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About This Guide
This implementation guide discusses architectural considerations and configuration steps for deploying the Live Streaming on AWS with MediaStore solution on Amazon Web Services (AWS). It includes links to an AWS CloudFormation template that launches and configures the AWS services required to deploy this solution using AWS best practices for security and availability.

This 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

Amazon Web Services (AWS) enables broadcasters and content owners to automate media supply chains, streamline content distribution, and cost-effectively broadcast live content to a global audience. With AWS, you can seamlessly scale your infrastructure to meet demand, and pay only for what you use, helping you build highly available and cost-effective solutions for live video streaming.

AWS offers several options for delivering live streaming content on the cloud that enable you to automatically provision and dynamically scale any combination of video processing, delivery, and storage services. Customers can combine AWS Media Services with Amazon CloudFront to build a highly resilient and secure architecture that delivers an exceptional real-time viewing experience.

The Live Streaming on AWS with MediaStore solution automatically configures AWS Elemental MediaLive (MediaLive) and AWS Elemental MediaStore (MediaStore) to encode and originate your content for adaptive bitrate streaming across multiple screens via HTTP Live Streaming (HLS). The solution also uses Amazon CloudFront to provide an elastic, highly available, global content delivery network for live video streaming. 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 Live Streaming on AWS with MediaStore solution supports four input types as the source for your video stream, including a device input so you can use an AWS Elemental Link as the source for the input for your live channel.

Cost

You are responsible for the cost of the AWS services used while running this solution. As of the date of publication, the total cost for running this solution with default settings in the US East (N. Virginia) Region is approximately $2.00 per hour, but will vary depending on the encoding profile you choose.

This cost estimate does not include costs for Amazon CloudFront, AWS Elemental MediaStore, and data transfer fees, which will vary based on the number of users and end user devices. For full details, see the pricing webpages for MediaLive and MediaStore, as well as the AWS services you will use in this solution.
Architecture overview
Deploying this solution with the default parameters builds the following environment in the AWS Cloud.

![Architecture diagram](image)

Figure 1: Live streaming on AWS with MediaStore architecture

The AWS CloudFormation template launches the AWS products and services necessary to ingest, transcode, and deliver live streaming video. AWS Elemental MediaLive ingests an input feed and transcodes your content into one adaptive bitrate (ABR) HTTP Live Streaming (HLS) stream as output. AWS Elemental MediaStore provides a scalable highly-available storage container to host the encoded segments.

An Amazon CloudFront distribution is configured to use the MediaStore custom endpoints as its origin. The CloudFront distribution delivers your live stream to viewers with low latency and high transfer speeds. An Amazon Simple Storage Service (Amazon S3) bucket stores the CloudFront logs, and an Amazon CloudWatch dashboard monitors the ingress and egress actions on the MediaStore container.

You can configure the solution to ingest Real-Time Transport Protocol (RTP), Real-Time Messaging Protocol (RTMP), HTTP Live Streaming (HLS) content, or live video from an AWS Elemental Link device.

The solution also includes three encoding profiles, which are adaptive bitrate (ABR) stream sets ranging in output resolution from 288p to 1080p, that you can set during initial configuration.
Deployment considerations

Encoding profiles
The Live Streaming on AWS with MediaStore solution configures AWS Elemental MediaLive with one of three progressive, 30 frames per second encoding profiles. Choose one of the following encoding profiles.

- **HD-1080p profile:** 1920x1080, 1280x720, 960x540, 768x432, 640x360, 512x288
- **HD-720p profile:** 1280x720, 960x540, 768x432, 640x360, 512x288
- **SD-540p profile:** 960x540, 768x432, 640x360, 512x288

MediaStore lifecycle policy
This solution deploys an AWS Elemental MediaStore storage container with an attached lifecycle policy. By default, stored files will be deleted after five minutes, to clean up the expired HLS segments from the live stream. For more details, see lifecycle policy in the AWS Elemental MediaStore documentation.

Demo content
The solution includes a link to a demo HTTP Live Streaming (HLS) stream hosted in an Amazon Simple Storage Service (Amazon S3) bucket, which enables you to test the solution without having to set up and configure a live stream. Deploying the solution with default parameters, will launch the demo.

Regional deployment
This solution uses AWS Elemental MediaLive and MediaStore 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. For the most current service availability by region, see AWS service offerings by Region.

To use an AWS Elemental Link device as an input, you must launch this solution in the AWS Region where the device is configured.
AWS CloudFormation template

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

- **live-streaming-on-aws-with-mediastore.template**: Use this template to launch the solution and all associated components. The default configuration deploys an AWS Lambda function, an AWS Elemental MediaLive input and channel, an AWS Elemental MediaStore container, Amazon CloudFront distributions, an Amazon CloudWatch log group, an Amazon CloudWatch dashboard, and an Amazon Simple Storage Service (Amazon S3) bucket, but you can also customize the template based on your specific needs.

Automated deployment

Before you launch the automated deployment, 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 five minutes

Prerequisites

Before you launch the Live Streaming on AWS with MediaStore solution, you must create an AWS Identity and Access Management (IAM) role and associated policy, to enable MediaStore access to Amazon CloudWatch. Launching this solution without an IAM role and policy will be successful. However, the deployed Amazon CloudWatch dashboard will not be configured. For details on how to create an IAM role and policy, see the AWS Elemental MediaStore documentation.

**Note**: This solution only requires one policy and role per account. However, they must be named **MediaStoreAccessLogsPolicy** and **MediaStoreAccessLogs**. The same role and policy will work for all deployments of this solution in any supported Region.

Launch the stack

This automated AWS CloudFormation template deploys the Live Streaming on AWS with MediaStore solution on the AWS Cloud. Verify that you have created an AWS Elemental MediaStore IAM role and policy before deploying this solution.

**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 use in this solution.
1. Log in to the AWS Management Console and select the button to the right to launch the `live-streaming-on-aws-with-mediastore` AWS CloudFormation template. You can also download the template as a starting point for your own implementation.

2. The template launches 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 AWS Elemental MediaLive and MediaStore 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. For the most current service availability by Region, see the AWS service offerings by Region.

3. On the **Create stack** page, verify that the correct template shows in the **Amazon S3 URL** text box and choose **Next**.

4. On the **Specify stack details** page, assign a name to your solution stack.

5. Under **Parameters**, review the parameters for the template and modify them as necessary. This solution uses the following default values.

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Default</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Source Input Type</strong></td>
<td>URL_PULL</td>
<td>Specify the input type for MediaLive: RTP_PUSH, RTMP_PUSH, URL_PULL (HLS), or INPUT_DEVICE (AWS Elemental Link). Detailed instructions for each input type can be found in the appendix.</td>
</tr>
<tr>
<td><strong>Source URL</strong></td>
<td>&lt; Optional input&gt;</td>
<td>If you selected <strong>URL_PULL</strong> for <strong>Source Input Type</strong>, enter the URL for your source stream. By default this parameter contains the primary demo source URL.</td>
</tr>
<tr>
<td><strong>Source Username</strong></td>
<td>&lt; Optional input&gt;</td>
<td>If you selected <strong>URL_PULL</strong> for <strong>Source Input Type</strong>, enter the username for your source stream if using authentication. This value will be stored securely in AWS Systems Manager Parameter Store.</td>
</tr>
<tr>
<td><strong>Source Password</strong></td>
<td>&lt; Optional input&gt;</td>
<td>If you selected <strong>URL_PULL</strong> for <strong>Source Input Type</strong>, enter the password for your source stream if using authentication. This value will be stored securely in AWS Systems Manager Parameter Store.</td>
</tr>
<tr>
<td><strong>Input Security Group CIDR Block</strong></td>
<td>&lt; Optional input&gt;</td>
<td>For RTP_PUSH and RTMP_PUSH input types, specify the CIDR block to restrict access to the MediaLive input endpoint. This should be the IP or IP range of your source stream location/network.</td>
</tr>
<tr>
<td><strong>Encoding Profile</strong></td>
<td>HD-720p</td>
<td>Specify the encoding profile to use with MediaLive.</td>
</tr>
<tr>
<td><strong>Start MediaLive Channel</strong></td>
<td>false</td>
<td>Choose whether to start the MediaLive channel when the solution is created. We recommend starting the channel if using the demo preview player.</td>
</tr>
</tbody>
</table>

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 AWS Identity and Access Management (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 five minutes.

   ![Note: To test the live stream playback, navigate to the AWS CloudFormation stack Outputs tab, copy the Amazon CloudFront URL, and open the URL in any player compatible with HTTP Live Streaming (HLS). For more details, see Appendix D.](image)

### 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](https://aws.amazon.com/security).

#### IAM roles

AWS Identity and Access Management (IAM) roles enable customers to assign granular access policies and permissions to services and users on the AWS Cloud. This solution creates IAM roles that grants the AWS Lambda function access to the other AWS services used in this solution.

#### 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](https://aws.amazon.com/documentation/cloudfront/#security).
Additional resources

- AWS CloudFormation
- AWS Elemental MediaLive
- AWS Elemental Link
- Amazon Simple Storage Service
- AWS Elemental MediaStore
- Amazon CloudWatch
- AWS Lambda
- AWS Identity and Access Management
Appendix A: AWS Elemental Link input configuration

Version 1.1.0 of the solution includes support for the AWS Elemental Link device as a source for live streaming content. AWS Elemental Link offers a configuration-free, cost-efficient way to securely and reliably transfer video to AWS Elemental MediaLive. For more details on the device, refer to the AWS Elemental Link product page.

To configure this solution to use an AWS Elemental Link device you will need:

- Your Link device powered on and connected to the internet.
- The Link device ID. To find the device ID, sign in to the AWS MediaLive console and navigate to MediaLive Devices in the AWS Region where your device is registered. The device is listed with the Link device ID.
- Launch the solution in the same Region as the Link device with the following parameters:
  - **Source Input Type**: INPUT_DEVICE
  - **AWS Elemental Link Input Device ID**: The ID of the Link device from the AWS Elemental MediaLive console. You can only attach a Link device to one input at a time. If the Link device is already attached to an input, you cannot create a new input using that device.
  - **Encoding Profile**: Select the profile that best matches your source resolution.
  - **Start MediaLive Channel**: If your device is ready to stream, select true. Otherwise, select false—you can start the MediaLive channel through the AWS MediaLive console when you’re ready to stream.

**Note**: Refer to the Creating an input topic in the AWS Elemental MediaLive User Guide for a full list of input types and configuration details.
Appendix B: URL Pull (HLS) input configuration

URL Pull provides the option to ingest an HLS stream over HTTP or HTTPS. The following parameters are required to configure the solution to ingest an HLS stream:

- **Source Input Type**: URL_PULL

- **Source URL**: The HTTP(s) link to the HLS stream manifest file. The default value is a demo stream from AWS.

- **Source Username**: Only required if you have basic authentication setup on your source HLS stream.

- **Source Password**: Only required if you have basic authentication setup on your source HLS stream.

- **Encoding Profile**: Select the profile that best matches your source resolution.
• **Start MediaLive Channel**: If your device is ready to stream, select **true**. Otherwise, select **false**—you can start the MediaLive channel through the AWS console when you’re ready to stream.

**Note**: Refer to the [Creating an input](#) topic in the *AWS Elemental MediaLive User Guide* for a full list of input types and configuration details.

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**Figure 3: URL Pull (HLS) input configuration**

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**Appendix C: RTMP Push and RTP Push input configuration**

RTP and RTMP Push provide the option to push a transport stream (TS) to AWS Elemental MediaLive. In both options, the following parameters are required to configure the solution:

- **Source Input Type**: RTP_PUSH / RTMP_PUSH
- **Input Security Group CIDR Block**: A valid CIDR block used to create a security group to restrict access to the MediaLive input.
- **Encoding Profile**: Select the profile that best matches your source resolution.
- **Start MediaLive Channel**: If your device is ready to stream, select true. Otherwise, select false—you can start the MediaLive channel through the AWS console when you’re ready to stream.
Note: Refer to the Creating an input topic in the AWS Elemental MediaLive User Guide for a full list of input types and configuration details.

Figure 4: RTMP Push and RTP Push input configuration
Appendix D: Amazon CloudWatch dashboard

The Live Streaming on AWS with MediaStore solution includes an Amazon CloudWatch dashboard that is configured to monitor the following AWS Elemental MediaStore data points captured in the Amazon CloudWatch logs.

- Ingress TPM (Transaction Per Minute)
- Egress TPM (Transaction Per Minute)
- Put Object Latencies (Successful Requests)
- Get Object Latencies (Successful Requests)
- Ingress 2xx Status Count by Operation
- Ingress 4xx Status Count by Operation
- Ingress 5xx Status Count by Operation
- Egress 2xx Status Count by Operation
- Egress 4xx Status Count by Operation
- Egress 5xx Status Count by Operation

Appendix E: Collection of Operational Metrics

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

- **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 selected at launch
- **Encoding Profile**: The encoding profile selected at launch
- **ChannelStart**: The option to start the MediaLive channel 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

You can visit our [GitHub repository](https://github.com) to download the templates and scripts for this solution, and to share your customizations with others.

### Document revisions

<table>
<thead>
<tr>
<th>Date</th>
<th>Change</th>
</tr>
</thead>
<tbody>
<tr>
<td>May 2020</td>
<td>Initial release</td>
</tr>
<tr>
<td>June 2020</td>
<td>Added support for AWS Elemental Link</td>
</tr>
</tbody>
</table>

**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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