

# Live Streaming with Automated Multi-Language Subtitling

## AWS Implementation Guide

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## About This Guide

This implementation guide discusses architectural considerations and configuration steps for deploying the Live Streaming with Automated Multi-Language Subtitling solution on Amazon Web Services (AWS). It includes links to [AWS CloudFormation](#) templates that launch and configure the AWS services required to deploy this solution using AWS best practices for security and availability.

The guide is intended for IT infrastructure architects, administrators, and DevOps professionals who have practical experience with video streaming and architecting on the AWS Cloud.

## Overview

Adding subtitles to your live video content can help improve reach and access, exposing your content to a much larger audience. However, it can be a challenging and time-consuming process to add subtitles to a live stream. The process can become more difficult when multi-language subtitles are required.

To help simplify that process, Amazon Web Services (AWS) offers Live Streaming with Automated Multi-Language Subtitling, a solution that automatically generates multi-language subtitles for live streaming video content in real time. The solution is easy to deploy and used only during the live event. When you finish streaming, you can delete the solution's stack to help ensure that you only pay for the infrastructure you use.

The solution uses [Live Streaming on AWS](#) to encode and package your content for adaptive bitrate streaming across multiple screens, and [AWS Lambda](#), [Amazon Transcribe](#), and [Amazon Translate](#) to convert the audio to text and generate captions in multiple languages.

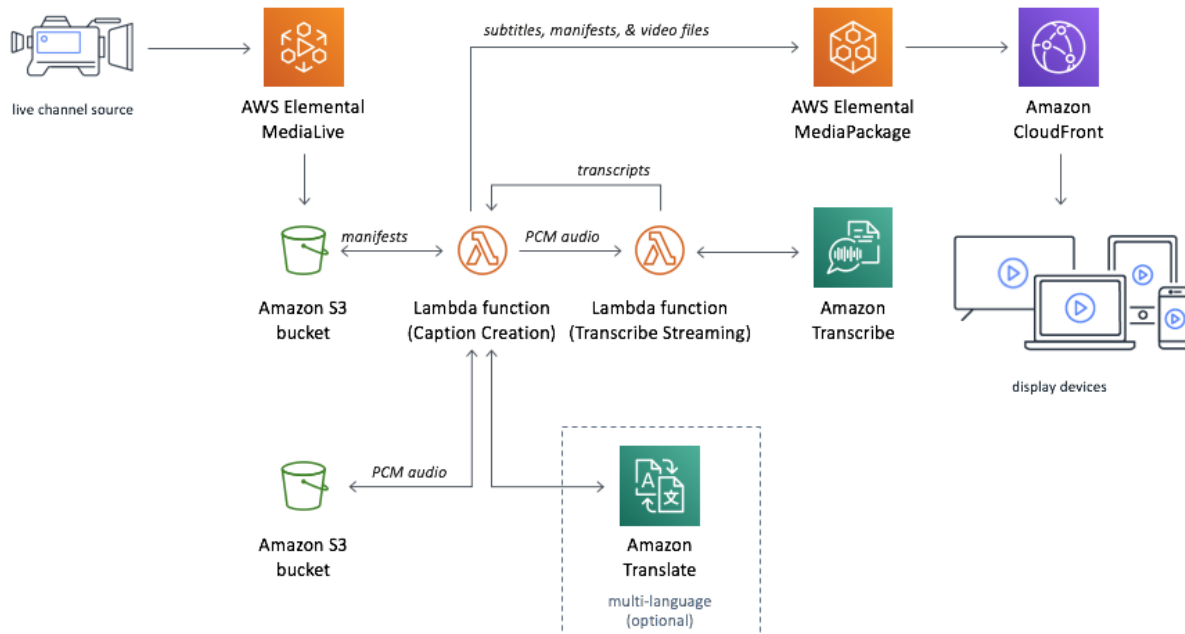
## Cost

You are responsible for the cost of the AWS services used while running this subtitling solution. As of the date of publication, the cost for running this solution in the US East (N. Virginia) Region is **\$1.44 per hour per stream** for English subtitles. Each additional language is **\$0.50 per hour per stream**. Prices are subject to change. For full details, see the pricing webpage for each AWS service you will be using in this solution.

The cost estimation includes the cost to add subtitles to your live streaming video content. It does not include the cost for running the Live Streaming on AWS solution. For more information about the costs to run the live streaming solution, see the [Cost](#) section in the *Live Streaming on AWS Implementation Guide*.

## Architecture Overview

Deploying this solution builds the following environment in the AWS Cloud.



**Figure 1: Live Streaming with Automated Multi-Language Subtitling solution architecture**

The solution's AWS CloudFormation template deploys Live Streaming on AWS, which includes AWS Elemental MediaLive, MediaPackage, and Amazon CloudFront; Amazon Simple Storage Service (Amazon S3) buckets; Amazon Transcribe; Amazon Translate; and two AWS Lambda functions: one function (`CaptionCreation`) that converts audio to text and one function (`TranscribeStreaming`) that generates WebVTT subtitles that are sent to MediaPackage.

The subtitle generation process starts when MediaLive output is sent to the solution's Amazon S3 bucket. The `CaptionCreation` Lambda function takes the manifest files from the bucket, extracts unsigned pulse-code module (PCM) audio from the TS video segments, and saves the PCM audio to Amazon S3. Then, the `CaptionCreation` function invokes the `TranscribeStreaming` function and gives it the PCM audio.

The `TranscribeStreaming` function uses Amazon Transcribe streaming transcription to convert the audio stream to text in real time. The function then sends the transcript back to the `CaptionCreation` function. If multiple languages are required, the `CaptionCreation` function calls Amazon Translate to translate the transcript.

The `CaptionCreation` function creates the WebVTT subtitle files and the manifests and sends those and the video files to MediaPackage.

MediaPackage ingests the files and packages them into formats that are delivered to four MediaPackage custom endpoints.

An Amazon CloudFront distribution is configured to use the MediaPackage custom endpoints as its origin. The CloudFront distribution delivers your live stream to viewers with low latency and high transfer speeds.

## Considerations

### Amazon Transcribe Limits

By default, you can run one AWS Elemental MediaLive channel with subtitles generated by Amazon Transcribe. For more information on limits, see [Amazon Transcribe Limits](#). To request a limits increase, use the [Amazon Transcribe service limits increase form](#). For customers who want to run more than one live channel with this solution, we recommend requesting a service limit increase for Amazon Transcribe.

### Supported Languages

This solution currently supports English as the input audio language. The solution can generate subtitles in the following languages. Language codes are in parentheses.

- Arabic (`ar`)
- Chinese Simplified (`zh`)
- Chinese Traditional (`zh-TW`)
- Czech (`cz`)
- Danish (`da`)
- Dutch (`nl`)
- English (`en`)
- Finnish (`fi`)
- French (`fr`)
- German (`de`)
- Hebrew (`he`)
- Indonesian (`id`)
- Italian (`it`)
- Japanese (`ja`)
- Korean (`ko`)
- Polish (`pl`)
- Portuguese (`pt`)
- Russian (`ru`)
- Spanish (`es`)
- Swedish (`sv`)
- Turkish (`tr`)

## Limits

Generating subtitles for a large number of languages can cause this solution to hit resource limits for AWS Elemental MediaPackage. We recommend generating subtitles for no more than five languages at one time.

## Encoding Profiles

This solution leverages the AWS Elemental MediaLive encoding profiles from the Live Streaming on AWS solution. The live streaming solution includes three encoding profiles.

- **1080p profile:** 1080p@6500kbps, 720p@5000kbps, 720p@3300kbps, 540p@2000kbps, 432p@1200kbps, 360p@800kbps, 270p@400kbps, 234p@200kbps
- **720p profile:** 720p@5000kbps, 720p@3300kbps, 540p@2000kbps, 432p@1200kbps, 360p@800kbps, 270p@400kbps, 234p@200kbps
- **540p profile:** 540p@2000kbps, 432p@1200kbps, 360p@800kbps, 270p@400kbps, 234p@200kbps

## Regional Deployment

This solution uses Amazon Translate, Amazon Transcribe, AWS Elemental MediaLive, and MediaPackage, and MediaConnect which are currently available in specific AWS Regions only. Therefore, you must launch this solution in an AWS Region where these services are available.<sup>1</sup>

## AWS CloudFormation Template

This solution uses AWS CloudFormation to automate the deployment of Live Streaming with Automated Multi-Language Subtitling on the AWS Cloud. It includes the following AWS CloudFormation template, which you can download before deployment:

[View template](#)

### **live-streaming-with-multi-language-subtitling.template:**

Use this template to launch the solution and all associated components. The default configuration deploys the Live Streaming on AWS solution, AWS Lambda functions, Amazon Simple Storage Service (Amazon S3) buckets, Amazon Transcribe, Amazon Translate, but you can also customize the template based on your specific needs. For more information on what is deployed with the Live Streaming on AWS

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<sup>1</sup> For the most current service availability by region, see <https://aws.amazon.com/about-aws/global-infrastructure/regional-product-services/>

solution, see the [Architecture Overview](#) section in the *Live Streaming on AWS Implementation Guide*.

## Automated Deployment

Before you launch the automated deployment, please review the considerations discussed in this guide. Follow the step-by-step instructions in this section to configure and deploy the solution into your account.

**Time to deploy:** Approximately 20 minutes

### Launch the Stack

This automated AWS CloudFormation template deploys the Live Streaming with Automated Multi-Language Subtitling solution on the AWS Cloud.

**Note:** You are responsible for the cost of the AWS services used while running this solution. See the [Cost](#) section for more details. For full details, see the pricing webpage for each AWS service you will be using in this solution.

1. Log in to the AWS Management Console and click the button to the right to launch the `live-streaming-with-automated-multi-language-subtitling` AWS CloudFormation template.

A blue rectangular button with white text that reads "Launch Solution".

You can also [download the template](#) as a starting point for your own implementation.

2. The template is launched in the US East (N. Virginia) Region by default. To launch this solution in a different AWS Region, use the region selector in the console navigation bar.

**Note:** This solution uses the Amazon Translate, Amazon Transcribe, AWS Elemental MediaLive, MediaPackage, and MediaConnect services, which are currently available in specific AWS Regions only. Therefore, you must launch this solution in an AWS Region where these services are available.<sup>2</sup>

3. On the **Select Template** page, verify that you selected the correct template and choose **Next**.
4. On the **Specify Details** page, assign a name to your solution stack.

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<sup>2</sup> For the most current service availability by region, see <https://aws.amazon.com/about-aws/global-infrastructure/regional-product-services/>

5. Under **Parameters**, review the parameters for the template and modify them as necessary.

This solution uses the following default values.

Parameter	Default	Description
<b>Deployment Options</b>		
<b>Source Code</b>	<Requires Input>	Choose whether to deploy the solution using NodeJS or Python source code for the AWS Lambda-backed custom resource
<div style="border: 1px solid gray; padding: 5px; margin: 5px 0;"> <p><b>Note:</b> There is no difference in functionality between the NodeJS version and the Python version.</p> </div>		
<b>Use CloudFront CDN for MediaPackage</b>	True	Choose whether to put Amazon CloudFront in front of MediaPackage endpoints. We recommend putting CloudFront in front of your MediaPackage endpoints.
<b>Live Streaming Source</b>		
<b>Source Input Type</b>	URL_PULL	Specify the input type for AWS Elemental MediaLive: RTP_PUSH, RTMP_PUSH, RTMP_PULL, URL_PULL, or MEDIACONNECT
<b>Source Codec</b>	AVC	Specify the codec for the source stream for MediaLive: AVC, HEVC, or MPEG2
<b>Encoding Profile</b>	720	Specify the encoding profile to use with MediaLive
<b>Start MediaLive Channel</b>	True	Choose whether to start the MediaLive channel when the solution is created.
<b>PUSH Source Input Types</b>		
<b>Input CIDR Block</b>	<Requires input>	Specify the CIDR block for the MediaLive security group for PUSH Input Types
<b>PULL Source Input Types</b>		
<b>Primary Source URL</b>	https://d15an60oaeed9r.cloudfront.net/live_stream_v2/sports_reel_with_makers.m3u8	The primary source URL for the live feed. By default, this parameter contains the primary demo source URL.
<b>Primary Source Username</b>	<Optional Input>	If authentication is required to access the source, enter the username
<b>Primary Source Password</b>	<Optional Input>	If authentication is required to access the source, enter the password
<b>Secondary Source URL</b>	https://d3h5srgm8b0t83.cloudfront.net/live_stream_v2/s	The secondary (backup) source URL for the live feed. By default, this parameter contains the secondary demo source URL.



Parameter	Default	Description
	ports_reel_with_markers.m3u8	
<b>Secondary Source Username</b>	<Optional Input>	If authentication is required to access the secondary source, enter the username
<b>Secondary Source Password</b>	<Optional Input>	If authentication is required to access the secondary source, enter the password
<b>MediaConnect Source Input Types</b>		
<b>Primary MediaConnect Flow ARN</b>	<Optional input>	The primary source MediaConnect flow for the live feed. You can create the flow in the MediaConnect console. To provide redundancy, create the primary and secondary flows in different Availability Zones.
<b>Secondary MediaConnect Flow ARN</b>	<Optional input>	The secondary source MediaConnect flow for the live feed. You can create the flow in the MediaConnect console. To provide redundancy, create the primary and secondary flows in different Availability Zones.
<b>Real Time Subtitling</b>		
<b>Turn on Subtitle Generation</b>	True	Choose whether to generate subtitles with the live stream
<b>Languages</b>	en	List of language codes for the subtitle language(s). Note that the format is comma separated (for more than one value). For example, <i>en, es, fr, de</i> .
<b>Custom Vocabulary</b>	<Optional input>	Specify a name of an existing custom vocabulary for Amazon Transcribe to use. For more information, see <a href="#">Custom Vocabularies</a> in the <i>Amazon Transcribe Developer Guide</i> .
<div style="border: 1px solid gray; padding: 5px; display: inline-block;"> <p><b>Note:</b> Your custom vocabulary must be located in the US East (N. Virginia) Region.</p> </div>		

6. Choose **Next**.
7. On the **Options** page, choose **Next**.
8. On the **Review** page, review and confirm the settings. Be sure to check the box acknowledging that the template will create IAM resources.
9. Choose **Create** to deploy the stack.

You can view the status of the stack in the AWS CloudFormation Console in the **Status** column. You should see a status of **CREATE\_COMPLETE** in approximately 20 minutes.

To test the live stream playback, navigate to the AWS CloudFormation stack **Outputs** tab, select the **Demo Console URL** from the **Value** column.

**Note:** In addition to the primary AWS Lambda function, this solution includes the `solution-helper` Lambda function, which runs only during initial configuration or when resources are updated or deleted.

When running this solution, you will see both Lambda functions in the AWS Lambda console, do not delete the `solution-helper` function as it is necessary to manage associated resources.

Once the live streaming event is complete, terminate the resources created by this solution to help ensure that you don't incur unnecessary AWS charges.

## Security

When you build systems on AWS infrastructure, security responsibilities are shared between you and AWS. This shared model can reduce your operational burden as AWS operates, manages, and controls the components from the host operating system and virtualization layer down to the physical security of the facilities in which the services operate. For more information about security on AWS, visit the [AWS Security Center](#).

## Amazon CloudFront

This solution deploys a static website [hosted](#) in an Amazon S3 bucket. To help reduce latency and improve security, this solution includes an Amazon CloudFront distribution with an origin access identity, which is a special CloudFront user that helps restrict access to the solution's website bucket contents. For more information, see [Restricting Access to Amazon S3 Content by Using an Origin Access Identity](#).

## Additional Resources

### AWS services

- [AWS Elemental MediaLive](#)
- [AWS Elemental MediaPackage](#)
- [AWS Elemental MediaConnect](#)
- [Amazon CloudFront](#)
- [AWS CloudFormation](#)
- [Amazon Transcribe](#)
- [Amazon Translate](#)
- [AWS Lambda](#)
- [Amazon Simple Storage Service](#)

## AWS Blogs

- [Connecting AWS Elemental Live On-Premises to AWS Media Services in the Cloud](#)
- [Connecting OBS Studio to AWS Media Services in the Cloud](#)
- [Connecting FFmpeg Using RTP to AWS Media Services in the Cloud](#)
- [Connecting FFmpeg Using RTMP to AWS Media Services in the Cloud](#)
- [Connecting VLC Media Playing Using RTP to AWS Media Services in the Cloud](#)

## Tutorials and Workshops

- [AWS Live Streaming and Live-to-VOD Workshop](#)
- [Build a Secure Packager and Encoder Key Exchange \(SPEKE\) Reference Server](#)
- [Build a Frame-Accurate Live-to-VOD Workflow with Image Recognition](#)

# Appendix: Collection of Operational Metrics

This solution includes an option to send operational metrics to AWS. We use this data to better understand how customers use this solution and related products and services. When enabled, the following information is collected and sent to AWS when the AWS CloudFormation template is launched:

- **Solution ID:** The AWS solution identifier
- **Unique ID (UUID):** Randomly generated, unique identifier for each live streaming solution deployment
- **Timestamp:** Data-collection timestamp
- **Launch Data:** The AWS Region where the stack was launched
- **Source Input Type:** The input type you selected at launch
- **Source Input Codec:** The codec you selected at launch
- **Source Input Resolution:** The resolution you selected at launch
- **Source Code:** The code base you selected at launch

Note that AWS will own the data gathered via this survey. Data collection will be subject to the [AWS Privacy Policy](#). To opt out of this feature, modify the AWS CloudFormation template mapping section as follows:

```
AnonymousData:  
  SendAnonymousData:  
    Data: Yes
```

to

```
AnonymousData:  
  SendAnonymousData:  
    Data: No
```

## Source Code

This solution includes two source code options, NodeJS and Python. There is no difference in functionality between the NodeJS version and the Python version. Use the **Source Code** AWS CloudFormation parameter to choose the source code you want. You can visit our [GitHub repository](#) to download the templates and scripts for this solution, and to share your customizations with others.

# Document Revisions

Date	Change	In sections
March 2019	Initial release	--

## Notices

Customers are responsible for making their own independent assessment of the information in this document. This document: (a) is for informational purposes only, (b) represents current AWS product offerings and practices, which are subject to change without notice, and (c) does not create any commitments or assurances from AWS and its affiliates, suppliers or licensors. AWS products or services are provided “as is” without warranties, representations, or conditions of any kind, whether express or implied. The responsibilities and liabilities of AWS to its customers are controlled by AWS agreements, and this document is not part of, nor does it modify, any agreement between AWS and its customers.

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