:15. But in the captions file, this time is marked as 00:06:18, and every other instance of captions is also off by 3 seconds. The solution is to subtract 3 seconds from the captions file. In this case, you would enter "-3" in the **Time delta** field.

Setting Up Input Captions With 608 XDS Data

The Extended Data Services (XDS or EDS) standard is part of EIA-608 and allows for the delivery of ancillary data.

If your content includes 608 XDS data, you can set up to include it or strip it from the output.

> **Note**
>
> The data is global – it is either included in every output and stream (even those streams that do not include captions) or it is excluded in every output and stream.

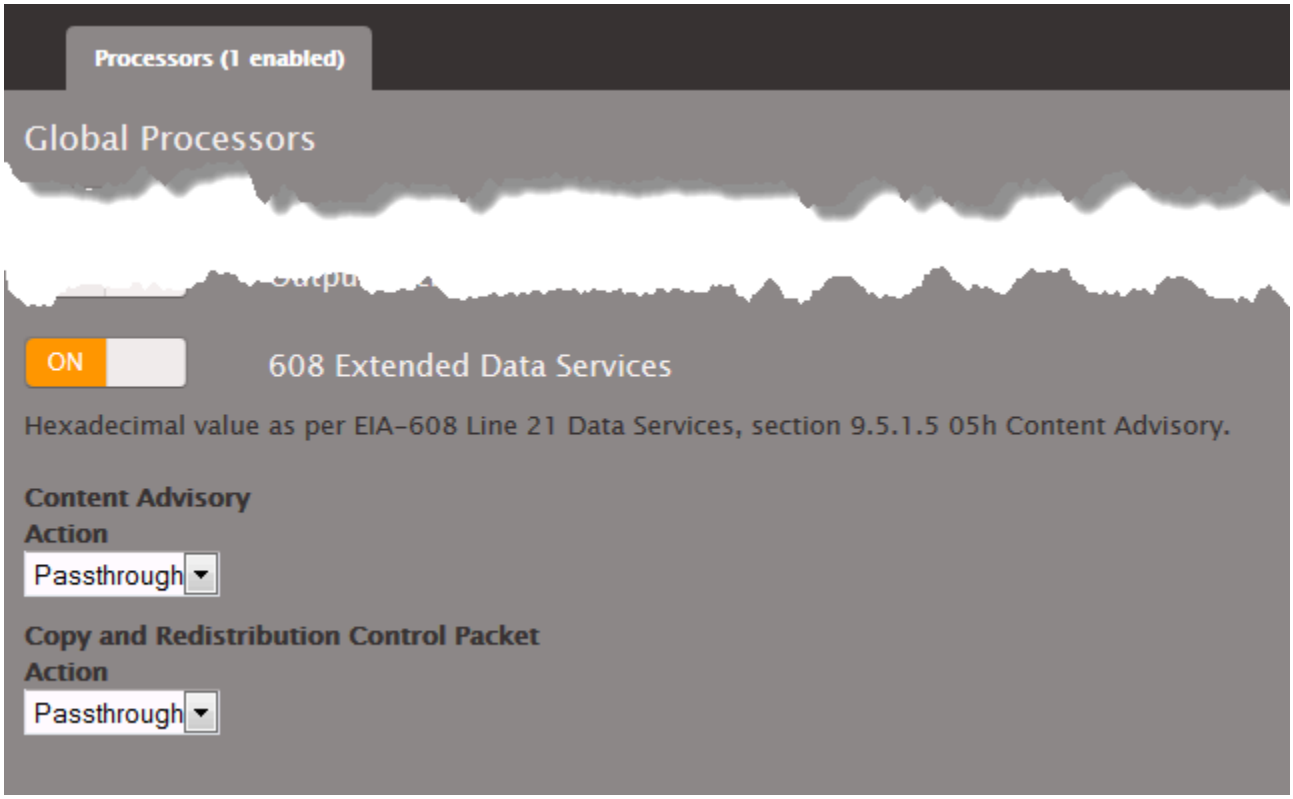
Extracting Data from Input

1. In the Input section of the job, click **Advanced**.
2. Click the Add Caption Selector button.
3. Set the source to **Null**.

   You only need to create one Caption Selector for 608 XDS data, regardless of the number of outputs you are creating.
4. If you also want to extract regular captions, create more Caption Selectors according to the regular procedure as described in Creating Input Captions Selectors.

Including Data in Output

- In the Global Processors section, turn on **608 Extended Data Services** and complete the fields as desired.



> **Note**
>
> No setup is required in the captions section of the output or the streams.

Extracting VBI Data Included in Embedded Input Captions

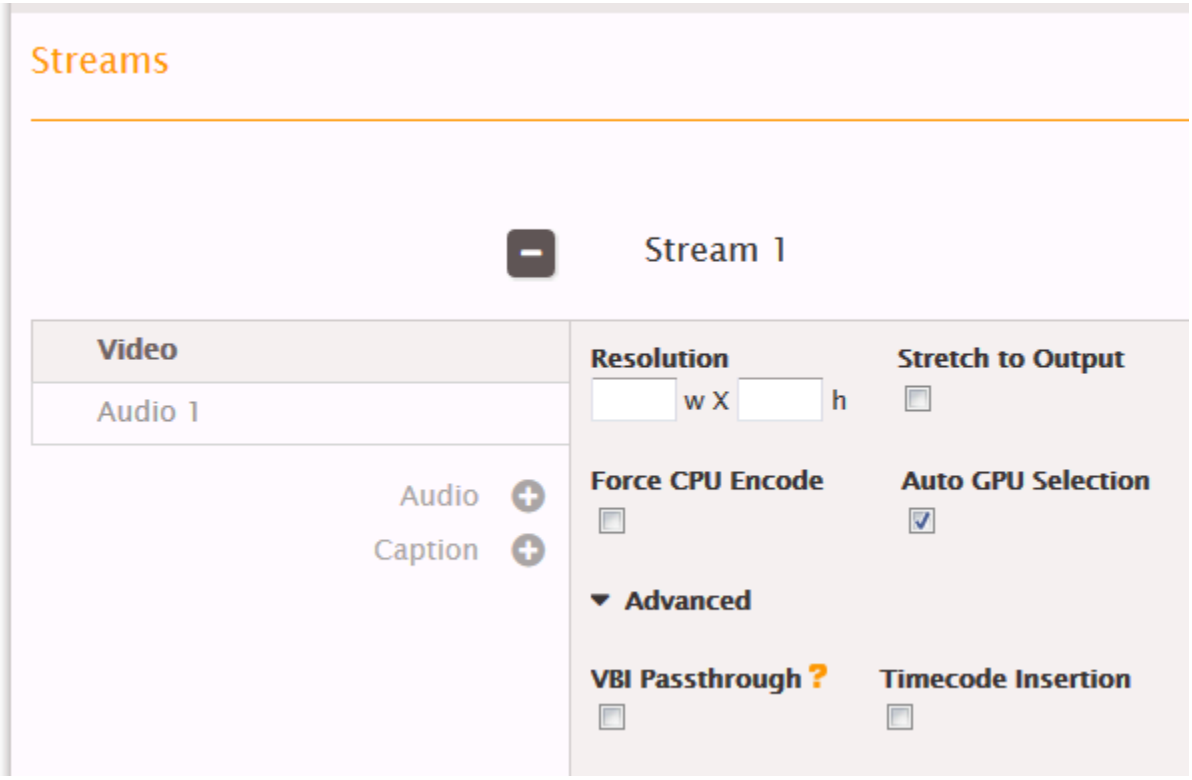
Read this section if all three of the following apply:

- You are extracting embedded captions from the input and using embedded captions in the output.
- The input includes VBI data, and
- You want to include all that data in the output.

Captions in VBI Data

To include embedded captions in this scenario, you do not create caption selectors and associate them with the desired output. Instead, follow this procedure:

1. Create an output for the asset that is to include VBI data.
2. Go to that Stream section.
3. Display the Video fields for this stream. Click **Advanced**. More fields appear.



4. Check the **VBI Passthrough** field.
5. Do not create a captions tab in this stream.

All the VBI data (including embedded captions) from the input is included in the output that is associated with this stream.

Including Captions in the Streams and Outputs

How you set up captions in your outputs depends on the output captions format.For more information, see About Captions Handling in Outputs.

For information about setting up captions in your outputs, choose the topic from the following list that corresponds to your output captions format.

Procedures by Output Captions Format

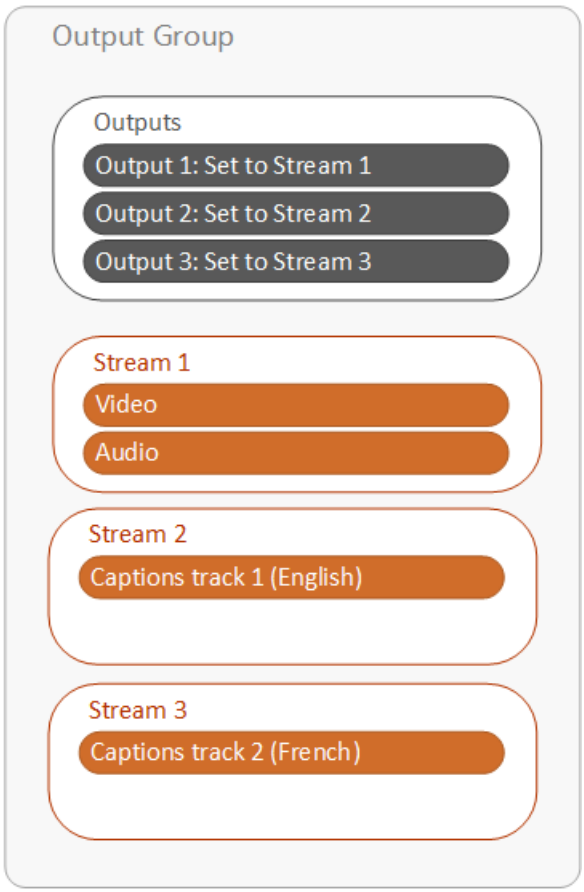
- Ancillary+Embedded

> **Note**
>
> To set up Ancillary+Embedded, choose **Embedded** for **Destination Type** . AWS Elemental Server automatically produces both Ancillary and Embedded captions.

- ARIB
- Burn-in
- CFF-TT
- DVB-Sub
- Embedded
- Embedded+SCTE-20
- RTMP CaptionInfo
- RTMP CuePoint
- SCC
- SCTE-20+Embedded
- SMI
- SRT
- Teletext
- TTML
- WebVTT

Setting Up Output Captions in a Sidecar Format (SCC, SMI, SRT, TTML, WebVTT)

To set up sidecar captions in an output, you create separate, captions-only streams. Each stream corresponds to one captions track. You set up a separate output to associate with each stream. On the AWS Elemental Server web interface, your outputs are structured as shown in the following diagram.



To set up sidecar format captions in an output

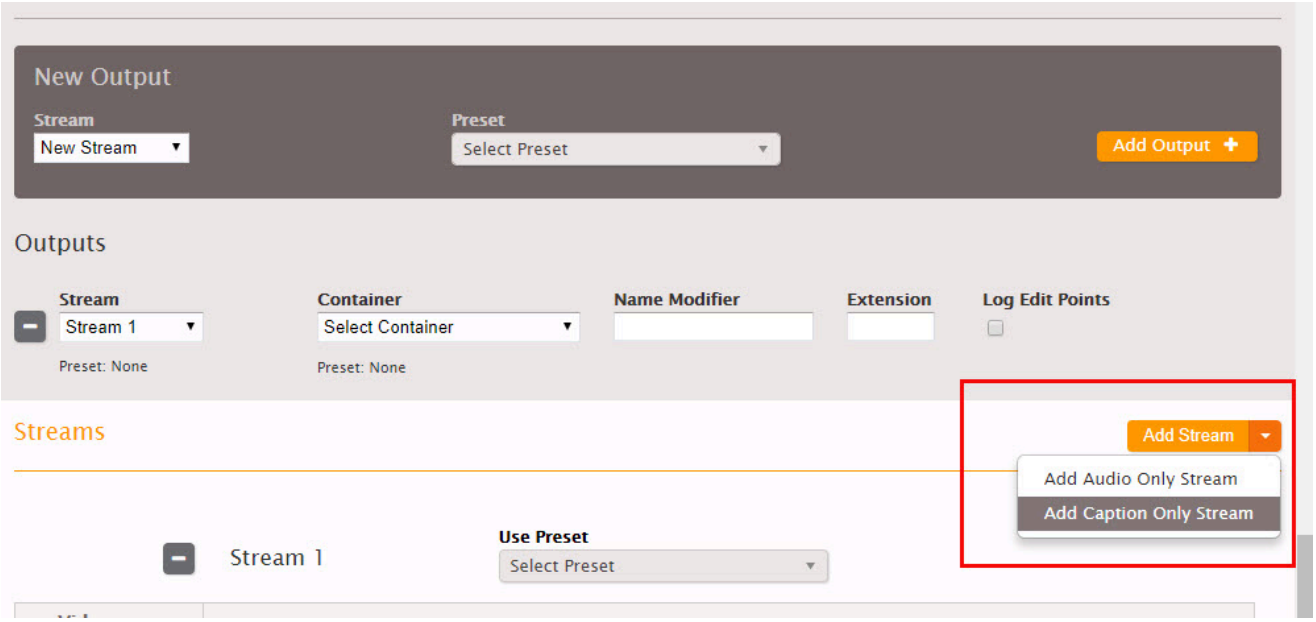
1. On the **Create New Job** page, find the very light gray **Output Groups** section at the bottom of the job.
2. Choose the output group tab that contains the output that you want your sidecar captions to go with.

   If you have not already set up the video and audio for the outputs in this output group, set them up first, before you set up the captions.
3. Create a stream for the first captions track that you want to include.

   a. Find the **Streams** section on the tab for your output group below the **Outputs** section.

   b. In the upper right corner of the **Streams** section, choose the arrow beside the **Add Stream** button. This brings up a drop-down menu.

> **Note**
>
> Do not choose the **Add Stream** button itself.



c. From the drop-down menu, choose **Add Captions Only Stream**.

d. Specify values for the settings in the stream as described in the table following this procedure.

4. Create a new output and associate your captions-only stream with it.

> **Note**
>
> AWS Elemental Server associates this output with your audio and video output because they are in the same output group.

a. Find the dark gray **New Output** section on your output group tab, just above the **Outputs** section.

b. For **Stream**, choose the captions-only stream you created earlier in this procedure.

c. Choose the orange **Add Output** button.

5. Create an additional captions-only stream and output for each additional captions track you want to include. Associate each stream with an output.

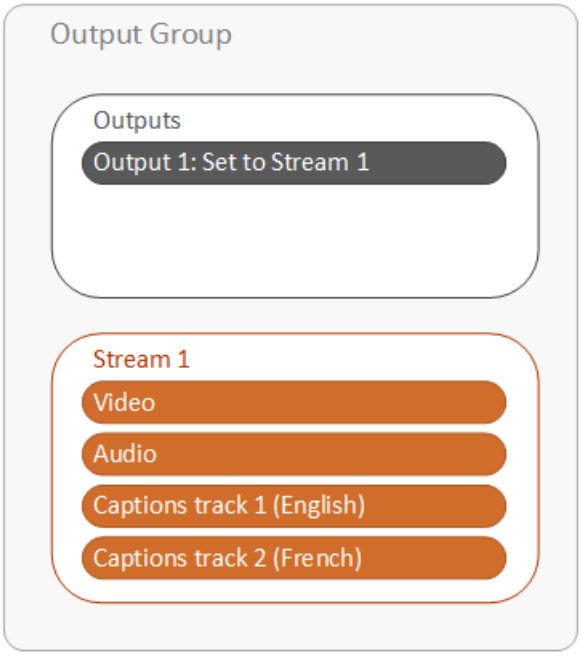
Field	Applicability	Description
Caption Source	All	Select the caption selector you created when specifying the input captions. For more information see Creating Input Captions Selectors)
Destination Type	All	Select the caption type. This type must be valid for your output type as per the relevant Supported Captions table.
Framerate	If the **Destination Type** is SCC.	Complete this field to ensure that the captions and the video are synchronized in the output. Specify a framerate that matches the framerate of the associated video. • If the video framerate is 23.97 or 24, choose the corresponding option • If the video framerate is 29.97, choose 29.97 dropframe only if the video has the **Video Insertion** and **Drop Frame Timecode** both checked; otherwise , choose 29.97 non-dropf rame.
Pass-style	If **Destination Type** is TTML. And if:	Complete as follows:

Field	Applicability	Description
	• The source caption type is TTML, SMPTE-TT, or CCF-TT. • And the output is an Archive output.	• Check this box if you want the style (font, position, and so on) of the input captions to be copied. • Leave unchecked if you want a simplified caption style. Some client players work best with a simplified caption style. (For other combinations of source caption types and output caption type, the output is always simplified.)
Font style fields	If the Destination Type is Burn-in.	See Font Styles for Burn-in.
Language	All	Complete if desired. This information may be useful to or required by a downstream system.
Description	All	Complete if desired. This information may be useful to or required by a downstream system.

Setting Up Output Captions for All Formats Except Sidecar

To set up output captions in any format other than sidecar, you add captions tabs to the stream that also contains the video and audio. You associate the one stream with one output. On the AWS Elemental Server web interface, your outputs are structured as shown in the following diagram. Depending on the output captions format, AWS Elemental Server creates the captions differently

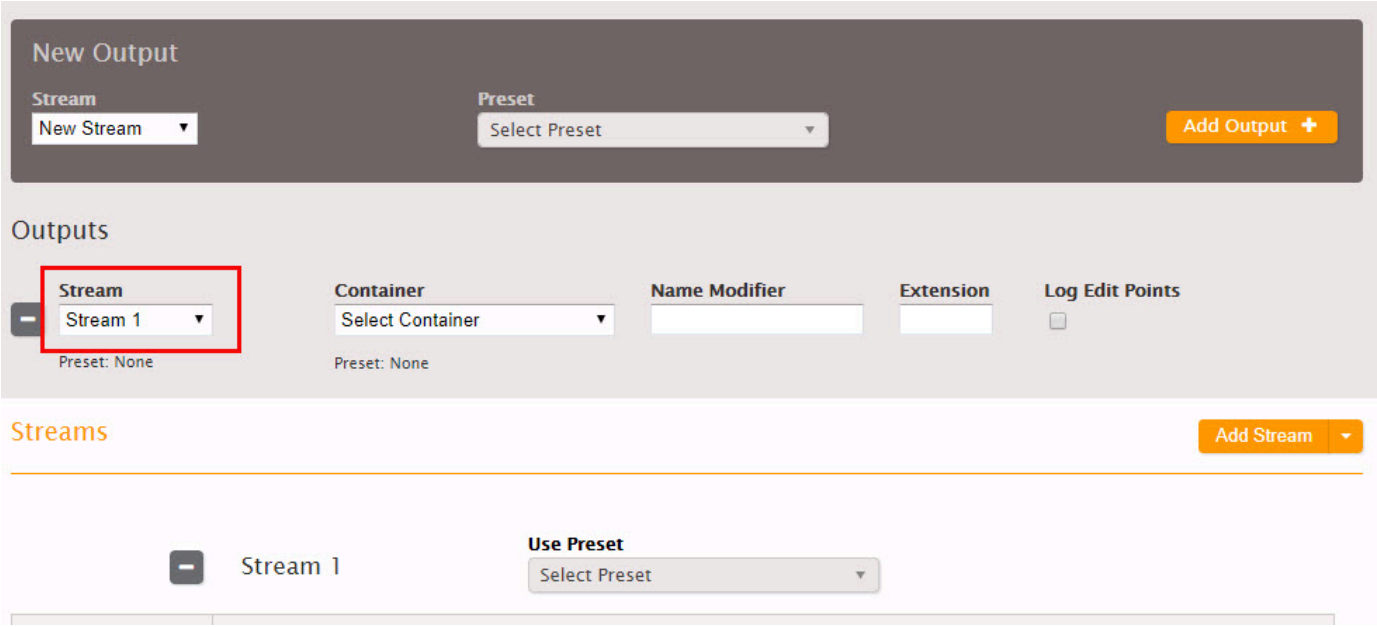
in the outputs. For more information about the job output results for different captions formats, see About Captions Handling in Outputs.



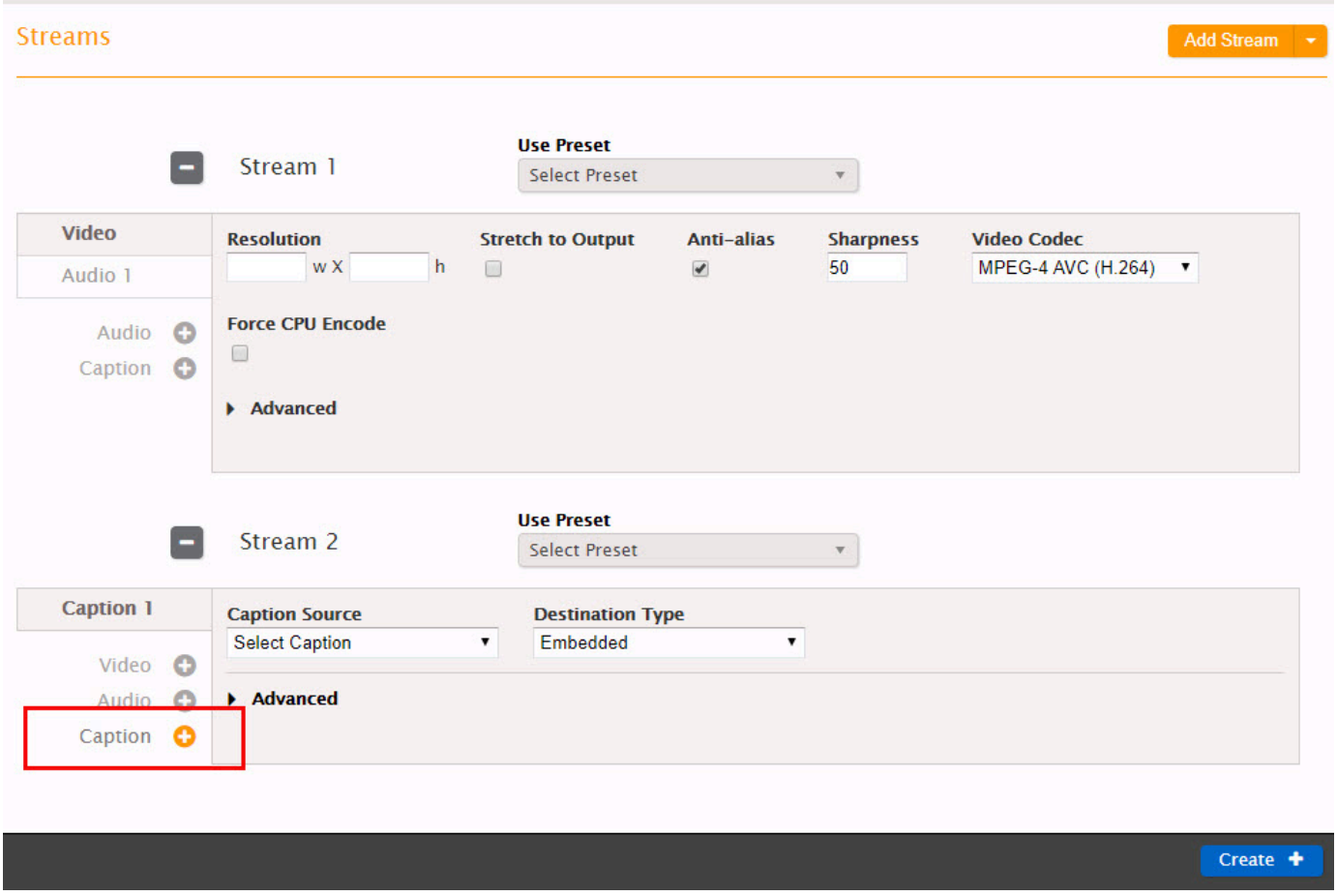
To set up captions in an output, all caption formats except sidecar

1. On the **Create New Job** page, find the very light gray **Output Groups** section at the bottom of the job.
2. Choose the output group tab that contains the output to which you want to add captions.

   If you have not already set up the video and audio for the outputs in this output group, set them up first,before you set up the captions.
3. Find the stream associated with the output. You can see the stream name in the value for **Stream** in the output.



4. Choose **Caption +**.



5. Specify values for the captions track settings as described in the table following this procedure.

6. Create an additional captions tabs in the same stream and output for each additional captions track you want to include.
7. Repeat this procedure for any other outputs you want to include captions in.

> **Note**
>
> If your output captions are embedded and your output package (that is, your output group type) is HLS, you can optionally include captions language information in the manifest. For more information, see Setting up the HLS Manifest.

Field	Applicability	Description
Caption Source	All	Select the caption selector you created when specifyin g the input captions (see Creating Input Captions Selectors).
Destination Type	All	Select the caption type. This type must be valid for your output type as per the relevant Supported Captions table.
Pass Style Information	If **Destination Type** is CCF-TT or TTML. And if the source caption type is an Embedded combinati on (Embedded, Embedded +SCTE-20, SCTE-20+E mbedded), or Teletext, TTML, SMPTE-TT, or CCF-TT.	The choices are: 1. Check this box if you want the style (font, position and so on) of the input captions to be copied. 2. Leave unchecked if you want a simplified caption style. Some client players work best with a simplified caption style.

Field	Applicability	Description
		(For other combinations of source caption types and output caption type, the output is always simplified.)
Font style fields	**Destination Type** type is Burn-in or DVB-Sub	For burn-in, see Font Styles for Burn-in. For DVB-Sub, see (Font Styles for DVB-Sub).
Language	All captions except not for embedded-to-embedded or Teletext-to-Teletext	Complete if desired. This information may be useful to or required by a downstream system. For embedded-to-embedded or Teletext-to-Teletext, leave as Undefined.
Description	All captions except not for Embedded-to-Embedded	This field is auto-comp leted after you specify the language.

Font Styles for Burn-in

You can specify the look of the captions if the output captions are Burn-in by changing the font styles.

> **Note**
>
> If you choose the same **Caption Selector** in the **Caption Source** field in more than one output, then you must set up the font style information identically in each output. If you do not, you will get an error when you save the job.

Name	Description
Font	Click **Browse** to find a font file to use. The file must be on a server mounted to the node and must have the extension TTF or TTE. Do not specify a font file if the caption source is embedded or teletext.
Font Size	Specify “auto” or enter a number. When set to auto, **font_size** scales depending on the size of the output. Giving a positive integer specifies the exact font size in points.
Font Resolution	Specify the font resolution in DPI (dots per inch). Range: 96 to 600. Default is 96 dpi.
Text Justify	• Centered: If the X Position and Y Position are both empty, positions the captions at the bottom center of the video frame. If the X Position and Y Position are specified, the captions are offset and then centered across the video frame. • Left: If the X Position and Y Position are both empty, positions captions at the bottom left of the video frame. If the X Position and Y Position are specified, the captions are offset and then left-aligned.
X Position	Specify the offset for the left edge of the caption relative to the horizontal axis of the video frame, in pixels. 0 is the left edge of the video frame. 10 pixels means *offset 10 pixels to the right*. Empty means *0 offset*.
Y Position	Specify the offset of the top edge of the caption relative to the vertical axis of the

Name	Description
	video frame, in pixels. 0 is the top edge of the video frame. 10 pixels means *offset 10 pixels from the top.* Empty means *position the captions towards the bottom of the output*.
Fixed Grid	Whether checked or not, applies only for conversions from Teletext to Burn-in. • Checked (default): Font is mono-spaced: each character takes up the space horizonta l space. • Unchecked: Font is proportionally spaced.
Font Color	Select the desired color.
Font Opacity	The opacity for the font color. Range 0 (transparent) to 255 (opaque).
Background Color	The color for the background rectangle.
Background Opacity	The opacity for the background rectangle. Range 0 (transparent) to 255 (opaque).
Outline Size	The size for the font outline, in pixels. Range 0 (no outline) to 10.
Outline Color	The color for the font outline.
Shadow Color	The color for the shadow cast by the captions.
Shadow Opacity	The opacity of the shadow, in pixels. Range 0 (transparent) to 255 (opaque). Empty means 0.

Name	Description
Shadow X Offset	The horizontal offset of the shadow, in pixels. A value of -2 results in a shadow offset 2 pixels to the left. A value of 2 results in a shadow offset 2 pixels to the right.
Shadow Y Offset	The vertical offset of the shadow, in pixels. A value of -2 results in a shadow offset 2 pixels above the text. A value of 2 results in a shadow offset 2 pixels above the text.

(Font Styles for DVB-Sub)

You can specify the look of the captions if the output captions are DVB-Sub.

> **Note**
>
> If you choose the same **Caption Selector** in the **Caption Source** field in more than one output, then you must set up the font style information identically in each output. If you do not, you will get an error when you save the job.

Name	Description
Font	Click **Browse** to find a font file to use. The file must be on a server mounted to the node and must have the extension TTF or TTE. Do not specify a font file if the caption source is embedded or teletext.
Font Size	Specify “auto” or enter a number. When set to auto, **font_size** will scale depending on the size of the output. Giving a positive integer specifies the exact font size in points.

Name	Description
Font Resolution	Font resolution in DPI (dots per inch). Range: 96 to 600. Default is 96 dpi.
Text Justify	• Centered: If X Position and Y Position are both empty, positions the captions at the bottom center of the video frame. If X Position and Y Position are specified, the captions are offset and then centered across the video frame. • Left: If X Position and Y Position are both empty, positions captions at the bottom left of the video frame. If X Position and Y Position are specified, the captions are offset and then left-aligned.
X Position	Specifies the offset for the left edge of the caption relative to the horizontal axis of the video frame, in pixels. 0 is the left edge of the video frame. 10 pixels means *offset 10 pixels to the right.* Empty means *0 offset*.
Y Position	Offset of the top edge of the caption relative to the vertical axis of the video frame, in pixels. 0 is the top edge of the video frame. 10 pixels means *offset 10 pixels from the top.* Empty means *position the captions towards the bottom of the output.*

Name	Description
Fixed Grid	Whether applies only for conversions from Teletext to DVB-Sub. • Checked (default): Font is mono-spaced: each character takes up the space horizonta l space. • Unchecked: Font is proportionally spaced.
Font Color	The font color. Select the desired color.
Font Opacity	The opacity for the font color. Range 0 (transparent) to 255 (opaque).
Background Color	The color for the background rectangle.
Background Opacity	The opacity for the background rectangle. Range 0 (transparent) to 255 (opaque).
Outline Size	The size for the font outline, in pixels. Range 0 (no outline) to 10.
Outline Color	The color for the font outline.
Shadow Color	The color for the shadow cast by the captions.
Shadow Opacity	The opacity of the shadow, in pixels. Range 0 (transparent) to 255 (opaque). Empty means 0.
Shadow X Offset	The horizontal offset of the shadow, in pixels. A value of -2 results in a shadow offset 2 pixels to the left. A value of 2 results in a shadow offset 2 pixels to the right.

Name	Description
Shadow Y Offset	The vertical offset of the shadow, in pixels. A value of -2 results in a shadow offset 2 pixels above the text. A value of 2 results in a shadow offset 2 pixels above the text.

Setting up the HLS Manifest

If the captions are embedded captions and the output is HLS, you can choose to include caption language information in the manifest.

1. In the HLS output group, go to the output. Click **Advanced**.
2. Complete Caption Languages as desired:
   - **Omit**: To omit any CLOSED-CAPTION lines in the manifest.
   - **None**: To include one CLOSED-CAPTION=None line in the manifest.
   - **Insert**: To insert one or more lines in the manifest.
3. If you chose **Insert**, more fields appear. Complete on more sets of fields.

- You should complete as many fields as there are languages in this output.
- The order in which you enter the languages must match the order of the captions in the source. For example, if the captions are in the order English, then French, then Spanish, then Portuguese, then set up CC1 as English, CC2 as French, and so on. If you do not order them correctly, the captions will be tagged with the wrong languages.

About Captions Handling in Outputs

Depending on the output captions format, AWS Elemental Server creates the captions differently in the outputs. Find information about each captions output format in the following table. Find details about each handling method in the sections following the table.

Output Captions Format	What AWS Elemental Server Creates in the Job Output
Ancillary+Embedded	The captions in ancillary format are in the ancillary data in the stream. The embedded captions are embedded in the video. To choose Ancillary+Embedded, choose **Embedded** as the **Destination Type** . AWS Elemental Server automatically produces both Ancillary and embedded captions.
ARIB	AWS Elemental Server creates a separate captions object in the output.
Burn-in	AWS Elemental Server writes the captions permanently into the video frames, replacing pixels of the original video with the words.
CFF-TT	AWS Elemental Server creates a separate captions object in the output.
DVB-Sub	AWS Elemental Server creates a separate captions object in the output.
Embedded	AWS Elemental Server embeds the captions inside the output video stream.
Embedded+SCTE-20	AWS Elemental Server embeds the captions inside the output video stream.
RTMP CaptionInfo	AWS Elemental Server creates a separate captions object in the output.
RTMP CuePoint	AWS Elemental Server creates a separate captions object in the output.
SCC	AWS Elemental Server creates a separate sidecar file for each captions track.

Output Captions Format	What AWS Elemental Server Creates in the Job Output
SCTE-20+Embedded	AWS Elemental Server embeds the captions inside the output video stream.
SMI	AWS Elemental Server creates a separate sidecar file for each captions track.
SRT	AWS Elemental Server creates a separate sidecar file for each captions track.
Teletext	AWS Elemental Server creates a separate captions object in the output.
TTML	AWS Elemental Server creates a separate sidecar file for each captions track.
WebVTT	AWS Elemental Server creates a separate sidecar file for each captions track.

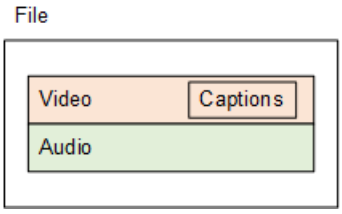
Embedded in Video

For embedded, embedded+SCTE-20, and SCTE-20+embedded captions, AWS Elemental Server embeds the captions inside the output video stream. There is only ever one captions object although that object may contain several captions tracks.

When you set this up in your job, you specify your captions as a tab in the same stream as your video and audio. You associate one stream with one output.

> **Note**
>
> The captions format you specify must be supported by the output container you specify for the video.

The resulting output from your job is put together as shown in the following diagram.



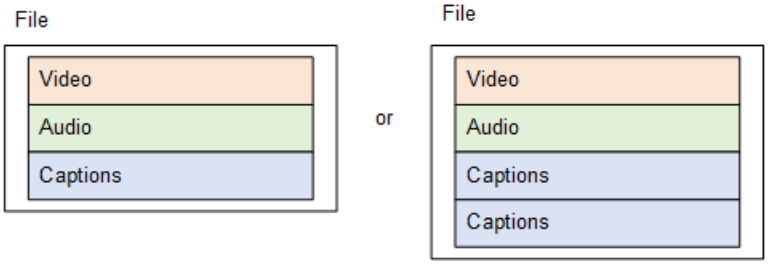
Separate Captions Object

For ARIB, CFF-TT, DVB-Sub, RTMP CaptionInfo, RTMP CuePoint, and Teletext captions, AWS Elemental Server creates a separate captions object in the output. Each captions object is a separate captions track or even a separate format. Each format you specify in an output must be supported by the output container.

When you set this up in your job, you specify your captions as a tab in the same stream as your video and audio. You associate one stream with one output. You put each output for a given package type or file type in one output group. For example, each rendition in a DASH adaptive bitrate (ABR) stack corresponds to one output in a DASH output group.

> **Note**
>
> Each captions format you specify must be supported by the output container you specify for the video.

The resulting output from your job is put together as shown in the following diagram.



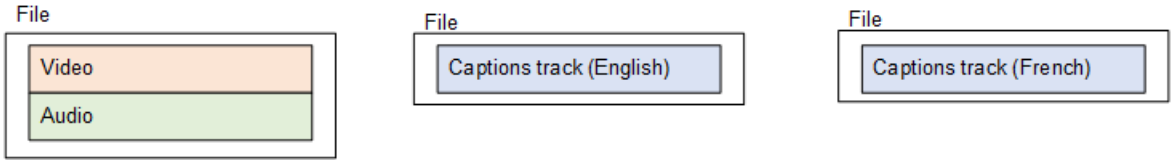
Sidecar

For SCC, SMI, SRT, TTML, and WebVTT captions, AWS Elemental Server creates a separate sidecar file for each captions track. The captions are each in a separate output, separate from the video and audio that contains one or more streams that contain only captions objects. Each captions stream output is a separate different language or even a separate format (so long as the output container supports that format.).

When you set this up in your job, you specify each captions track in a separate, captions-only stream. You associate one stream with one output. You identify sets of outputs that belong together by putting them in the same output group.

> **Note**
>
> Each captions format you specify must be supported by the output container you specify for the video.

The resulting output from your job is put together as shown in the following diagram.



Examples for Setting Up Captions

The following examples walk you through typical captions scenarios. They refer to the procedures in the topics Creating Input Captions Selectors and Including Captions in the Streams and Outputs.

Topics

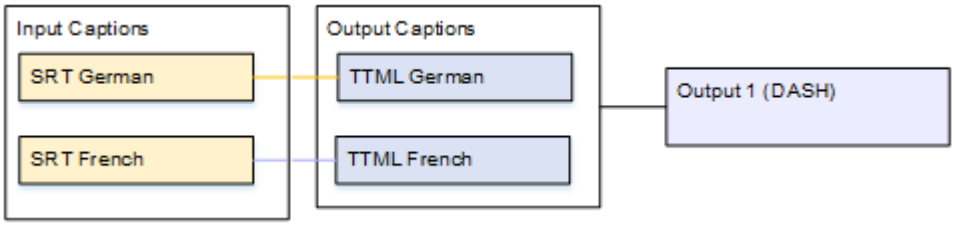
- One Input Format to a Different Output Format, One Output
- One Input Format to the Same Output Format, One Output
- One Input Format to the Same Output Format, Multiple Outputs
- One Input Format to Multiple Different Formats, One for Each Output
- One Captions Output Shared Across an Adaptive Bitrate (ABR) Package

One Input Format to a Different Output Format, One Output

The input is set up with one format of captions and two or more languages. You want to convert the captions to a different format in the output. You want to produce only one type of output and include all the languages in that output.

Example: Two SRT Tracks to Two TTML Tracks

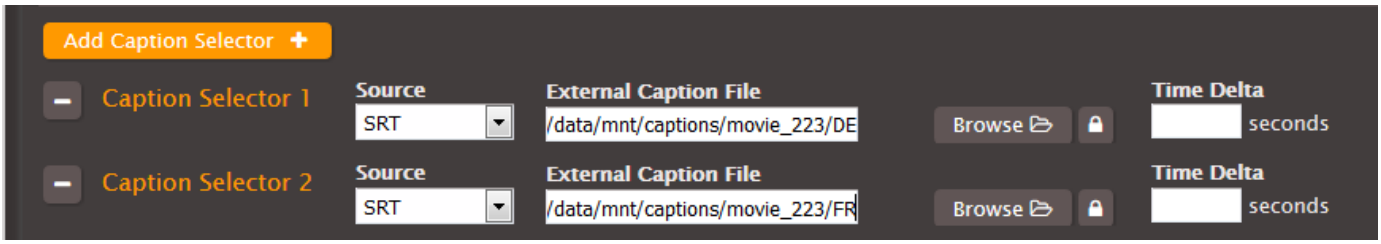
The input has SRT captions in German and French. You want to convert the captions to TTML and include these captions in both languages in a DASH output.



To set up a job for this example

1. In the input, follow the procedure in Creating Input Captions Selectors to create two caption selectors:

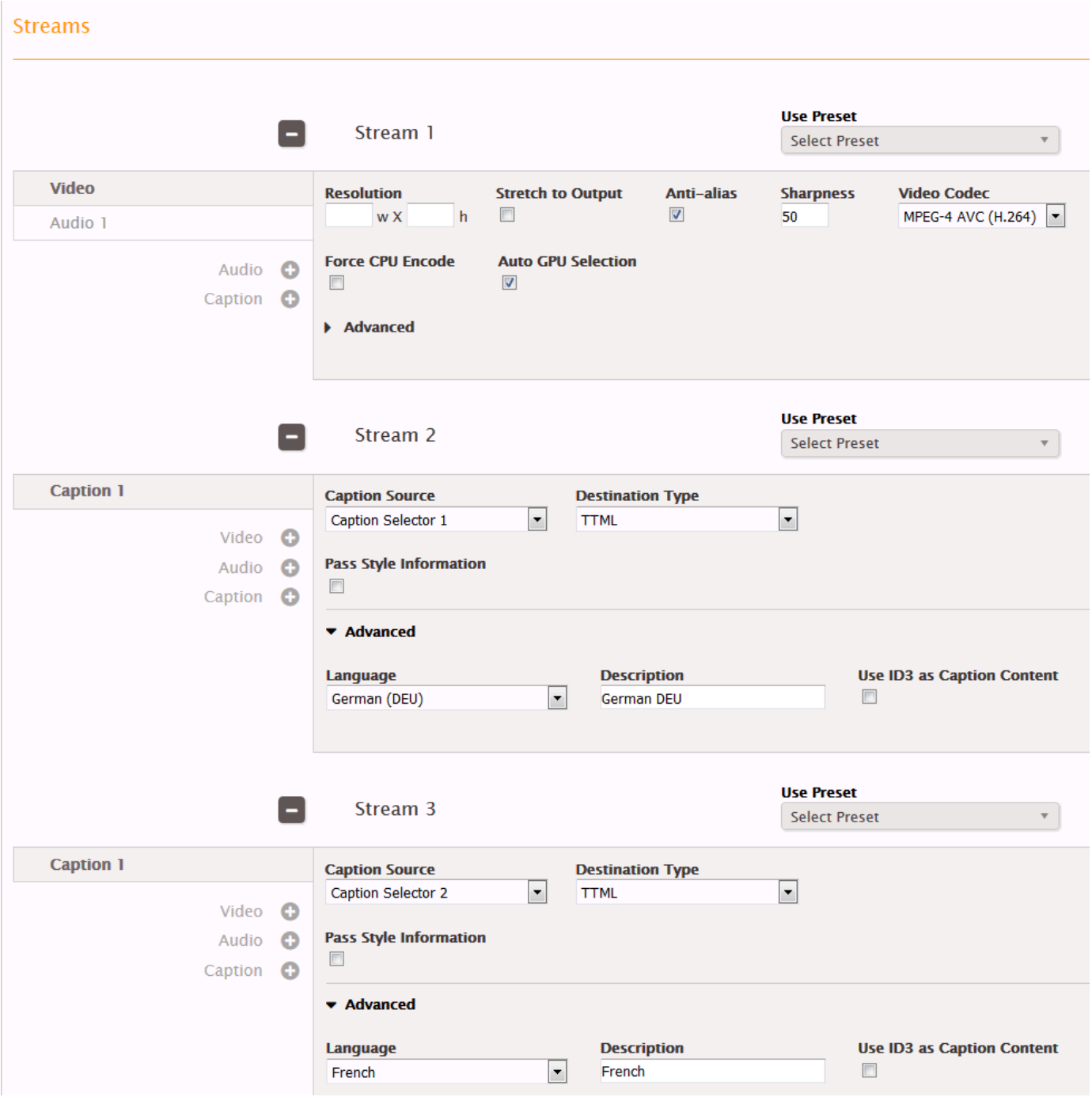
   - One for the German SRT file.
   - One for the French SRT file.



2. Create a stream (for example, Stream 1) and set up the video and audio.
3. Create one caption stream (for example, Stream 2) following the procedure for sidecar captions in the topic Setting Up Output Captions in a Sidecar Format (SCC, SMI, SRT, TTML, WebVTT). Specify the captions settings as follows:

   - **Caption Source**: Caption Selector 1.
   - **Destination Type**: TTML.
   - **Language**: German.
   - **Pass Style Information**: Set it as desired, but you must set both languages identically.
   - **Use ID3 as Caption Content**: Leave unchecked.
4. Create another caption stream (for example, Stream 3) following the procedure for sidecar captions in the topic Setting Up Output Captions in a Sidecar Format (SCC, SMI, SRT, TTML, WebVTT). Specify the captions settings as follows:

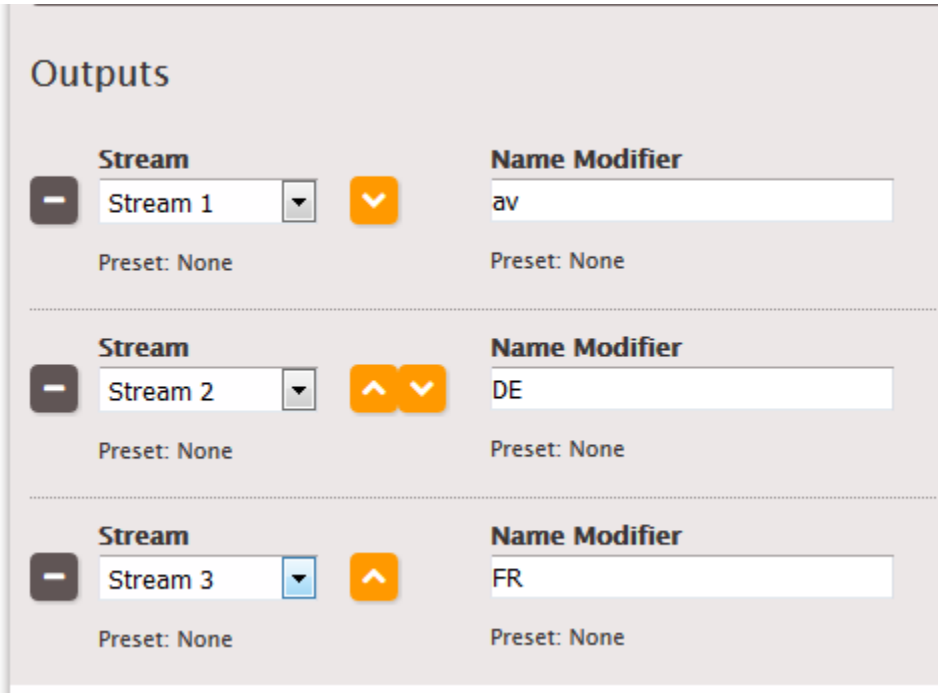
- **Caption Source**: Caption Selector 2.
- **Language**: French.
- Other fields: same as the first caption stream.



5. In the DASH output group, create three outputs:

- In the first output, set the Stream field in that output to Stream 1.
- In the second output, set the Stream field in that output to Stream 2.
- In the third output, set the Stream field in that output to Stream 3.

Although there are three outputs, they are all in the same output group, so the video/audio and two captions are kept together.

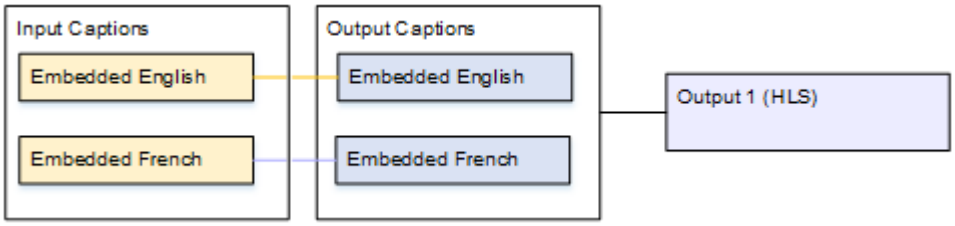


One Input Format to the Same Output Format, One Output

The input is set up with one format of captions and two or more languages. You want to maintain the format in the output. You want to produce only one type of output and include all the languages in that output.

Example: Pass Through Embedded Captions to an HLS Output

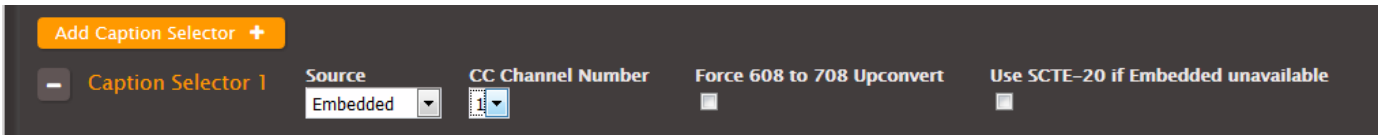
The input has embedded captions in English and Spanish. You want to produce HLS output that includes embedded captions in both English and Spanish.



This example illustrates two important features of an embedded-to-embedded workflow. First, you do not create separate caption selectors; all of the languages are all automatically included. Secondly, if you are outputting to HLS, there is an opportunity to specify the languages and the order in which they appear.

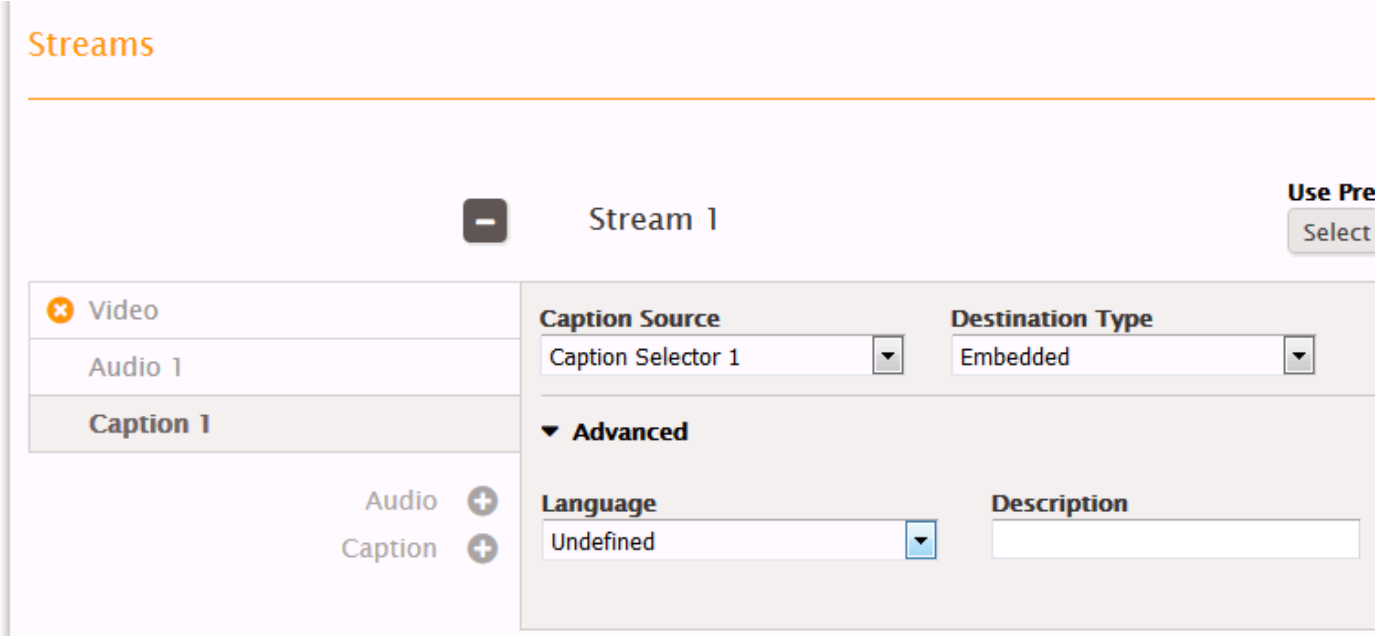
To set up a job for this example

1. In the input, follow the procedure in Creating Input Captions Selectors to create one caption selector for Embedded.

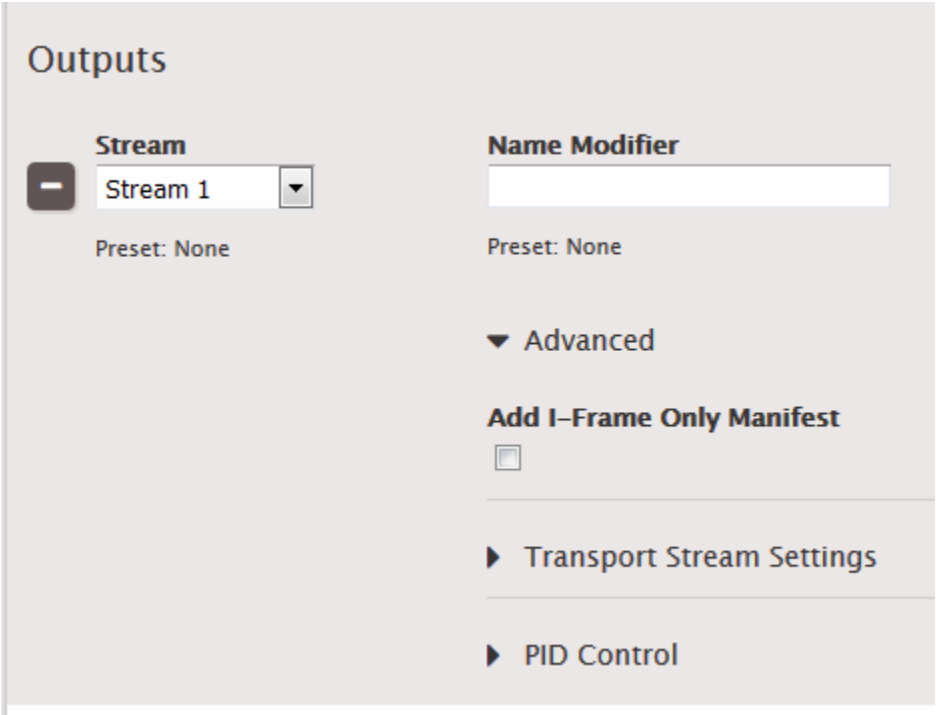


2. Create a stream (for example, Stream 1) and set up the video and audio.
3. In that same stream, set up a captions tab as described in the topic the section called "Setting Up Output Captions for All Formats Except Sidecar ". Create one captions tab only and specify the settings as follows:

   - **Caption Source**: Caption Selector 1.
   - **Destination Type**: Embedded.
   - **Language**: Leave blank; with embedded captions, all the languages are included.



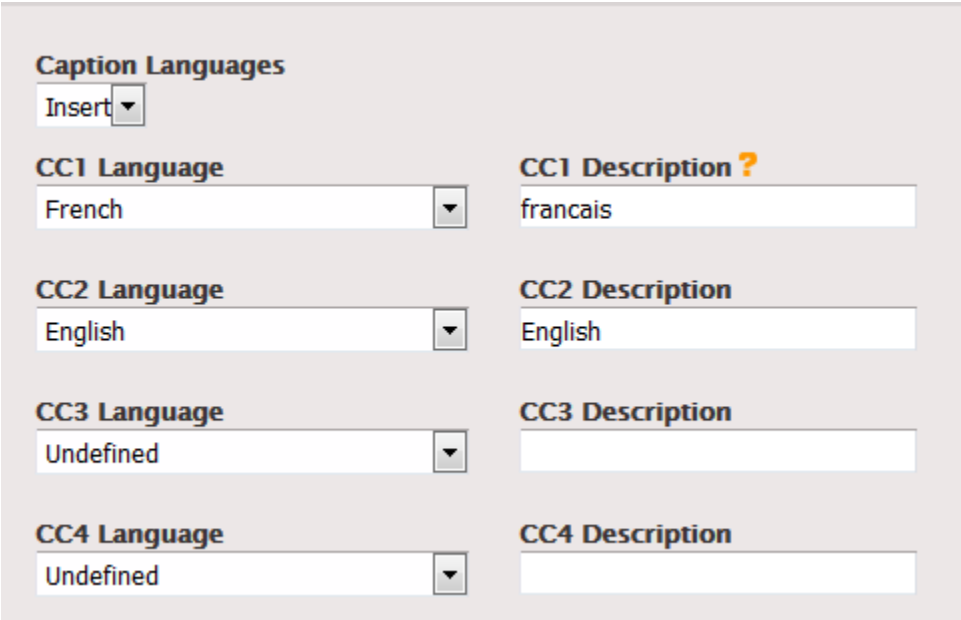
4. In the HLS output group, create an output. In the Output section, set the Stream field in that output to Stream 1.



5. Still in the Output Group section (not in the Output section), click **Advanced**. In Caption Languages, choose **Insert**. The CC Language fields appear:

   - Set up CC1 as English.

- Set up CC2 as French.



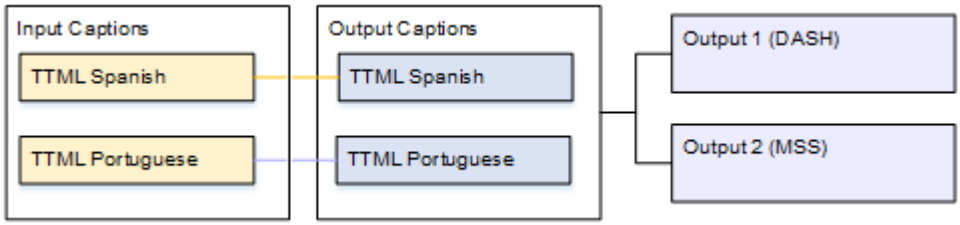
6. Save the job.

One Input Format to the Same Output Format, Multiple Outputs

The input is set up with one format of captions and two or more languages. You want to maintain the format in the output. You want to produce several different types of outputs and include all the languages in all the outputs.

Example: Pass Through Two TTML Tracks, Multiple Outputs

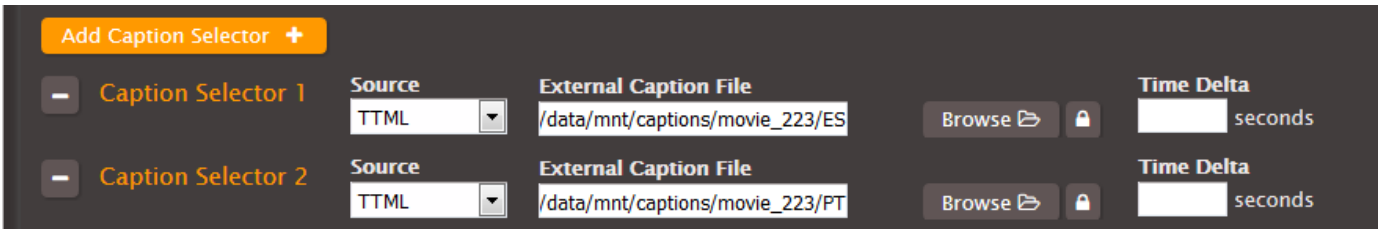
The input has TTML captions in Spanish and Portuguese. You want to produce a DASH output and an MSS output. You want the DASH output to include the TTML captions in both Spanish and Portuguese and the MSS output to also include the TTML captions in both Spanish and Portuguese.



To set up a job for this example

1. In the input, follow the procedure in Creating Input Captions Selectors to create two caption selectors:

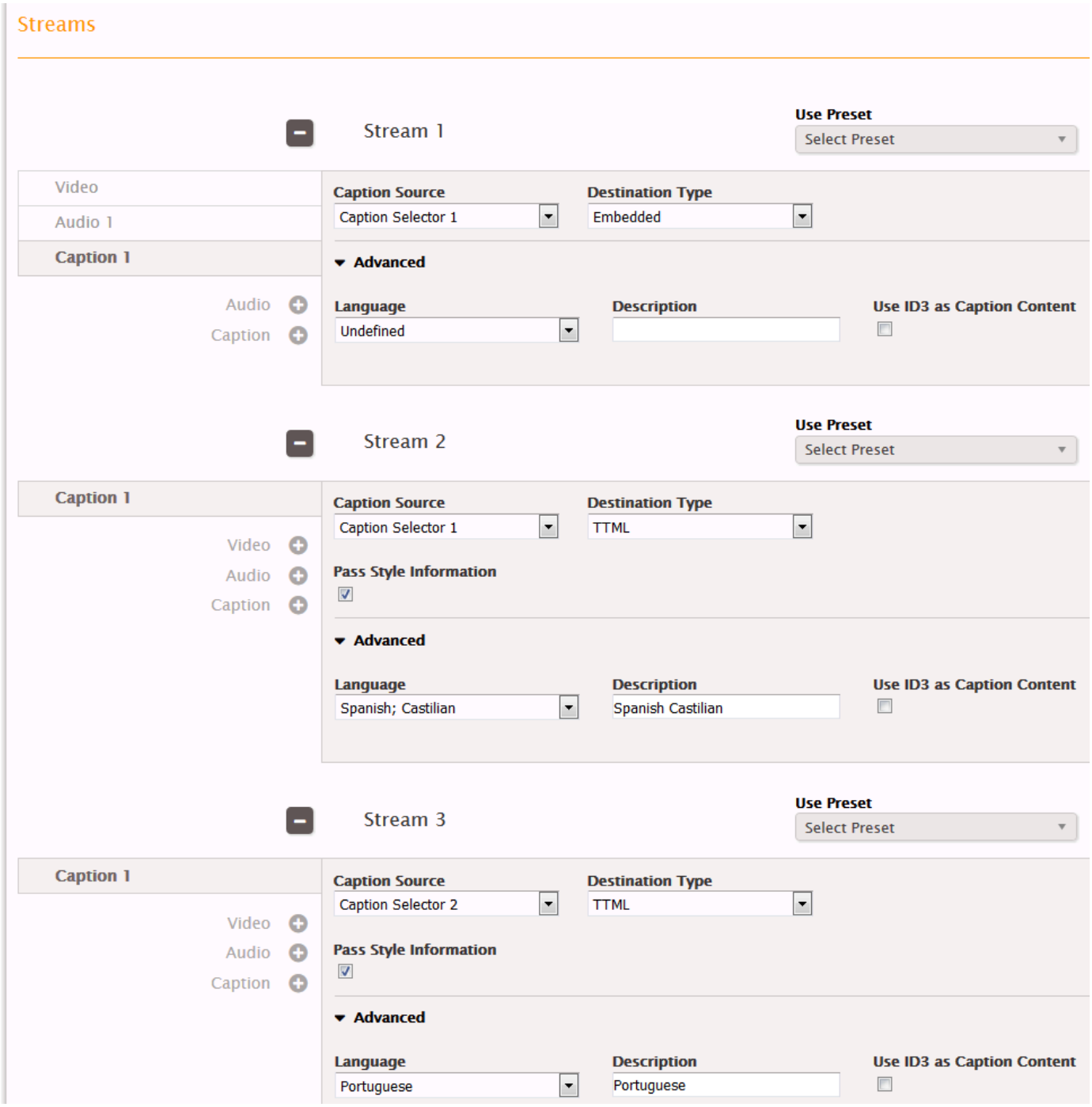
   - One for TTML Spanish.
   - One for TTML Portuguese.



2. Create a stream (for example, Stream 1) and set up the video and audio.
3. Create a captions-only stream (for example, Stream 2) following the procedure for sidecar captions in the topic Setting Up Output Captions in a Sidecar Format (SCC, SMI, SRT, TTML, WebVTT). Specify the captions settings as follows:

   - **Caption Source**: Caption Selector 1.
   - **Destination Type**: TTML.
   - **Language**: Spanish.
   - **Pass Style Information**: Set it as desired, but you must set both languages identically.
   - **Use ID3 as Caption Content**: Leave unchecked.
4. Create a second captions-only stream (for example, Stream 3), specifying the captions settings as follows:

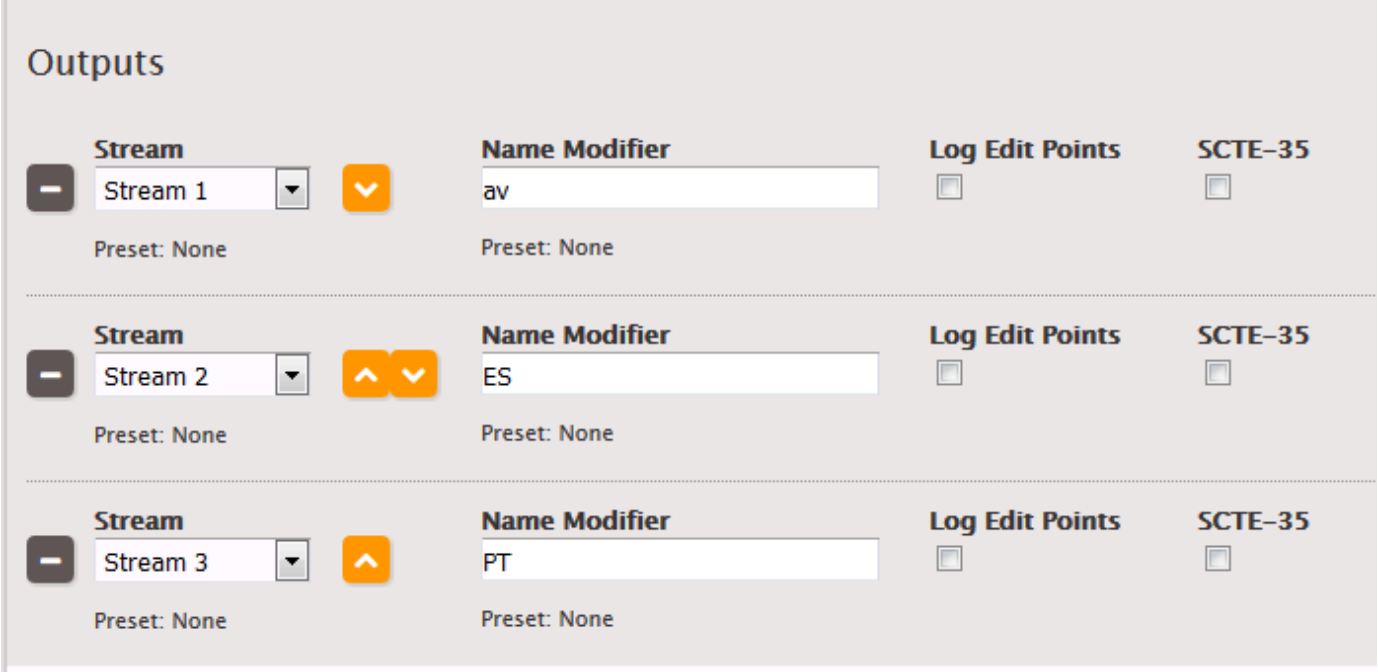
   - **Caption Source**: Caption Selector 2.
   - **Language**: Portuguese.
   - Other fields: Same as the first caption stream.



5. In the DASH output group, create three outputs:

   - In the first output, set the Stream field in that output to Stream 1.
   - In the second output, set the Stream field in that output to Stream 2.
   - In the third output, set the Stream field in that output to Stream 3.

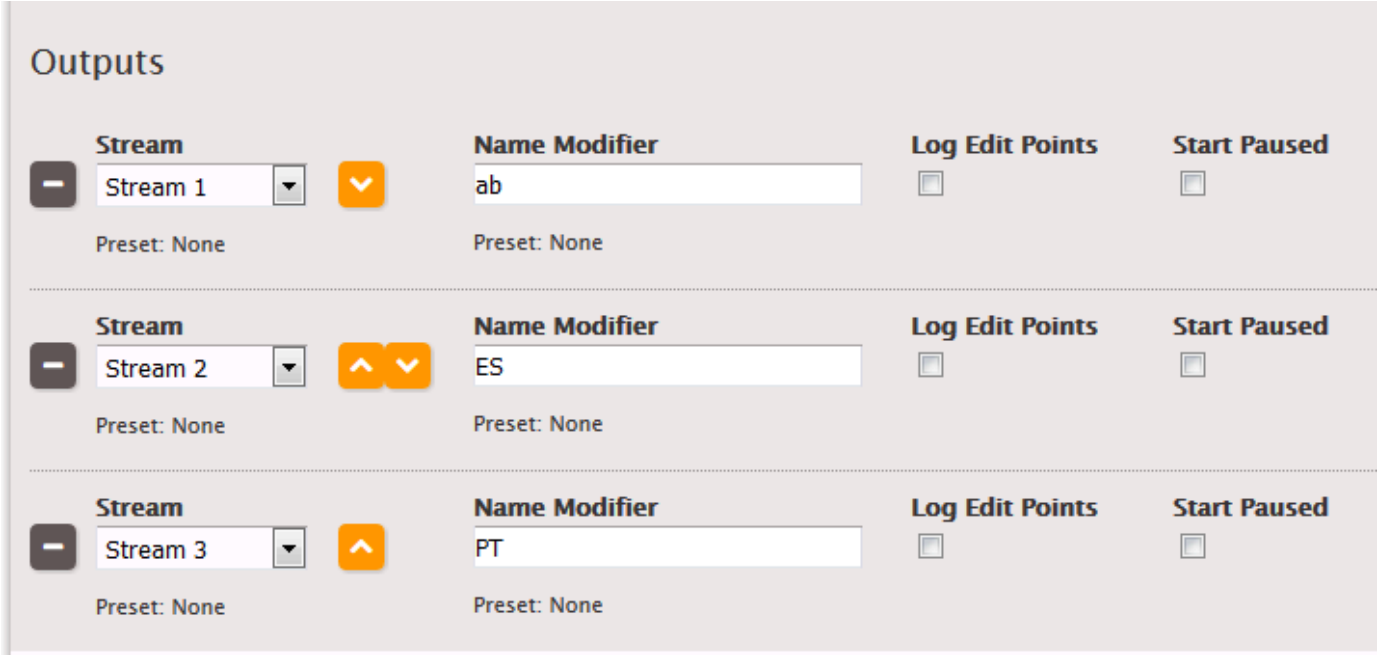
Although there are three outputs, they are all in the same output group, so the video/audio and two captions are kept together.



6. In the MSS output group, create three outputs:

   - In the first output, set the Stream field in that output to Stream 1.
   - In the second output, set the Stream field in that output to Stream 2.
   - In the third output, set the Stream field in that output to Stream 3.

   Notice that the streams in this output are also associated with the DASH output.



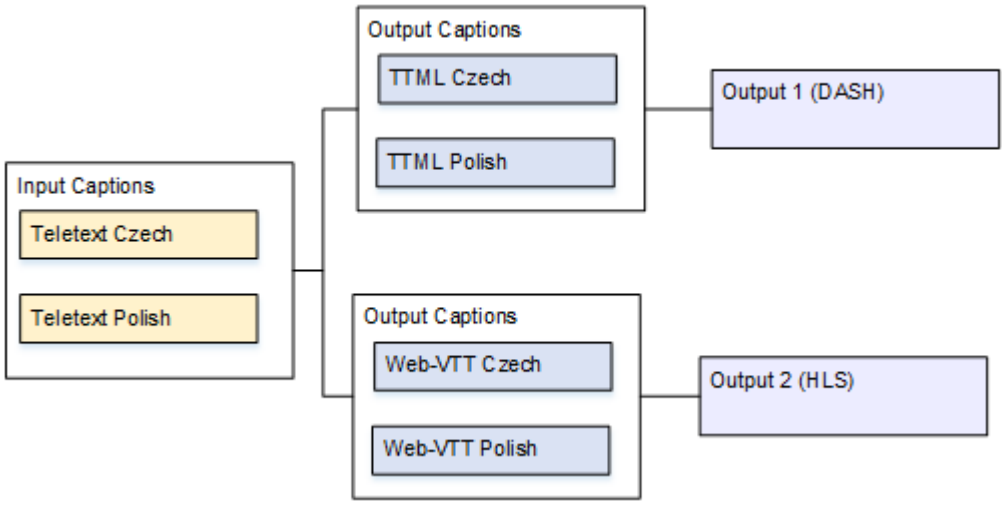
7. Save the job.

One Input Format to Multiple Different Formats, One for Each Output

The input is set up with one format of captions and two or more languages. You want to produce several different types of output. In each output, you want to convert the captions to a different format but include all the languages.

Example: Two SRT Tracks to TTML and WebVTT

For example, the input has SRT captions in Czech and Polish. You want to produce a DASH output and an HLS output. In the DASH output, you want to convert the same Teletext captions to TTML and include both languages. In the HLS output, you want to convert the same SRT captions to WebVTT and include both languages.



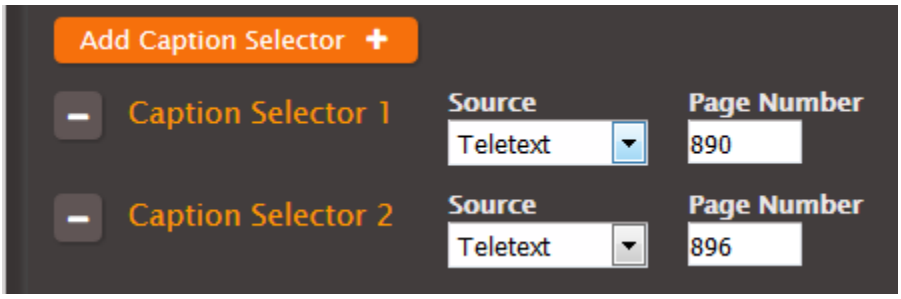
This example illustrates an important feature of setting up streams. The two output captions are TTML and WebVTT. WebVTT cannot be associated with the DASH output, which means that the stream that holds the WebVTT captions cannot be associated with the DASH output. This means that you must create two separate streams – one for the video, audio and captions (TTML) for DASH, another for the video, audio and captions (WebVTT) for HLS.

It looks like this means that the video is being encoded twice – an expensive operation. But that is not true. So long as the video and audio are set up to be identical in both streams, the encoder only encodes the video and audio once in the job. The source captions are, of course, processed twice.

To set up a job for this example

1. In the input, follow the procedure in Creating Input Captions Selectors to create two caption selectors:

   - One for Teletext Czech. Specify the page that holds the Czech captions.
   - One for Teletext Polish. Specify the page that holds the Polish captions.



2. Create a stream (for example, Stream 1) and set up the video and audio. This stream is associated with the DASH output.
3. Create a second stream (for example, Stream 2) and set up the video and audio in exactly the same way as Stream 1. This stream is associated with the HLS output.
4. Create one caption stream (for example, Stream 3) following the procedure for sidecar captions in the topic Setting Up Output Captions in a Sidecar Format (SCC, SMI, SRT, TTML, WebVTT). Specify the captions settings as follows:
   - **Caption Source**: Caption Selector 1.
   - **Destination Type**: TTML.
   - **Language**: Czech.
   - **Pass Style Information**: Set it as desired, but you must set both languages identically for all captions (TTML and Teletext).
   - **Use ID3 as Caption Content**: Leave unchecked.
5. Create a second caption stream (for example, Stream 4) in the same way, specifying the captions settings as follows:
   - **Caption Source**: Caption Selector 2.
   - **Language**: Polish.
   - Other fields: same as the first caption stream.
6. Create a third caption stream (for example, Stream 5) in the same way, specifying the captions settings as follows:
   - **Caption Source**: Caption Selector 1.
   - **Destination Type**: WebVTT.
   - **Language**: Czech.
   - **Pass Style Information**: Set it as desired, but you must set both languages identically for all captions (TTML and Teletext).
7. Create a fourth caption stream (for example, Stream 6) in the same way, specifying the captions settings as follows:
   - **Caption Source**: Caption Selector 2.
   - **Language**: Polish.
   - Other fields: Same as the third caption stream.

Streams

Stream 1

Use Preset: Select Preset

Video
Audio 1
Audio
Caption

Resolution: w X h
Stretch to Output
Anti-alias
Sharpness: 50
Video Codec: MPEG-4 AVC (H.264)
Force CPU Encode
Auto GPU Selection
Advanced

Stream 2

Use Preset: Select Preset

Video
Audio 1
Audio
Caption

Resolution: w X h
Stretch to Output
Anti-alias
Sharpness: 50
Video Codec: MPEG-4 AVC (H.264)
Force CPU Encode
Auto GPU Selection
Advanced

Stream 3

Use Preset: Select Preset

Caption 1
Video
Audio
Caption

Caption Source: Caption Selector 1
Destination Type: TTML
Pass Style Information
Advanced
Language: Czech
Description: Czech

Stream 4

Use Preset: Select Preset

Caption 1
Video
Audio
Caption

Caption Source: Caption Selector 2
Destination Type: TTML
Pass Style Information
Advanced
Language: Polish
Description: Polish

Stream 5

Use Preset: Select Preset

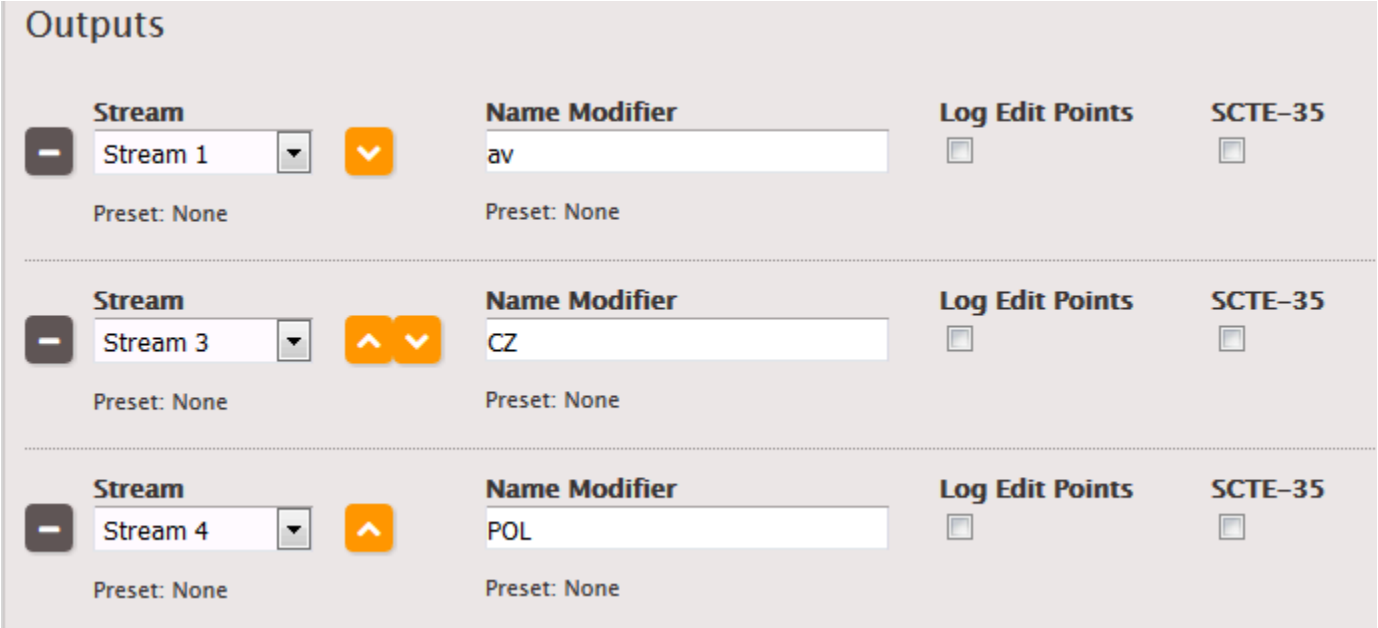
Caption 1

Caption Source
Destination Type

8. In the DASH output group, create three outputs:

   - In the first output, set the Stream field in that output to Stream 1 (the first video/audio stream).
   - In the second output, set the Stream field in that output to Stream 3.
   - In the third output, set the Stream field in that output to Stream 4.

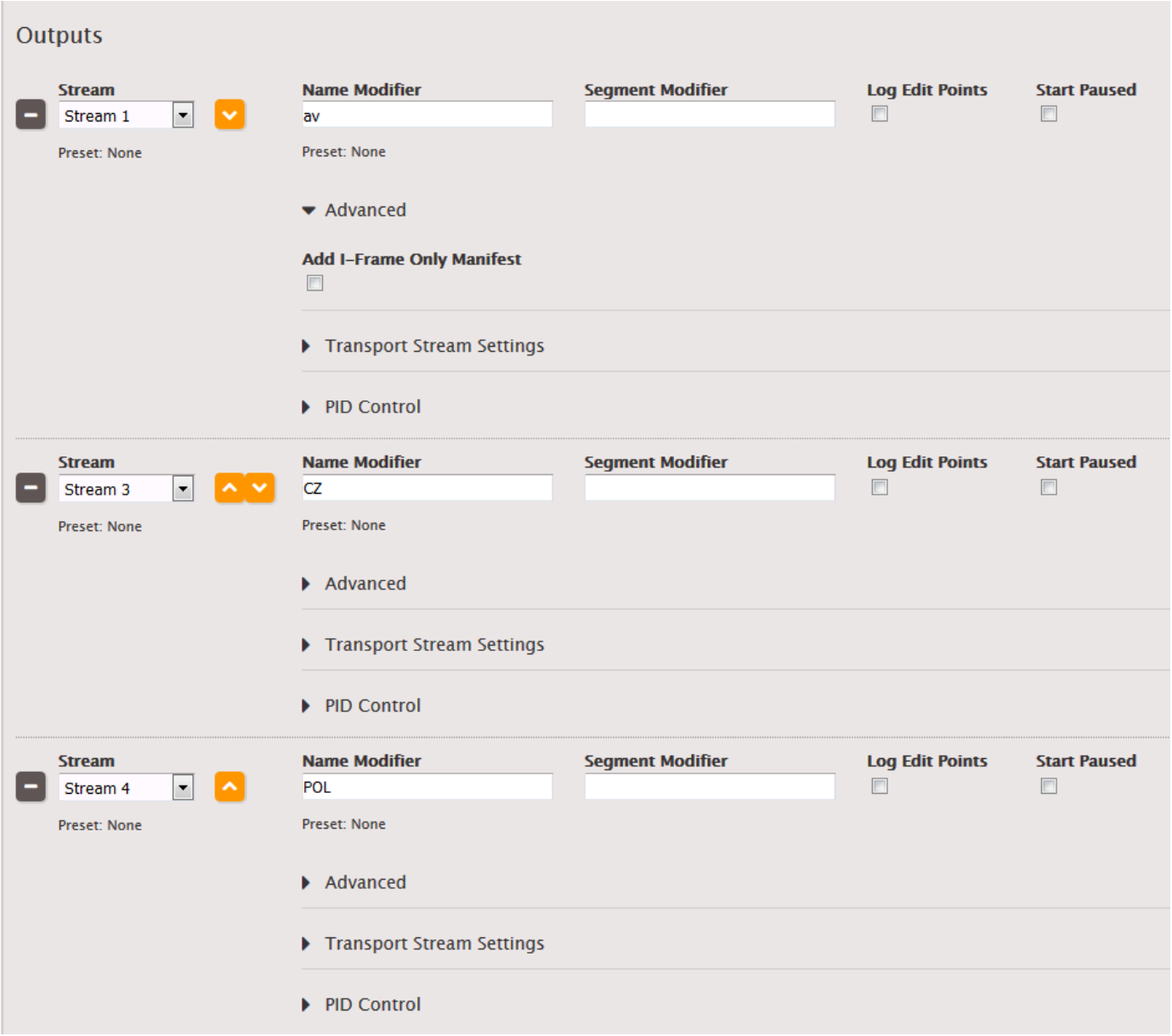
   Although there are three outputs, they are all in the same output group, so the video/audio and two captions are kept together.



9. In the HLS output group, create three outputs:

   - In the first output, set the Stream field in that output to Stream 2 (the second video/audio stream).
   - In the second output, set the Stream field in that output to Stream 5.
   - In the third output, set the Stream field in that output to Stream 6.

   Again, although there are three outputs, they are all in the same output group, so the video/audio and two captions are kept together.

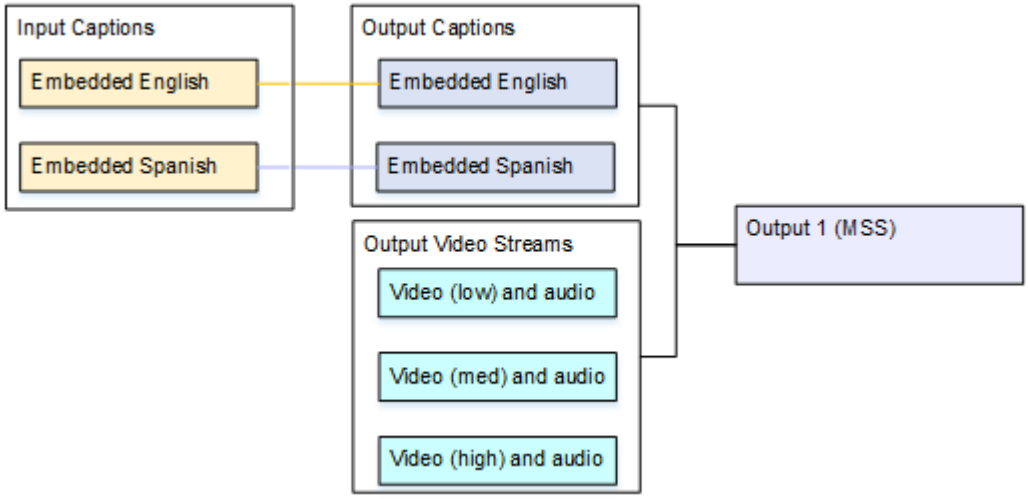


One Captions Output Shared Across an Adaptive Bitrate (ABR) Package

These examples show how to set up captions for streaming, adaptive bitrate (ABR) workflows.

Example: ABR Package with Embedded Output Captions

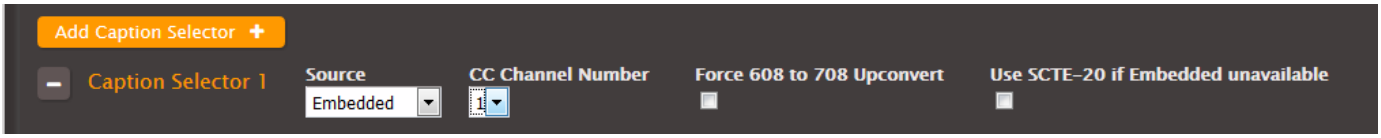
In this example, there are three video/audio streams – one for low-resolution video, one for medium, and one for high. There is one output captions (English and Spanish embedded) that is associated with all three video/audio streams.



To set up a streaming output with captions that are not sidecar

Follow these steps if the captions are embedded in the video or are a captions object in the same stream as the video and audio.

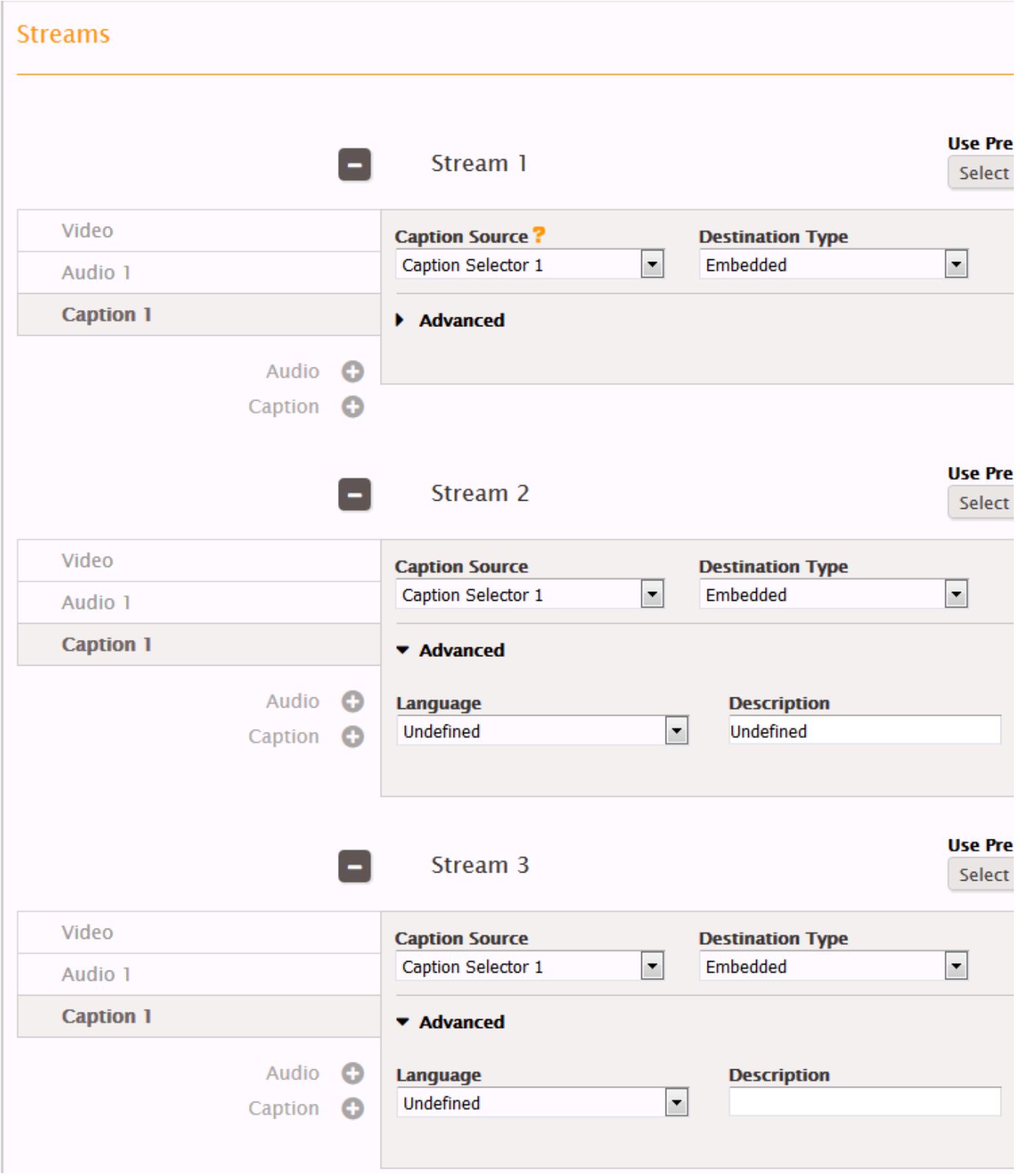
1. In the input, follow the procedure in Creating Input Captions Selectors to create one caption selector for Embedded.



2. Create a stream (for example, Stream 1) and set up the video and audio for low-resolution video.
3. In that same stream, set up a captions tab as described in the topic the section called "Setting Up Output Captions for All Formats Except Sidecar ". Create one captions tab only and specify the settings as follows:
   - **Caption Source**: Caption Selector 1.
   - **Destination Type**: Embedded.
   - **Language**: Leave blank; with embedded captions, all the languages are included.
4. Create a second stream (for example, Stream 2) and set up the video and audio for medium-resolution video.
5. Set up the second stream in the same way, specifying the captions settings as follows:
   - **Caption Source**: Caption Selector 1.
   - **Destination Type**: Embedded.

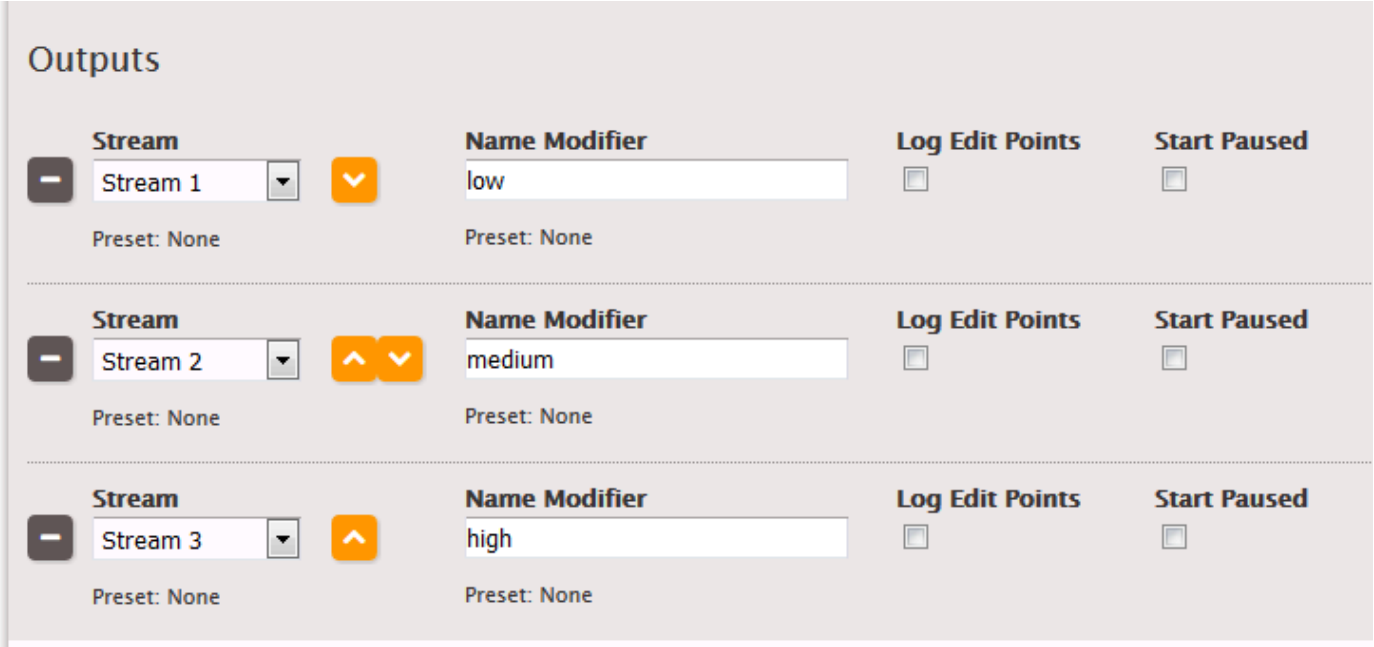
- **Language**: Leave blank; with embedded captions, all the languages are included.

6. Create a third stream (for example, Stream 3) and set up the video and audio for high-resolution video.
7. Set up the third stream in the same way, specifying the captions settings as follows:
   - **Caption Source**: Caption Selector 1.
   - **Destination Type**: Embedded.
   - **Language**: Leave blank; with embedded captions, all the languages are included.



8. In the MSS output group, create three outputs.

- In the first output, set the Stream field in that output to Stream 1.
- In the second output, set the Stream field in that output to Stream 2.
- In the third output, set the Stream field in that output to Stream 3.



9. Save the job.

Example: ABR Package with Sidecar Output Captions

For sidecar output formats, the setup is similar. The only real difference is that each stream may contain more than one captions tab – for example, one for English, one for Spanish, one for Portuguese.

To set up a streaming output with sidecar captions

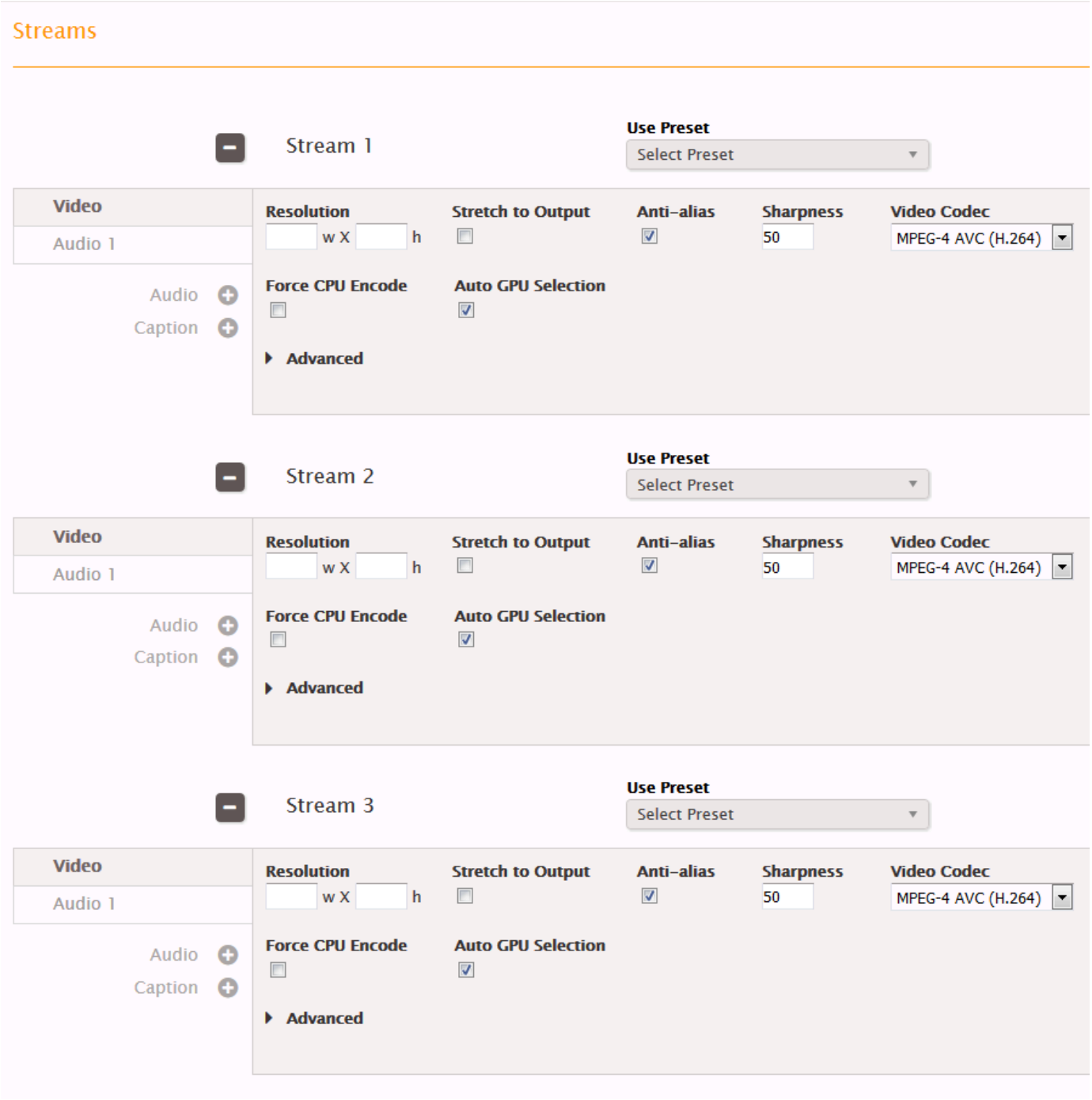
Follow these steps if the captions are set up as sidecars – each captions track is in its own stream.

For example, there are three video/audio streams – one for low-resolution video, one for medium-resolution, and one for high-resolution. There are two output captions (English and Spanish SCC) that are associated with all three video/audio streams.

1. In the input, follow the procedure in Creating Input Captions Selectors to create one caption selector for each language:

- **Caption Selector 1**: for SCC English.
- **Caption Selector 2**: for SCC Spanish.

2. Create a stream (for example, Stream 1) and set up the video and audio for low-resolution video.
3. Create another stream (for example, Stream 2) and set up the video and audio for medium-resolution video.
4. Create another stream (for example, Stream 3) and set up the video and audio for high-resolution video.



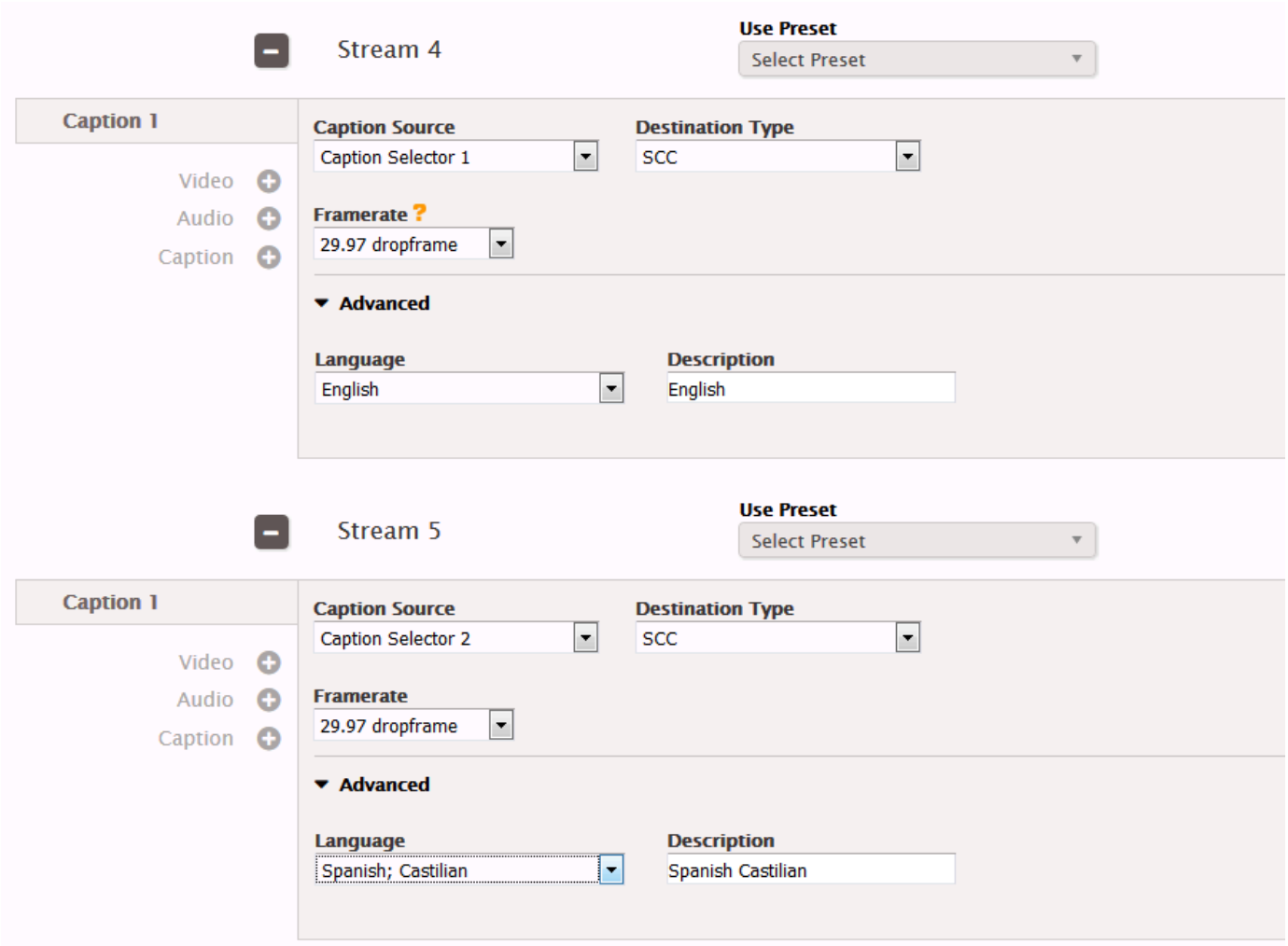
5. Set up a captions-only stream (for example, Stream 4) for your first captions track following the procedure for sidecar captions in the topic Setting Up Output Captions in a Sidecar Format (SCC, SMI, SRT, TTML, WebVTT). Specify the captions settings as follows:

   - **Caption Source**: Caption Selector 1.
   - **Destination Type**: SCC.
   - **Language**: English

- **Framerate**rate: As appropriate.

6. Set up another captions-only stream (for example, Stream 5) in the same way, specifying the captions settings as follows:

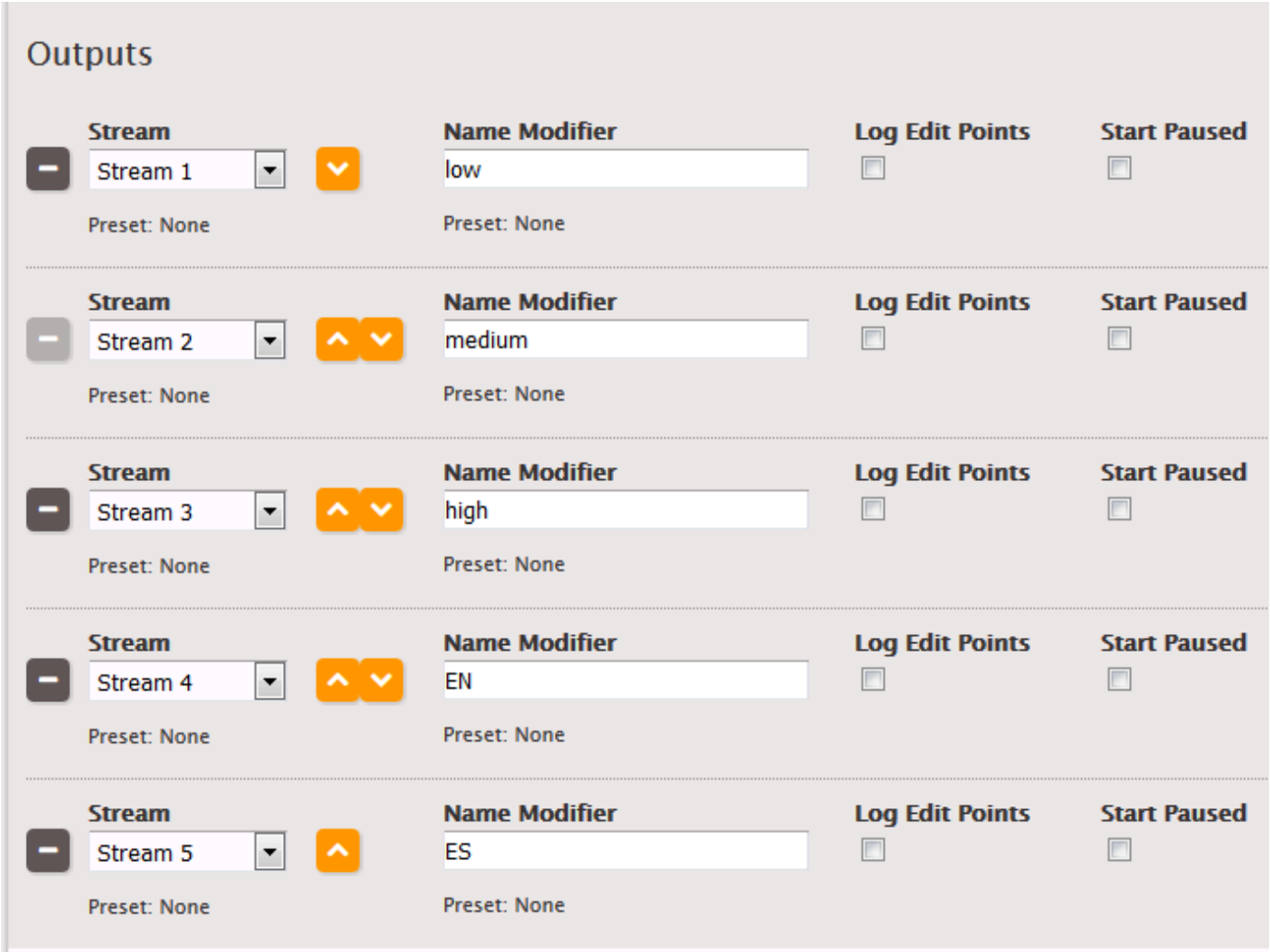
   - **Caption Source**: Caption Selector 2.
   - **Destination Type**: SCC.
   - **Language**: Spanish
   - **Framerate**: As appropriate.



7. In the MSS output group, create five outputs.

   - In the first output, set the Stream field in that output to Stream 1.
   - In the second output, set the Stream field in that output to Stream 2.
   - In the third output, set the Stream field in that output to Stream 3.

- In the fourth output, set the Stream field in that output to Stream 4.
- In the fifth output, set the Stream field in that output to Stream 5.



8. Save the job.

Reference

Find reference tables that relate to captions support in the following topics.

Topics

- Reference: Supported Input Containers
- Reference: Supported Captions Formats

Reference: Supported Input Containers

If the source captions are inside the input container, you can include them in the input only if the AWS Elemental encoder can extract the captions from the container. The AWS Elemental encoder can extract captions only from specific input containers types.

If the source captions are an external file (sidecar captions) in one of the supported formats (for example, an SRT file), you can include them in the transcoding regardless of the input container.

Source Captions Are Inside the Input Container

Type of Input	Container	Captions Can Be Extracted from Container?
File	Adobe Flash® container	No
File	Audio Video Interleave (AVI) container	No
File	HLS container	Yes
File	Matroska container	No
File	MP4 container	Yes
File	MPEG Transport stream	Yes
File	MPEG-1 system stream	No
File	MXF container	Yes
File	No container	Yes
File	QuickTime container	Yes
File	Transport stream	Yes
File	VOB container	No
File	WMV/ASF container	No
Stream	HLS	Yes

Type of Input	Container	Captions Can Be Extracted from Container?
Stream	RTP	Yes

Reference: Supported Captions Formats

The following lists show supported input and output captions types. The table at the end of this topic provides definitions for each of these captions types.

> **Note**
>
> Support for an input format and support for an output format doesn't mean that AWS Elemental Server supports *conversion from* a particular input format to a particular output format. For that information, see the **Reference** tab of the documentation on the web interface of your appliance. To go to the documentation, choose the **Support** tab at the top of the interface.

Supported Input Caption Formats

- Ancillary data
- ARIB
- DVB-Sub
- Embedded
- Embedded+SCTE-20
- SCC
- SCTE-20
- SCTE-27
- SMI
- SRT
- STL

Supported Output Caption Formats

- Ancillary+Embedded
- ARIB
- Burn-in
- CFF-TT
- DVB-Sub
- Embedded
- Embedded+SCTE-20
- RTMP CaptionInfo
- RTMP CuePoint
- SCC
- SCTE-20+Embedded
- SMI
- SRT
- Teletext
- TTML
- WebVTT

Caption Format Descriptions

Caption	Description
Ancillary data	From MXF input, data that is compliant with “SMPTE 291M: Ancillary Data Package and Space Formatting” and is contained in ancillary data. From QuickTime® input or for QuickTime output, data that is compliant with EIA-608 (also known as CEA-608) or CEA-708 (also known as EIA-708) and is contained in ancillary data.

Caption	Description
Ancillary+Embedded	For QuickTime output only, the output combines captions in ancillary data and embedded captions. The ancillary captions are compliant with EIA-608 (also known as CEA-608) or CEA-708 (also known as EIA-708). The embedded captions are described below.
ARIB	Captions that are compliant with the ARIB STD-B37 Version 2.4
Burn-in	It is technically impossible for the encoder to read burn-in captions. Therefore, from an input viewpoint, they cannot be considered to be captions. Burn-in captions are captions that are converted into text and then overlaid on top of the picture directly in the video stream.
CFF-TT	Captions for Ultraviolet output.
DVB-Sub	Captions that are compliant with ETSI EN 300 743.
Embedded	Captions that are compliant with the EIA-608 standard (also known as CEA-608 or SMPTE-259M or “line 21 captions”) or the CEA-708 standard (also known as EIA-708).
Embedded+SCTE-20	Captions that have both embedded and SCTE-20 in the video. The embedded captions are inserted before the SCTE-20 captions.
RTMP CaptionInfo	Captions that are compliant with the Adobe onCaptionInfo format.
RTMP CuePoint	Captions that are in the cuePoint format.

Caption	Description
SCC	Captions that are in the Scenarist format, file extension .scc.
SCTE-20	Captions that are compliant with the standard “SCTE 20 2012 Methods for Carriage of CEA-608 Closed Captions and Non-Real Time Sampled Video.”
SCTE-20+Embedded	Captions that are compliant with SCTE-43. The SCTE-20 captions are inserted in the video before the Embedded captions.
SCTE-27	Captions that are compliant with the standard “SCTE-27 (2011), Subtitling Methods for Broadcast Cable.”
SMI	Captions in the Microsoft SAMI format.
SRT	Captions in the SRT format.
STL	Captions in the EBU STL format. Spruce STL format is not supported.
Teletext	From TS input: Captions in the EBU Teletext format. From MXF file input: Captions in the EBU Teletext format. For output: Captions in the EBU Teletext format.
TTML	Caption files that are compliant with the standard “Timed Text Markup Language 1 (TTML1) (Second Edition).”

Caption	Description
WebVTT	Captions that are compliant with “webvtt: The Web Video Text Tracks Format” as defined by the W3C organization.

Using the QVBR Rate Control Mode with AWS Elemental Server

This topic covers the AWS Elemental Server Quality Variable Bitrate (QVBR) implementation, which was introduced in AWS Elemental Server version 2.13.

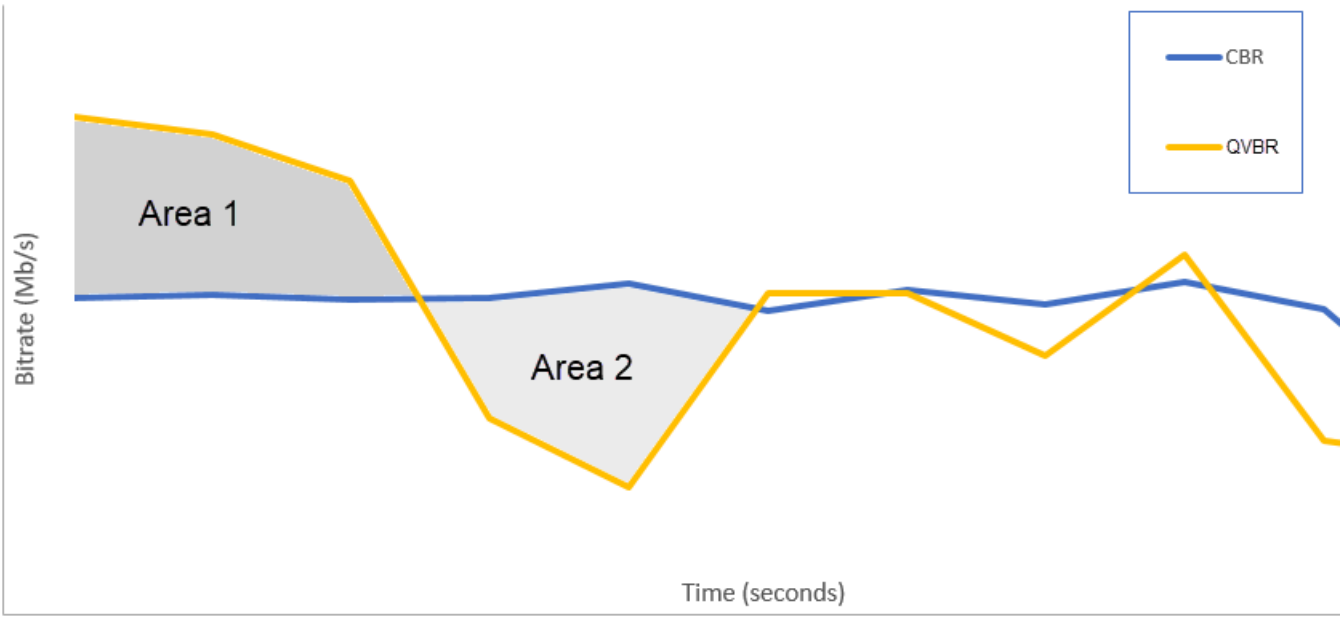
The rate control mode that you choose for your output determines whether the encoder uses more data for complex parts of your video or maintains a constant amount of data per frame. This chapter provides guidance for choosing the right rate control mode for your asset, depending on how you plan to distribute it. In general, you get the best video quality for a given file size using QVBR for your rate control mode.

Choose QVBR mode for distribution over the internet (OTT) and for video on demand (VOD) download. For best video quality for your file size, always choose this mode except in the following cases:

- You need your bit rate to be constant, for example, for distribution over fixed-bandwidth networks
- You need your total file size to not drop below the size that you specify, for example, to comply with contractual or regulatory requirements

When you choose QVBR, the encoder determines the right number of bits to use for each part of the video to maintain the video quality that you specify. You can use the same QVBR settings for all your assets; the encoder automatically adjusts the file size to suit the complexity of the video.

The following graph illustrates how the varying bit rate modes (QVBR and VBR) save unnecessary bits and provide better quality compared to CBR. The graph shows QVBR versus CBR, but the same principle applies to VBR:



In the parts of the graph where the QVBR line is above the CBR line, as in the part labeled Area 1, the CBR capped bit rate limits video quality below that of other scenes, so QVBR gives you more consistent quality. In the parts where the QVBR line drops below the CBR line, as in the part labeled Area 2, a low bitrate is sufficient for the same video quality, so QVBR saves bits and provides the opportunity for cost savings in storage and distribution through your content delivery network (CDN).

Guidelines for Using Quality-Defined Variable Bitrate Mode (QVBR)

When you use QVBR, you specify the quality level for your output and the maximum peak bitrate. For reasonable values of those settings, the encoder chooses how many bits to use for each part of the video. When you apply the same settings to several assets, your job outputs for simpler assets (such as cartoons) have smaller file sizes than your outputs for visually complex assets (such as high-motion sports with brightly dressed crowds in the background).

The following table provides a set of recommended values to get you started:

Resolution	Width	Height	QVBR Quality Level	Max Bit Rate
1080p	1920	1080	9	6000000
720p	1280	720	8	4000000

Resolution	Width	Height	QVBR Quality Level	Max Bit Rate
720p	1280	720	7	2000000
480p	640	480	7	1000000
360p	480	360	7	700000
240p	352	240	7	350000

With all resolutions, don't specify a value for **Max average bitrate** unless you need to guarantee a total file size cap. When you specify a maximum average bit rate, it reduces the benefit that QVBR provides in video quality to file size ratio. To use **Max average bitrate**, you first have to set **Passes** to **2-pass**.

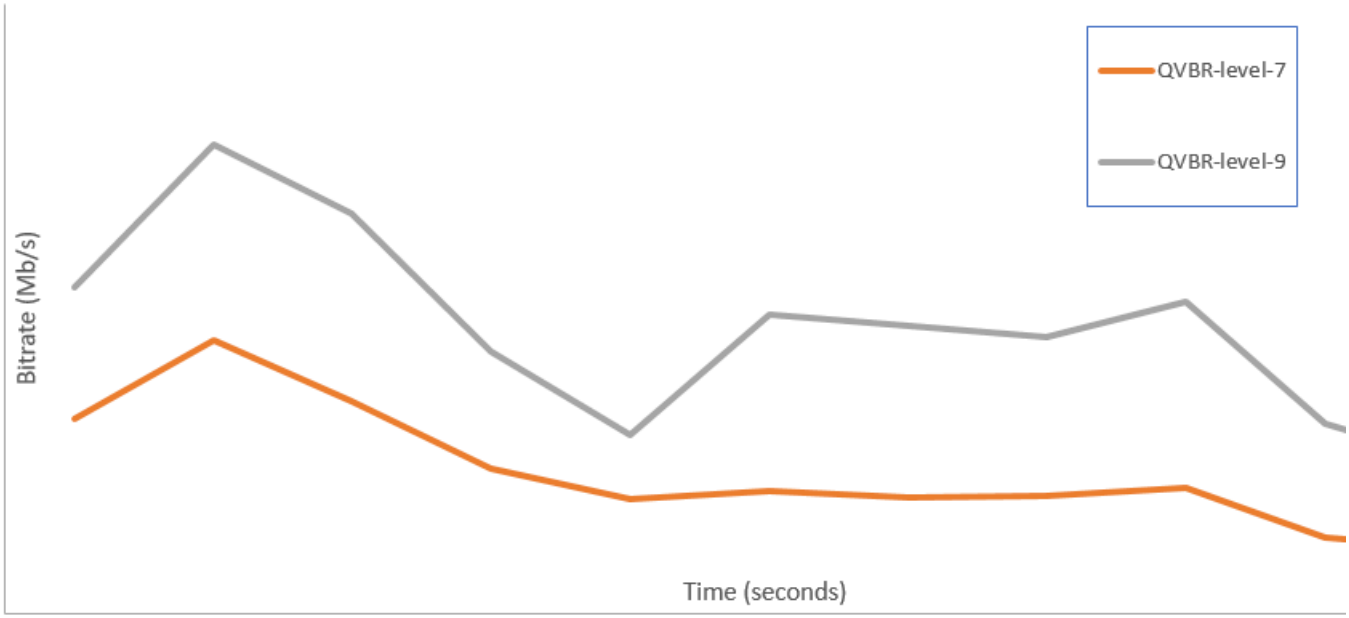
Setting QVBR Quality Tuning Level

You can specify the QVBR quality level on a scale between 1 and 10. The encoder determines the right number of bits to use for each part of the video to maintain the video quality that you specify.

The best value for an output depends on how the output will be viewed. In general, set **QVBR Quality Level** as shown in the following table.

Intended Viewing Devices	Recommended QVBR Quality Level for 720p/1080p
Large-screen TV	8 or 9
PC or tablet	7
Smartphone	6

The following graph shows how changing the quality level affects the bit rate that the encoder uses for different parts of the video. While the lines for both level 7 and level 9 spike and drop in the same places, the encoder uses more bits total when the quality is set higher:


QVBR-level-7
QVBR-level-9
Bitrate (Mb/s)
Time (seconds)

Using IMF Inputs with AWS Elemental Server

This topic covers the AWS Elemental Server Interoperable Master Format (IMF) App #2 and App #2E ingest implementation, which was introduced in AWS Elemental Server version 2.13. IMF is a collection of SMPTE specifications, starting with the prefix ST 2067.

Anatomy of an Interoperable Master Package (IMP)

An IMP is just a directory. It must contain an `ASSETMAP.xml` at the root of the IMP. This file associates file paths with asset UUIDs. All assets must be within the IMP directory - no relative paths ../, etc. are allowed.

IMPs can have the following status:

- Complete - All of the assets that exist in this IMP.
- Incomplete - CPL refers to assets in another folder.

A composition playlist (CPL) describes how a version of an asset is presented (within a timeline). This timeline is specified similarly to a non-linear edit timeline. It consists of a description of what samples play from what files and when. Files are located by the source file ID via the `ASSETMAP.xmls`.

Feature Limitations

AWS Elemental Server cannot do the following with IMF:

- Ingest IMF applications other than #2 and #2E.
- Write IMF assets.
- Ingest IMSC1 image profile captions.
- Ingest new IMSC1.1 features like skew, top-bottom captions, ruby, etc.
- Burn in IMSC1 captions with styling.
- Parse timecode start time from CPL.

Specifying Inputs

To ingest an IMF source, enter the Composition Playlist (CPL) file in the input field. The extension must be `.xml`.

Incomplete IMPs (OV + VF workflows)

If the IMP that contained the specified CPL file is not complete (i.e. it relies on resources in another IMP), provide paths to the `ASSETMAP.xml` files for every required supplemental IMP.

For example, you may specify a CPL from a localized version file (VF) of an asset. This VF IMP replaces captions, audio, and certain video scenes. The CPL still uses to the original version (OV) video file for most of the timeline.

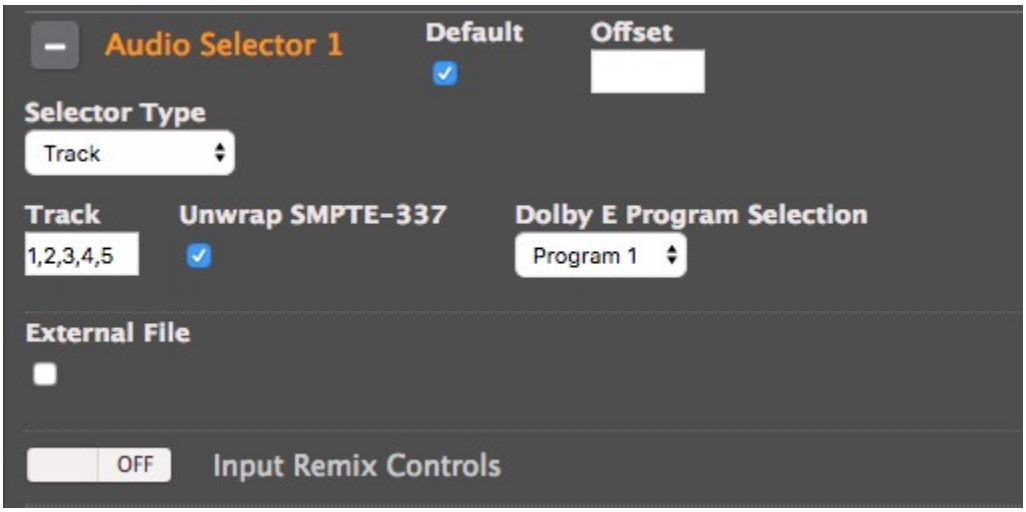
The user would select the VF CPL as the file input, then add the `ASSETMAP.xml` of the OV IMP as a supplemental IMP after choosing **Add IMF Asset**.

Selecting audio tracks

In the CPL, there are the tracks are specified by track ID (which is a 32-bit UUID). Instead of using the UUID as the track selector, we relabel the audio tracks internally by order of incidence (top to bottom) in the CPL and accept the track ID as this number.

The first audio track that occurs in the CPL (reading top to bottom) is audio that is selected by audio track 1. The second audio track that occurs in the file is selected by audio track 2, and so forth. If the audio is mono or the tracks need to be grouped together for workflow reasons, use a comma-separated list track numbers (for example, 1,2,3,4,5,6 for 5.1 mono).

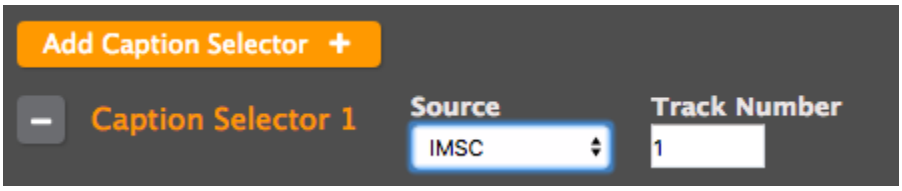
The default selection is the first track as it occurs in the CPL.



Selecting subtitle tracks

Similar to audio track selection, subtitle tracks are specified by track ID (which is a 32-bit UUID). Instead of using the UUID as the track selector, we relabel the subtitle tracks internally by order of incidence (top to bottom) in the CPL and accept the track ID as this number.

To select the first subtitle track, click **Add Caption Selector**, change the source to IMSC, and change the track number to 1.



Creating HDR Outputs with AWS Elemental Server

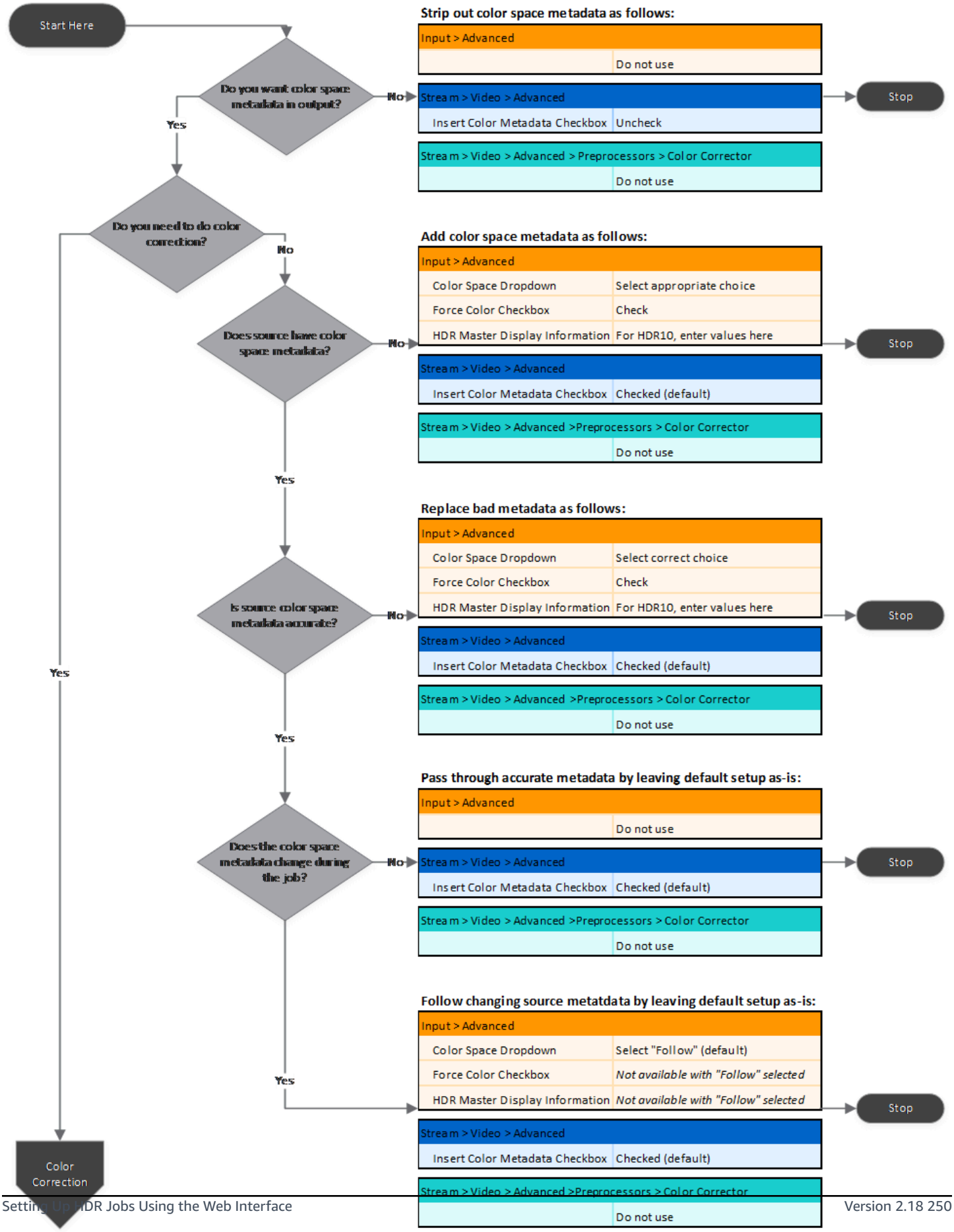
Supported HDR Formats

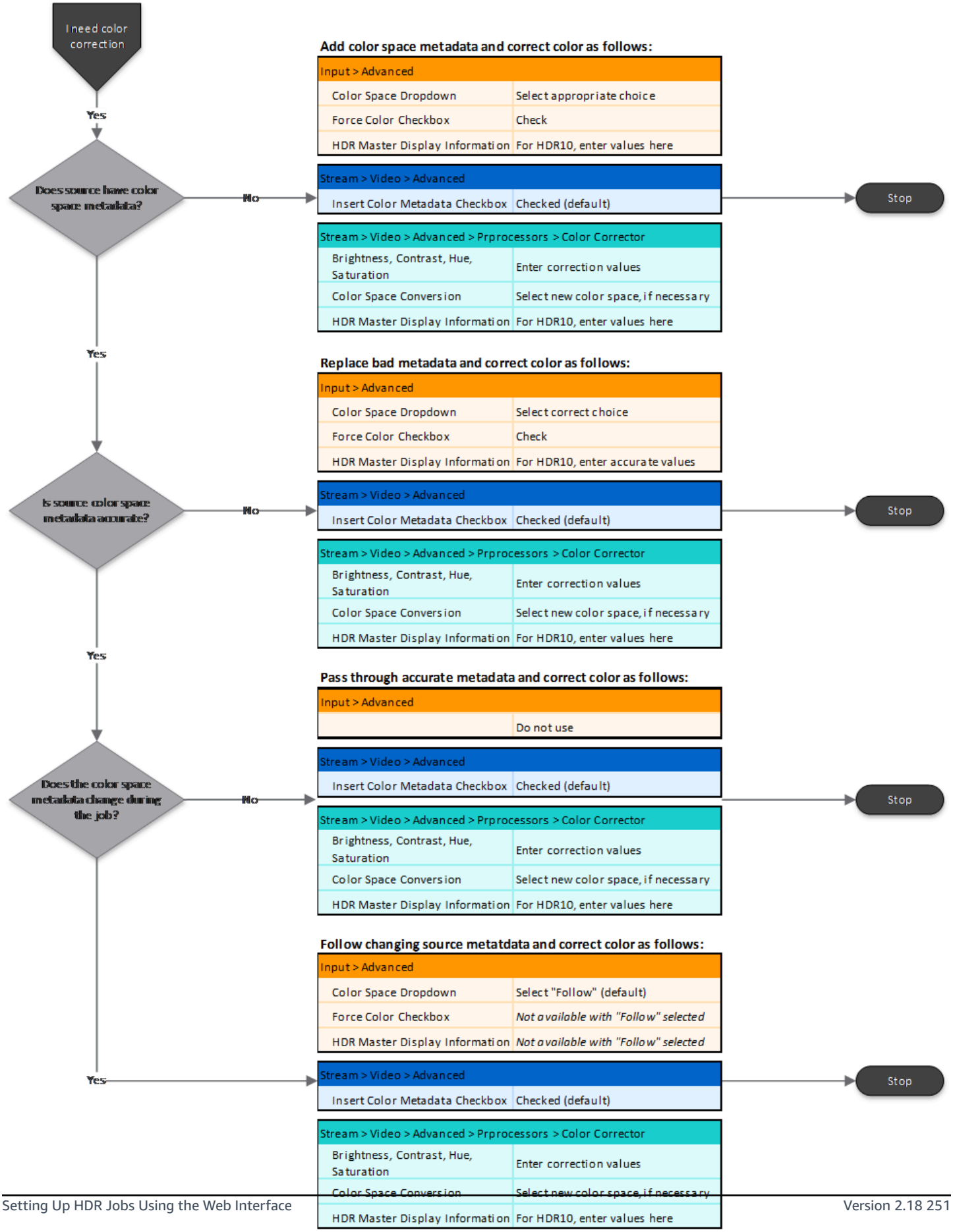
AWS Elemental Server can ingest and output video in the following formats and color spaces:

- HDR10
- HLG, rec. 2020
- SDR, rec. 709
- SDR, rec. 609

Setting Up HDR Jobs Using the Web Interface

Use the following flowchart to determine which fields in the job or profile you need to adjust to get the HDR functionality that you need. Then find detailed instructions and screenshots in the sections that follow.


Start Here
Do you want color space metadata in output?
No
Yes
Stop
Strip out color space metadata as follows:
Input > Advanced
Do not use
Stream > Video > Advanced
Insert Color Metadata Checkbox
Uncheck
Stream > Video > Advanced > Preprocessors > Color Corrector
Do not use
Do you need to do color correction?
No
Does source have color space metadata?
No
Stop
Add color space metadata as follows:
Input > Advanced
Color Space Dropdown
Select appropriate choice
Force Color Checkbox
Check
HDR Master Display Information
For HDR10, enter values here
Stream > Video > Advanced
Insert Color Metadata Checkbox
Checked (default)
Stream > Video > Advanced >Preprocessors > Color Corrector
Do not use
Yes
Is source color space metadata accurate?
No
Stop
Replace bad metadata as follows:
Input > Advanced
Color Space Dropdown
Select correct choice
Force Color Checkbox
Check
HDR Master Display Information
For HDR10, enter values here
Stream > Video > Advanced
Insert Color Metadata Checkbox
Checked (default)
Stream > Video > Advanced >Preprocessors > Color Corrector
Do not use
Yes
Yes
Does the color space metadata change during the job?
No
Stop
Pass through accurate metadata by leaving default setup as-is:
Input > Advanced
Do not use
Stream > Video > Advanced
Insert Color Metadata Checkbox
Checked (default)
Stream > Video > Advanced >Preprocessors > Color Corrector
Do not use
Yes
Stop
Follow changing source metatdata by leaving default setup as-is:
Input > Advanced
Color Space Dropdown
Select "Follow" (default)
Force Color Checkbox
Not available with "Follow" selected
HDR Master Display Information
Not available with "Follow" selected
Stream > Video > Advanced
Insert Color Metadata Checkbox
Checked (default)
Stream > Video > Advanced >Preprocessors > Color Corrector
Do not use
Color Correction

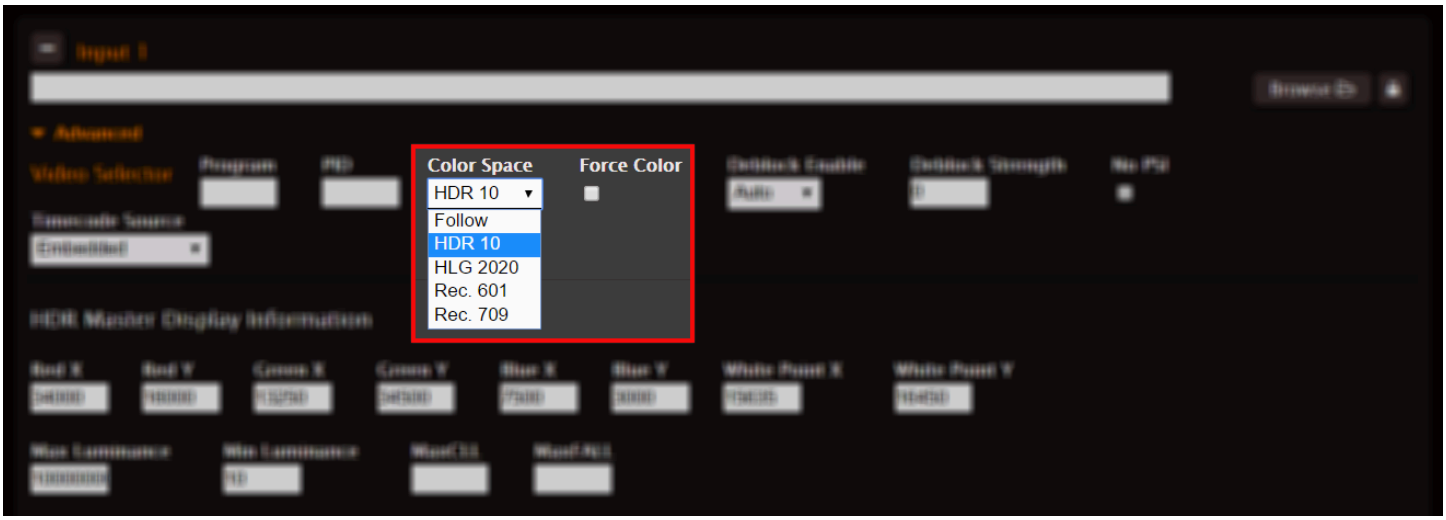

I need color correction
Yes
Does source have color space metadata?
No
Add color space metadata and correct color as follows:
Input > Advanced
Color Space Dropdown
Select appropriate choice
Force Color Checkbox
Check
HDR Master Display Information
For HDR10, enter values here
Stream > Video > Advanced
Insert Color Metadata Checkbox
Checked (default)
Stream > Video > Advanced > Prprocessors > Color Corrector
Brightness, Contrast, Hue, Saturation
Enter correction values
Color Space Conversion
Select new color space, if necessary
HDR Master Display Information
For HDR10, enter values here
Stop
Yes
Is source color space metadata accurate?
No
Replace bad metadata and correct color as follows:
Input > Advanced
Color Space Dropdown
Select correct choice
Force Color Checkbox
Check
HDR Master Display Information
For HDR10, enter accurate values
Stream > Video > Advanced
Insert Color Metadata Checkbox
Checked (default)
Stream > Video > Advanced > Prprocessors > Color Corrector
Brightness, Contrast, Hue, Saturation
Enter correction values
Color Space Conversion
Select new color space, if necessary
HDR Master Display Information
For HDR10, enter values here
Stop
Yes
Does the color space metadata change during the job?
No
Pass through accurate metadata and correct color as follows:
Input > Advanced
Do not use
Stream > Video > Advanced
Insert Color Metadata Checkbox
Checked (default)
Stream > Video > Advanced > Prprocessors > Color Corrector
Brightness, Contrast, Hue, Saturation
Enter correction values
Color Space Conversion
Select new color space, if necessary
HDR Master Display Information
For HDR10, enter values here
Stop
Yes
Follow changing source metatdata and correct color as follows:
Input > Advanced
Color Space Dropdown
Select "Follow" (default)
Force Color Checkbox
Not available with "Follow" selected
HDR Master Display Information
Not available with "Follow" selected
Stream > Video > Advanced
Insert Color Metadata Checkbox
Checked (default)
Stream > Video > Advanced > Prprocessors > Color Corrector
Brightness, Contrast, Hue, Saturation
Enter correction values
Color Space Conversion
Select new color space, if necessary
HDR Master Display Information
For HDR10, enter values here
Stop

Input > Advanced: Managing Overwrite of Source Metadata

Use the controls under Input > Advanced to either provide missing metadata or to replace incorrect metadata. The new values are passed into every output.

To do this, choose the Force Color checkbox under Input > Advanced and choose the correct color space in the Color Space dropdown box. Do not select **Follow** from the Color Space dropdown box.

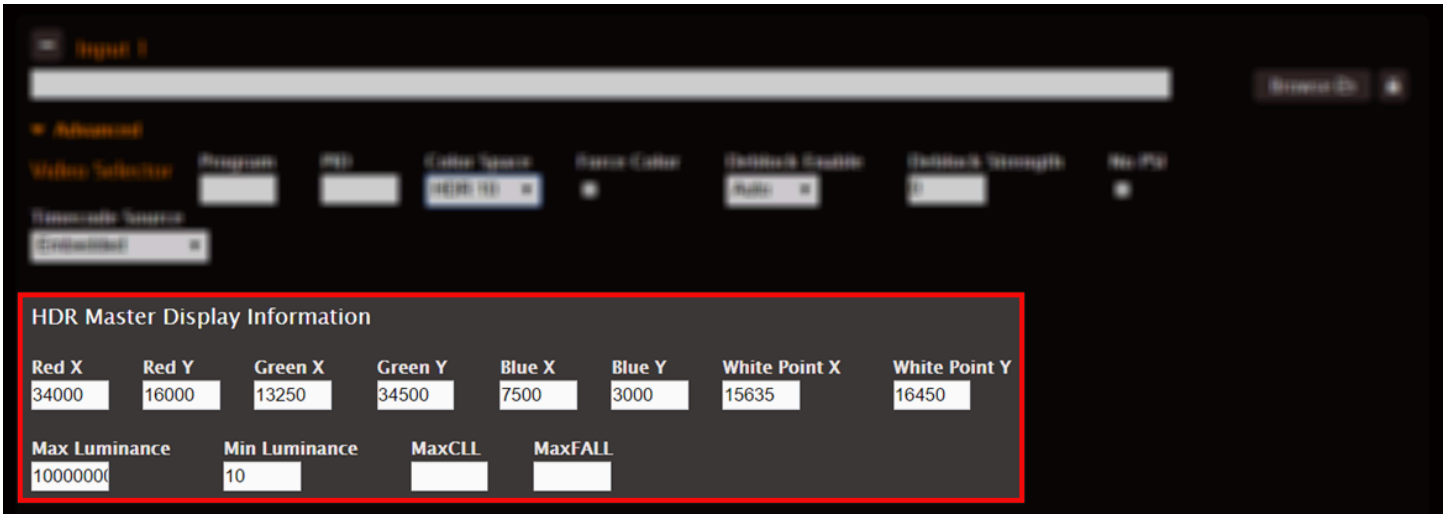
If you leave the Force Color checkbox unchecked, AWS Elemental Server ignores the value in the Color Space dropdown box and any values provided in the HDR Master Display Information (shown below).



For HDR10 Input Only

If you select HDR10 in the Color Space dropdown box, the HDR Master Display Information fields appears below. Enter correct values in these fields. Make sure to check the Force Color checkbox (described above) to incorporate these values in your metadata.

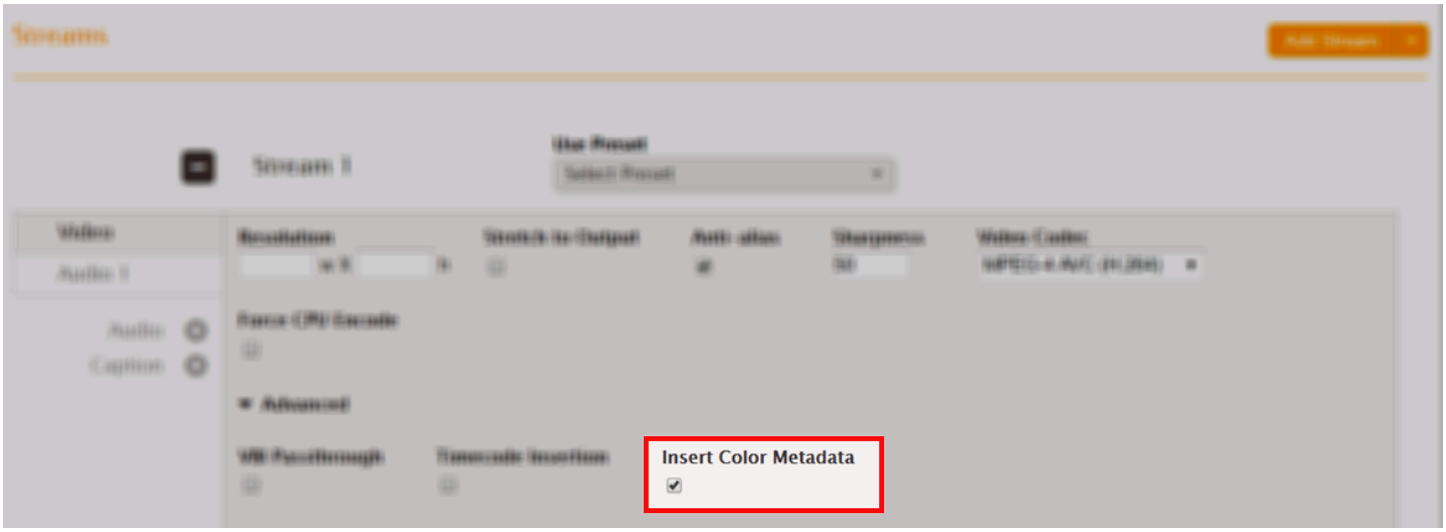
If you leave Force Color unchecked, these HDR Master Display Information fields still show values, but these values are not used. AWS Elemental Server instead uses metadata values from the incoming stream. You can view these values in the media info display after the job starts.



Stream > Video > Advanced: Include/Exclude Metadata per Output

The Insert Color Metadata checkbox is located under Advanced on the Video tab of each stream. Use this checkbox to indicate whether outputs should include metadata.

You can include metadata in some outputs and not in others because this checkbox is in the Streams section. To exclude metadata from an output, uncheck this checkbox in the stream associated with the output.



Stream > Video > Advanced > Preprocessors > Color Corrector

Access the color correction control as follows:

1. Choose **Advanced** on the Video tab of a stream.
2. Scroll down and choose **Preprocessors** to open a list of available preprocessors

3. Choose the slider switch labeled **Color Corrector**.

If you need to do color correction, use the Color Corrector preprocessor.

Color correction is calculated using the values in these fields and the color metadata from the input. The input metadata depends on your input settings. If you check the Force Color checkbox (described in the orange section, above), color correction is calculated from the metadata you supply. If you leave the Force Color checkbox unchecked, color correction is calculated from the source-supplied metadata.

Because the color correction checkbox is in the Streams section, you can apply color correction for some outputs and not others. Settings in the Color Corrector preprocessor apply to any output associated with the stream.

Brightness, Contrast, Hue, Saturation

Enter color correction values in these fields. AWS Elemental Server uses these values to do color correction regardless of whether you choose to do color space conversion as well.Color space conversion is discussed below.

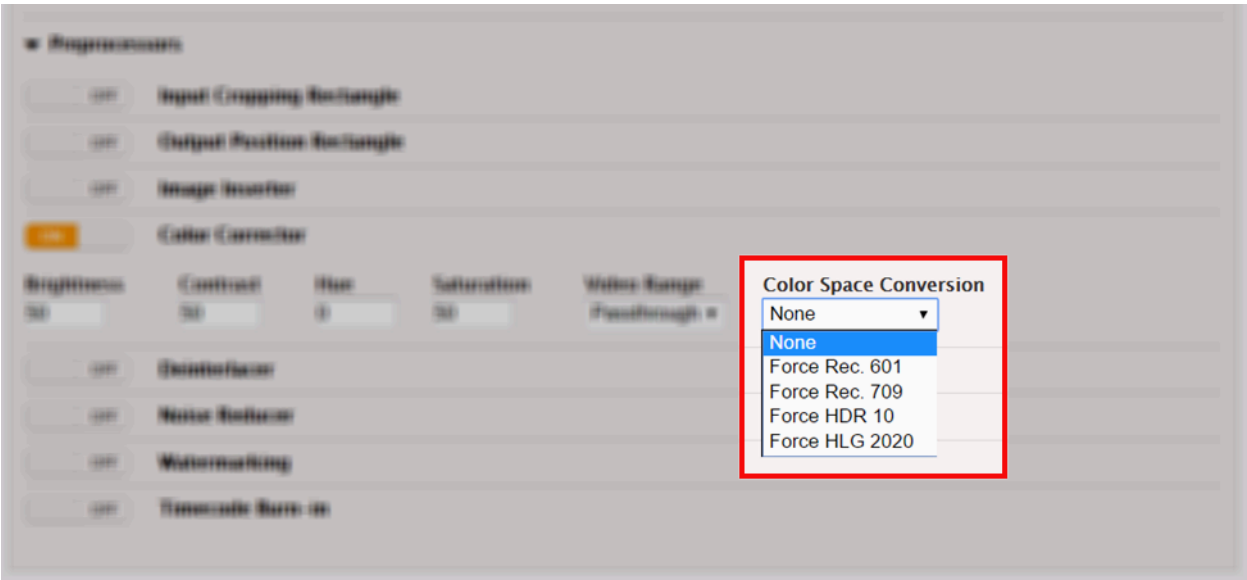
Color Space Conversion

The Color Space Conversion dropdown box is located on the right side of the Color Corrector section. Use this dropdown to create output streams encoded with a different standard than the input stream. Select the option for the format you are converting to. (The format you are converting from is determined by the input.)

AWS Elemental Server supports the following conversions:

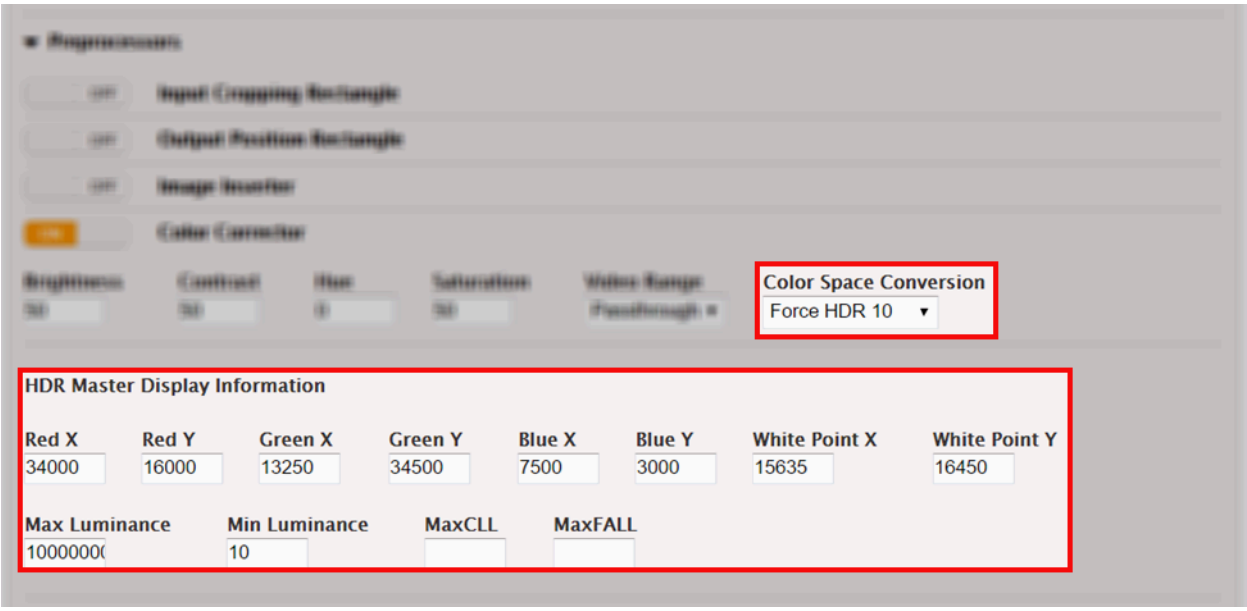
- Between the two HDR formats (HDR10 and HLG)

- Between the two SDR color spaces (rec. 601 and rec. 709)
- From either SDR color space to either HDR format



HDR Master Display Information

The HDR Master Display Information fields appear when you select “Force HDR 10” from the Color Space Conversion dropdown list. If you are converting to HDR10, use these fields to supply master display information metadata to be included in the output.



Setting Up HDR Jobs Using the REST API

This section provides information for setting up your AWS Elemental Server job and profile XML for HDR.

To use the information in this section, you should understand:

- The conceptual information provided in the main body of this document.
- How to create and modify jobs using XML.

XML Reference Tables for HDR

Managing Overwrite of Source Metadata

Element				Notes
job				Top-level element
	input			
		video_selector		Corresponds to the Video Selector section of the UI, under Input > Advanced. One <video_selector> element exists per job, which applies to all outputs.
			force_color	Corresponds to the Force Color checkbox in the UI. Set to `true` to overwrite the

Element				Notes
				source metadata with the values in <color_space> and, for HDR10, the children of <hdr10_metadata>. Set to `false` to retain metadata from the source.
			color_space	Corresponds to the Color Space dropdown in the Video Selector section of the UI. Valid values are: follow, rec_601, rec_709, hdr10, hlg_2020
			hdr10_metadata	Contains children for specifying master display information for HDR10. See the table below.

Metadata Specific to HDR10

Child of <hdr10_metadata>	Valid Range
red_primary_x	0-50000
red_primary_y	0-50000
green_primary_x	0-50000
green_primary_y	0-50000
blue_primary_x	0-50000
blue_primary_y	0-50000
white_point_x	0-50000
white_point_y	0-50000
min_lumninance	0-2147483647
max_luminance	0-2147483647
maxcll	0- 65535
maxfall	0- 65535

For the following table, different outputs can have different values for `<insert_color_metadata>` because this setting is contained in the stream assembly.

Including or Excluding Metadata from Outputs

Element		Notes
job		Top-level element
	stream_assembly	Use one <stream_assembly>

Element				Notes
				element for each set of encoding instructions you need.
		name		Use the value of this element to map a stream assembly to an output.
		video_description		Contains settings for how the video is encoded.
			insert_color_metadata	Set to `true` to include color metadata in the output; set to `false` to exclude it.

Element				Notes
	output group			Use one output group element for each video package type produced. Different outputs within the group can have different sets of encoding instructions (different stream assemblies) applied to them.
		output		Represents the actual set of elementar y streams delivered to a single destinati on address.
			stream_as sembly_name	Set the value of this element to match that of a <stream_a ssembly>/ <name> element, which associates this output with the stream assembly.

For the following table, different outputs can have different settings for color correction because this setting is contained in the stream assembly.

Color Correction

Element					Notes
job					Top-level element
	stream_assembly				Use one <stream_assembly> element for each set of encoding instructions you need.
		name			Use the value of this element to map a stream assembly to an output.
			video_preprocessors		
				color_corrector	Include this element if you want color correctio

Element					Notes
					n on your output.

Element						Notes
					color_space_conversion	Use this element to specify the color space or format you want your video stream converted to. Supported conversions are between HDR10 and HLG, from either rec. 601 or rec. 709 to either HDR10 or HLG, and between rec. 601 and rec. 709. Valid values are: none, force_601, force_709, force_hdr10,

Element						Notes
						force_hlg_2020
					brightness	Provide brightness correction value here. Valid range is: 1 through 100
					contrast	Provide contrast correction value here. Valid range is: 1 through 100
					hue	Provide hue correction value here. Valid range is: -180 through 180

Element						Notes
					saturation	Provide saturation correction value here. Valid range is: 1 through 100
					hdr10_metadata	Contains children for specifying master display information for HDR10. See the table below.

Element			Notes
	output group		Use one output group element for each video package type produced. Different outputs within the group can have different sets of encoding instructi ons (differen t stream assemblie s) applied to them.
		output	Represents the actual set of elementar y streams delivered to a single destination address.

Element				Notes
			stream_assembly_name	Set the value of this element to match that of a <stream_assembly>/<name> element, which associates this output with the stream assembly.

The following table shows HDR10-specific metadata structures and ranges for which values for the elements must be supplied by your color grader or another upstream source along with information about your specific video asset.

Metadata Specific to HDR10

Child of <hdr10_metadata>	Valid Range
red_primary_x	0-50000
red_primary_y	0-50000
green_primary_x	0-50000
green_primary_y	0-50000
blue_primary_x	0-50000
blue_primary_y	0-50000

Child of <hdr10_metadata>	Valid Range
white_point_x	0-50000
white_point_y	0-50000
min_lumninance	0-2147483647
max_luminance	0-2147483647
maxcll	0- 65535
maxfall	0- 65535

Creating Dolby Atmos Outputs with AWS Elemental Server

Dolby Atmos provides an immersive audio experience in cinemas and home theaters. With the right audio input files, you can use AWS Elemental Server to create Dolby Atmos outputs. You can create streaming outputs that end viewers can experience in their home theaters or file outputs that you can use in your professional workflows.

AWS Elemental Server can create Dolby Digital Plus with Atmos outputs by either encoding channel-based immersive audio content that you provide as 9.1.6, 7.1.4, or 5.1.4 PCM mono channels, or by passing through already encoded Dolby Digital Plus with Atmos content.

Topics

- Using Dolby Atmos Passthrough with AWS Elemental Server
- Using Dolby Atmos Encoding with AWS Elemental Server

Using Dolby Atmos Passthrough with AWS Elemental Server

AWS Elemental Server can create Dolby Digital Plus with Atmos outputs by either encoding audio in 9.1.6, 7.1.4, or 5.1.4 PCM mono channels, or by passing through already encoded Dolby Digital Plus with Atmos content.

You set up your job to pass through Dolby Digital Plus with Atmos content in the same way that you pass through Dolby Digital and Dolby Digital Plus content.

To set up a Dolby Atmos job, passing through finished audio content

1. Set up your input audio and video as usual.
2. Create outputs and streams. To set up the audio in your streams, for **Audio Codec**, choose **Dolby Digital Pass Through**.

Feature Restrictions for Dolby Atmos Passthrough

Note the following restrictions in the AWS Elemental Server implementation of Dolby Atmos passthrough:

- **Output codec:** You can create Dolby Atmos audio outputs encoded with only the Dolby Digital Plus (EAC3) codec.
- **Output containers:** For file outputs, you can create Dolby Atmos audio in only one of the video containers that supports Dolby Digital Plus: MPEG-4, MPEG-2 Transport Stream, or QuickTime.

Using Dolby Atmos Encoding with AWS Elemental Server

AWS Elemental Server can encode Dolby Digital Plus with Atmos channel-based, immersive audio, Audio Descriptive Model Broadcast WAV files, or Dolby Atmos Master File.

> **Note**
>
> Understanding Dolby Atmos is required prerequisite knowledge for using this feature. Your input audio channels must already be set up according the Dolby Atmos standard you are using as input. For more information about Dolby Atmos, see the Dolby online documentation.

Input File Requirements for Dolby Atmos Encoding

Feature Restrictions for Dolby Atmos Encoding

Note the following restrictions in the AWS Elemental Server implementation of Dolby Atmos encoding:

- **Channel-based immersive:** AWS Elemental Server supports channel-based immersive (CBI) content.
- **Dolby Atmos Master File (DAMF):** AWS Elemental Server supports Dolby Atmos master file (DAMF). This is a collection of 3 files with the extensions, .atmos, .atmos.metadata, and .atmos.audio
- **Audio Descriptive Model Broadcast WAV Format (ADM BWF):** AWS Elemental Server supports ADM BWF. It is a single broadcast WAV file contains header data with the .atmos and .atmos.metadata information.
- **Output codec:** You can create Dolby Atmos audio outputs encoded with only the Dolby Digital Plus (EAC3) codec.

- **Output containers:** For file outputs, you can create Dolby Atmos audio in only in one of the video containers that supports Dolby Digital Plus: MPEG-4, MPEG-2 Transport Stream, or QuickTime.
- **Output packages:** For adaptive bitrate (ABR) outputs, you can create Dolby Atmos audio in any of the AWS Elemental Server output group types: CMAF, Apple HLS, DASH ISO, or Microsoft Smooth Streaming.

Setting Up a Job for Dolby Atmos Encoding

To encode 9.1.6 audio Dolby Atmos objects, provide 16 input channels of PCM audio, either in individual .wav files or as tracks in a single container.

If you provide input audio as individual .wav files, you specify them in order in your input. You specify them as **Audio selector 1**, **Audio selector 2**, and so on, up to **Audio selector 16**. If you provide your audio as a single file containing 16 tracks, you specify the file in your input as **Audio selector 1**, and then you specify the tracks individually within that audio selector.

> **Important**
>
> Regardless of whether they are in separate files or a single file, you must set up the channels in the following order: L, R, C, LFE, Ls, Rs, Lrs, Rrs, Lw, Rw, Ltf, Rtf, Ltm, Rtm, Ltr, Rtr.

Summary Instructions for Individual .wav File Input

If your audio input is individual .wav files, do the following:

1. Create 16 separate input audio selectors, in this order: L, R, C, LFE, Ls, Rs, Lrs, Rrs, Lw, Rw, Ltf, Rtf, Ltm, Rtm, Ltr, Rtr.
2. Create a single audio selector group; include each of the 16 audio selectors.
3. Create one output stream with a single audio tab.
   a. For **Audio Codec**, choose **Dolby Digital Plus JOC (Atmos)**.
   b. For **Audio Source**, choose the audio selector group that you created.

Summary Instructions for Single, Multi-Track File Input

1. Create an input audio selector.
2. For **Selector Type**, choose **Track**.
3. For Track, specify your 16 channels with a comma-separated list of channel numbers. Specify them in this order: L, R, C, LFE, Ls, Rs, Lrs, Rrs, Lw, Rw, Ltf, Rtf, Ltm, Rtm, Ltr, Rtr.
4. Create one output stream with a single audio tab.
   a. For **Audio Codec**, choose **Dolby Digital Plus JOC (Atmos)**.
   b. For **Audio Source**, keep the default **Audio Selector 1**.

For more detailed instructions, see one of the following procedures:

Procedure with separate audio input files

Procedure with a single audio input file

To set up a Dolby Atmos job, with audio inputs as 16 individual .wav files

1. Set up your input audio selectors as follows:
   a. On the **Create New Job** page, in the **Input** section, under **Advanced**, find **Audio Selector 1**.
   b. Choose the **External file** check box.
   c. For **External File**, provide the path and file name to the .wav file for your first channel. For **Audio Selector 1**, this channel must be L.

   > **Important**
   > You must set up the channels in the following order: L, R, C, LFE, Ls, Rs, Lrs, Rrs, Lw, Rw, Ltf, Rtf, Ltm, Rtm, Ltr, Rtr.
   > That is, if your input audio is in separate .wav files, **Audio Selector 1** must point to the L channel, **Audio Selector 2** must point to the R channel, and so on.

   d. At the top of the **Audio Selector** sections, choose **Add Audio Selector** to create **Audio Selector 2**.
   e. Under **Audio Selector 2**, choose **External file**.

f. Specify the path and file name to the .wav file for your second channel. For **Audio Selector 2**, this channel must be R.

g. Repeat the steps to create an audio selector for the rest of your 16 channels. Choose the following channels for each selector:

- **Audio Selector 3**: C
- **Audio Selector 4**: LFE
- **Audio Selector 5**: Ls
- **Audio Selector 6**: Rs
- **Audio Selector 7**: Lrs
- **Audio Selector 8**: Rrs
- **Audio Selector 9**: Lw
- **Audio Selector 10**: Rw
- **Audio Selector 11**: Ltf
- **Audio Selector 12**: Rtf
- **Audio Selector 13**: Ltm
- **Audio Selector 14**: Rtm
- **Audio Selector 15**: Ltr
- **Audio Selector 16**: Rtr

2. Create an input **Audio Selector Group** as follows:

   a. At the top of the **Audio Selector** sections, choose **Add Audio Selector Group**.

   b. For **Selector Group Name**, enter a descriptive name, such as **`Dolby Atmos Audio Group`**.

   c. All the audio selectors appear below **Selector Group Name**. Choose each audio selector that you created earlier in this procedure.

3. In the bottom section of the **Create New Job** page, set up your output groups and outputs. Choose supported containers as listed in Feature Restrictions for Dolby Atmos Encoding.

4. Set up the **Audio 1** tab of **Stream 1**.

> **Note**
>
> Avoid setting up multiple audio tabs within the stream. One audio tab represents the entire Atmos audio content.

a. For **Audio Codec**, choose **Dolby Digital Plus JOC (Atmos)**.

   For **Audio Source**, choose the audio selector group that you created earlier in this procedure, such as **Dolby Atmos Audio Group**.

b. For the audio encoding settings, choose values that are suitable for your workflow. For more information, see the Dolby documentation for the Dolby Digital Plus Atmos encoding library.

> **Note**
>
> AWS Elemental Server automatically performs audio normalization on Dolby Digital Plus Atmos outputs. Therefore, there is no **Dialnorm** setting under audio encoding settings.

To set up a Dolby Atmos job, with audio input as a single file with 16 tracks

1. Set up your input audio selector as follows:
2. a. On the **Create New Job** page, in the **Input** section, under **Advanced**, find **Audio Selector 1**.

   b. Choose the **External file** check box.

   c. For **External Audio File**, provide the path and file name to the .wav file.

   d. For **Selector Type**, choose **Track**.

   e. For **Track**, list your 16 PCM mono tracks in a comma-separated list. Specify them in the following order: L, R, C, LFE, Ls, Rs, Lrs, Rrs, Lw, Rw, Ltf, Rtf, Ltm, Rtm, Ltr, Rtr.

      - If the tracks of your input audio file are already in that order, then list them that way: **`1, 2, 3, … 16`**.

- If the tracks of your input audio file are in a different order, list them according to the specified order. For example, if your L channel is in track 3, then list **3** first.

3. In the bottom section of the **Create New Job** page, set up your output groups and outputs.
4. Set up the **Audio 1** tab of **Stream 1**.

> **Note**
>
> Don't set up multiple audio tabs within the stream. One audio tab represents the entire Atmos audio content.

a. For **Audio Codec**, choose **Dolby Digital Plus JOC (Atmos)**.

   For **Audio Source**, keep the default **Audio selector 1**.

b. For the audio encoding settings, choose values that are suitable for your workflow. For more information, see the Dolby documentation for the Dolby Digital Plus Atmos encoding library.

> **Note**
>
> AWS Elemental Server automatically performs audio normalization on Dolby Digital Plus Atmos outputs. Therefore, there is no **Dialnorm** setting under audio encoding settings.

Supported DRM Solutions with AWS Elemental Server

Output Container	DRM Technology Provider	Key Provider (DRM Implementer)	Version of AWS Elemental Server API from DRM Implementer	Client Player	Encryption Mode	Key Rotation	Version of AWS Elemental Encoder
DASH	CENC/ Widevine	Piksel	GetEncryptInfo v1.0	Piksel-approved player that is Widevine/ CENC compliant	AES CTR (AES-128)	Static	2.10 +
HLS	Apple Fairplay	1Mainstream	Version 1.1	1Mainstream-approved player	AES CBC (Sample AES)	Static	2.6 +
HLS	PlayReady	Conax	GetPlayReady KeyForHLS v1	Conax-approved player	AES CTR (AES-128)	Static	2.6 +
HLS	PlayReady	Irdeto ActiveCloak for Media	Irdeto does not currently have API versioning.	Irdeto-approved player	AES CTR (AES-128)	Static	2.6 +

Output Container	DRM Technology Provider	Key Provider (DRM Implementer)	Version of AWS Elemental Server API from DRM Implementer	Client Player	Encryption Mode	Key Rotation	Version of AWS Elemental Encoder
HLS	PlayReady	InsideSecure	keyprovisioning v1.0	InsideSecure-approved player	AES CTR (AES-128)	Static, Rotating	2.6 +
HLS	PlayReady	InsideSecure on thePlatform	Not applicable; static key generated by AWS Elemental	thePlatform-approved player	AES CTR (AES-128)	Static	2.6 +
HLS	PlayReady	Irdeto on thePlatform	Not applicable; static key generated by AWS Elemental	thePlatform-approved player	AES CTR (AES-128)	Static	2.7 +
HLS	PlayReady	Microsoft client on thePlatform	Not applicable; static key generated by AWS Elemental	thePlatform-approved player	AES CTR (AES-128)	Static	2.7 +

Output Container	DRM Technology Provider	Key Provider (DRM Implementer)	Version of AWS Elemental Server API from DRM Implementer	Client Player	Encryption Mode	Key Rotation	Version of AWS Elemental Encoder
HLS	PlayReady	Piksel	GetEncryptInfo v1.0	Piksel-approved player	AES CTR (AES-128)	Static	2.6 +
HLS	SecureMedia	SecureMedia	No versioning information is available from Arris.	SecureMedia-approved player	AES CTR (AES-128)	Static, Rotating	2.6 +
HLS	Verimatrix Content Authority System (VCAS)	Verimatrix	VCAS for Internet TV 4.2 Integration Guide	Verimatrix-approved player	AES CBC (AES-128)	Static, Rotating	2.6 +
HLS	Apple Fairplay	Self-Generated	Not applicable; key is generated by AWS Elemental.	iOS player	AES CBC (Sample AES)	Static, Rotating	2.6 +

Output Container	DRM Technology Provider	Key Provider (DRM Implementer)	Version of AWS Elemental Server API from DRM Implementer	Client Player	Encryption Mode	Key Rotation	Version of AWS Elemental Encoder
HLS	Apple Fairplay	Generic Key Provider	Not applicable	iOS player	AES CBC (Sample AES)	Static, Rotating	2.6 +
HLS	Adobe pHLS	-	Not applicable	Adobe-approved player	AES ECB (AES-128)	Static	2.6 +
HLS	Flash Access	Adobe Access Primetime	Not applicable; key is generated outside AWS Elemental.	Adobe-approved player	AES ECB (AES-128)	Static	2.7 +
MSS	PlayReady	Conax	GetPlayReadyKeyForMSSmoothtreaming v1	Conax-approved player	AES CTR	Static	2.6 +
MSS	PlayReady	InsideSecure	keyprovisioning v1.0	InsideSecure-approved player	AES CTR	Rotating	2.6 +

Output Container	DRM Technology Provider	Key Provider (DRM Implementer)	Version of AWS Elemental Server API from DRM Implementer	Client Player	Encryption Mode	Key Rotation	Version of AWS Elemental Encoder
MSS	PlayReady	Irdeto on thePlatform	Not applicable; static key is generated by AWS Elemental.	thePlatform-approved player	AES CTR	Static	2.6 +
MSS	PlayReady	Piksel	GetEncryptInfo v1.0	Piksel-approved player	AES CTR	Static	2.6 +
MSS	PlayReady	Self-Generated or Static	Not applicable.	Microsoft-Silverlight-approved player	AES CTR	Static	2.6 +
MSS	PlayReady	Seachange	Acquire Packaging Data v1.0	Seachange-approved player	AES CTR	Static	2.9 +
HDS	Adobe pHDS	-	Not applicable	Adobe-approved player	AES ECB	Static	2.6 +

Output Container	DRM Technology Provider	Key Provider (DRM Implementer)	Version of AWS Elemental Server API from DRM Implementer	Client Player	Encryption Mode	Key Rotation	Version of AWS Elemental Encoder
HDS	Flash Access	Adobe Access Primetime	Not applicable; key is generated outside AWS Elemental.	Adobe-approved player	AES ECB	Static	2.6 +

Document History for User Guide

The following table describes the documentation for this release of AWS Elemental Server.

- **API version:** 2.18
- **Release notes:** AWS Elemental Server Release Notes

The following table describes the documentation for this release of AWS Elemental Server. For notification about updates to this documentation, you can subscribe to an RSS feed.

Change	Description	Date
Version 2.18 release	Minor changes to support the 2.18 software release.	June 7, 2024