Implementation Guide

Live Streaming on AWS with Amazon S3

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Live Streaming on AWS with Amazon S3: Implementation Guide

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Deliver resilient and secure real-time viewing experiences using AWS Elemental MediaLive and Amazon S3 services

Amazon Web Services (AWS) helps 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.

The Live Streaming on AWS with Amazon S3 solution helps you build highly available live video streaming content using AWS Elemental MediaLive and Amazon Simple Storage Service (Amazon S3) services to deliver resilient and secure real-time viewing experiences to your customers.

This solution is 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.

This solution provides the following features:

- Automatically configures MediaLive and Amazon S3 to encode and originate your content for adaptive bitrate streaming across multiple screens via HTTP Live Streaming (HLS).
- Provides an elastic, highly available, global content delivery network for live video streaming using Amazon CloudFront.
- Supports four input types (RTP_PUSH, RTMP_PUSH, URL_PULL, and INPUT_DEVICE) 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.

This implementation guide provides an overview of the Live Streaming on AWS with Amazon S3 solution, its reference architecture and components, considerations for planning the deployment, configuration steps for deploying the solution to the AWS Cloud.

The intended audience for using this solution's features and capabilities in their environment includes solution architects, business decision makers, DevOps engineers, data scientists, and cloud professionals who have practical experience with video streaming and architecting in the AWS Cloud.

Use this navigation table to quickly find answers to these questions:

If you want to . . .	Read . . .
Know the cost for running this solution.	Cost
Understand the security considerations for this solution.	Security
Know how to plan for quotas for this solution.	Quotas
Know which AWS Regions support this solution.	Supported AWS Regions
View or download the AWS CloudFormation template included in this solution to automatically deploy the infrastructure resources (the "stack") for this solution.	AWS CloudFormation template
Access the source code and optionally use the AWS Cloud Development Kit (AWS CDK) to deploy the solution.	GitHub repository

Features and benefits

The solution provides the following features:

Input format support

Supports four input types (RTP_PUSH, RTMP_PUSH, URL_PULL, and INPUT_DEVICE) 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.

Simple configuration

Automatically configures MediaLive and Amazon S3 to encode and originate your content for adaptive bitrate streaming across multiple screens via HTTP Live Streaming (HLS).

Integration with Service Catalog AppRegistry and Application Manager, a capability of AWS Systems Manager

This solution includes a Service Catalog AppRegistry resource to register the solution's CloudFormation template and its underlying resources as an application in both Service Catalog AppRegistry and Application Manager. With this integration, you can centrally manage the solution's resources and enable application search, reporting, and management actions.

Use cases

Streaming Media

As consumer demand for video streaming increases, media and entertainment companies are looking for secure and reliable web-based video streaming alternatives to traditional television. With Live Streaming on AWS with Amazon S3, customers can avoid inefficient trial-and-error approaches and save on time and costs for their streaming media projects.

Concepts and definitions

This section describes key concepts and defines terminology specific to this solution:

application

A logical group of AWS resources that you want to operate as a unit.

Adaptive Bit Rate (ABR)

A streaming method that adjusts the video quality based on network conditions to improve video streaming over HTTP networks.

HTTP Live Streaming (HLS)

A HTTP-based streaming protocol to deliver media over the internet and developed by Apple Inc.

QVBR

Quality-Defined Variable Bitrate is a video encoding technology that uses fewer bits in low-complexitiy periods of content, and more bits during high-completely periods (up to the maximum bitrate) delivering consistently high video quality.

> **Note**
>
> For a general reference of AWS terms, see the AWS Glossary.

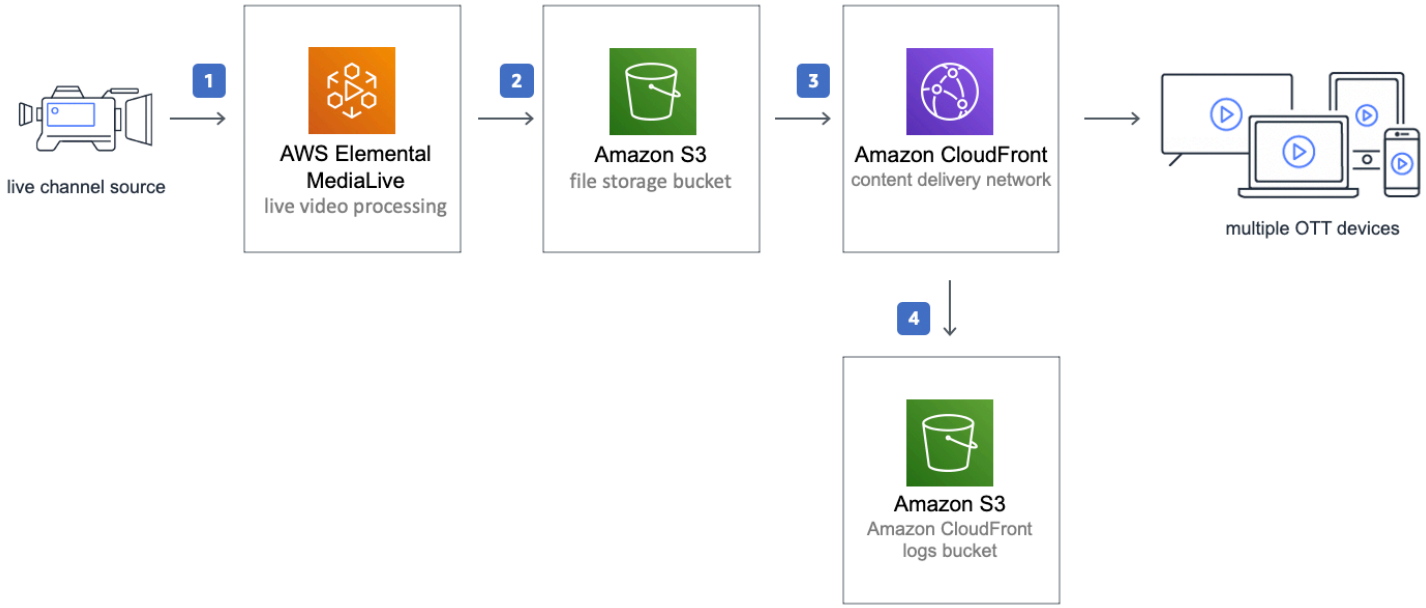
Architecture overview

This section provides a reference implementation architecture diagram for the components deployed with this solution.

Architecture diagram

Deploying this solution with the default parameters deploys the following components in your AWS account.

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.

1. AWS Elemental MediaLive ingests an input feed and transcodes your content into one adaptive bitrate (ABR) HTTP Live Streaming (HLS) stream as output.
2. Amazon Simple Storage Service (Amazon S3) provides a scalable highly available storage bucket to host the encoded segments.
3. An Amazon CloudFront distribution is configured to use the Amazon S3 custom endpoints as its origin. The CloudFront distribution delivers your live stream to viewers with low latency and high transfer speeds.
4. An Amazon S3 bucket stores the CloudFront logs.

You can configure this 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.

> **Note**
>
> AWS CloudFormation resources are created from AWS Cloud Development Kit (AWS CDK) (CDK) constructs.

AWS Well-Architected design considerations

This solution uses the best practices from the AWS Well-Architected Framework, which helps customers design and operate reliable, secure, efficient, and cost-effective workloads in the cloud.

This section describes how the design principles and best practices of the Well-Architected Framework benefit this solution.

Operational excellence

This section describes how we architected this solution using the principles and best practices of the operational excellence pillar.

The Live Streaming on AWS with Amazon S3 solution tracks all assets via AWS CloudTrail. Logs from Medialive, Amazon S3, and Amazon CloudFront provide observability into the infrastructure and the rest of the solution components.

Security

This section describes how we architected this solution using the principles and best practices of the security pillar.

To help reduce latency and improve security, Live Streaming on AWS with Amazon S3 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.

Reliability

This section describes how we architected this solution using the principles and best practices of the reliability pillar.

The solution supports AWS Elemental Link, which offers a configuration-free, cost-efficient way to securely and reliably transfer video to MediaLive.

Performance efficiency

This section describes how we architected this solution using the principles and best practices of the performance efficiency pillar.

This solution uses MediaLive, which is currently available in specific AWS Regions only. To use an AWS Elemental Link device as an input, you must launch this solution in the AWS Region where the device is configured.

The solution is automatically tested and reviewed by solutions architects and subject matter experts for areas to experiment and improve.

Cost optimization

This section describes how we architected this solution using the principles and best practices of the cost optimization pillar.

The cost for running the solution varies based on a number of factors, including the encoded profile selected, the bitrate of the live stream, and the number of viewers.

Customers can measure the efficiency of the workloads, and the costs associated with delivery, by using Application Manager.

Sustainability

This section describes how we architected this solution using the principles and best practices of the sustainability pillar.

Live Streaming on AWS with Amazon S3 uses managed and serverless services, to minimize the environmental impact of the backend services. Customers can run this solution only during the live event and delete the stack after the program ends, reducing the carbon footprint compared to the footprint of continually operating on-premises servers.

Architecture details

This section describes the components and AWS services that make up this solution and the architecture details on how these components work together.

AWS Elemental Link input configuration

This 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 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 need the following:

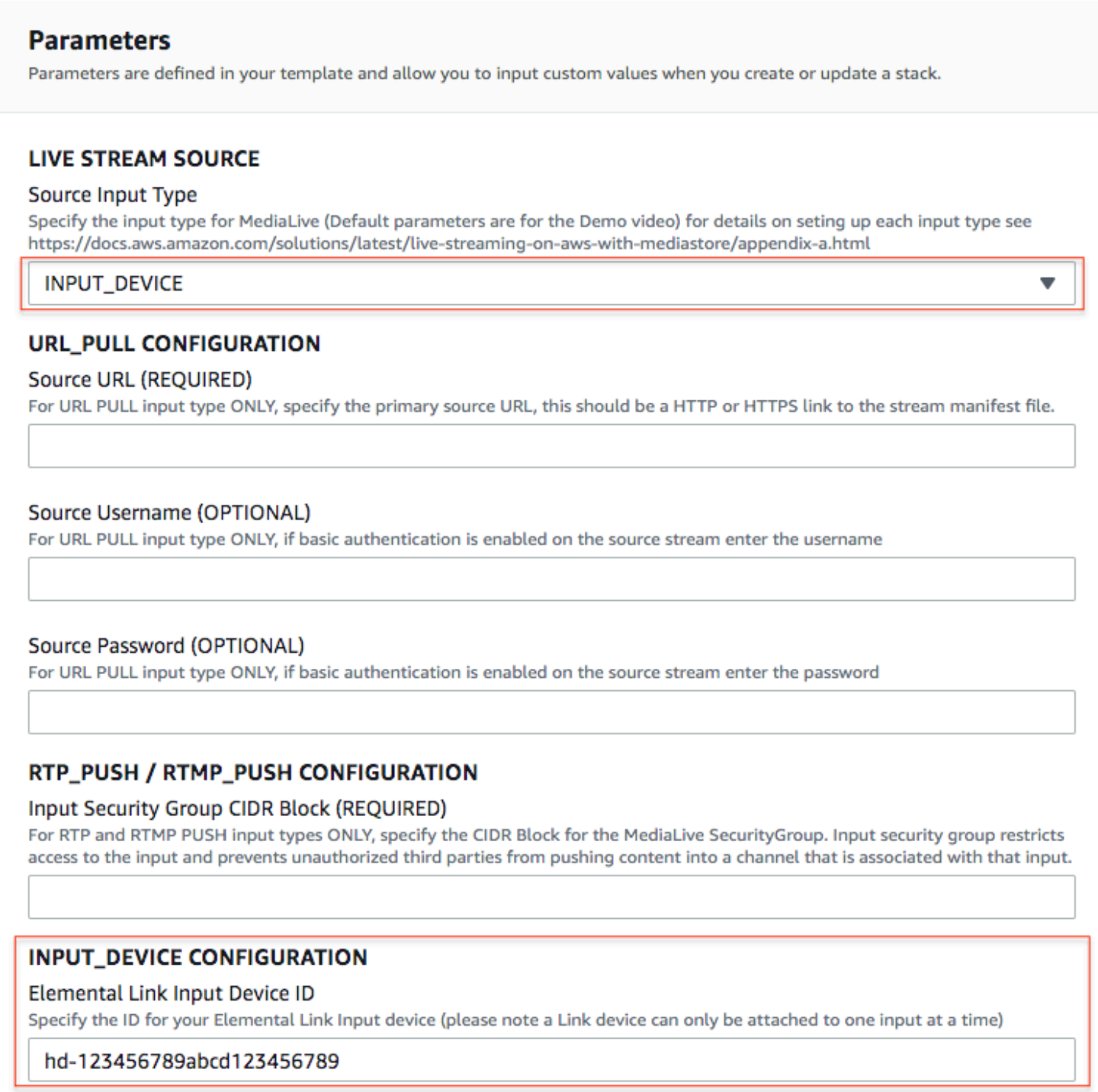
- A Link device powered on and connected to the internet.
- The Link device ID. To find the device ID, sign in to the AWS Elemental MediaLive console and navigate to **MediaLive Devices** in the AWS Region where your device is registered. The device is listed with the Link device ID.

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 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 MediaLive console when you're ready to stream.

> **Note**
>
> For a full list of input types and configuration details, refer to Creating an input in the *AWS Elemental MediaLive User Guide*.

AWS Elemental Link input configuration



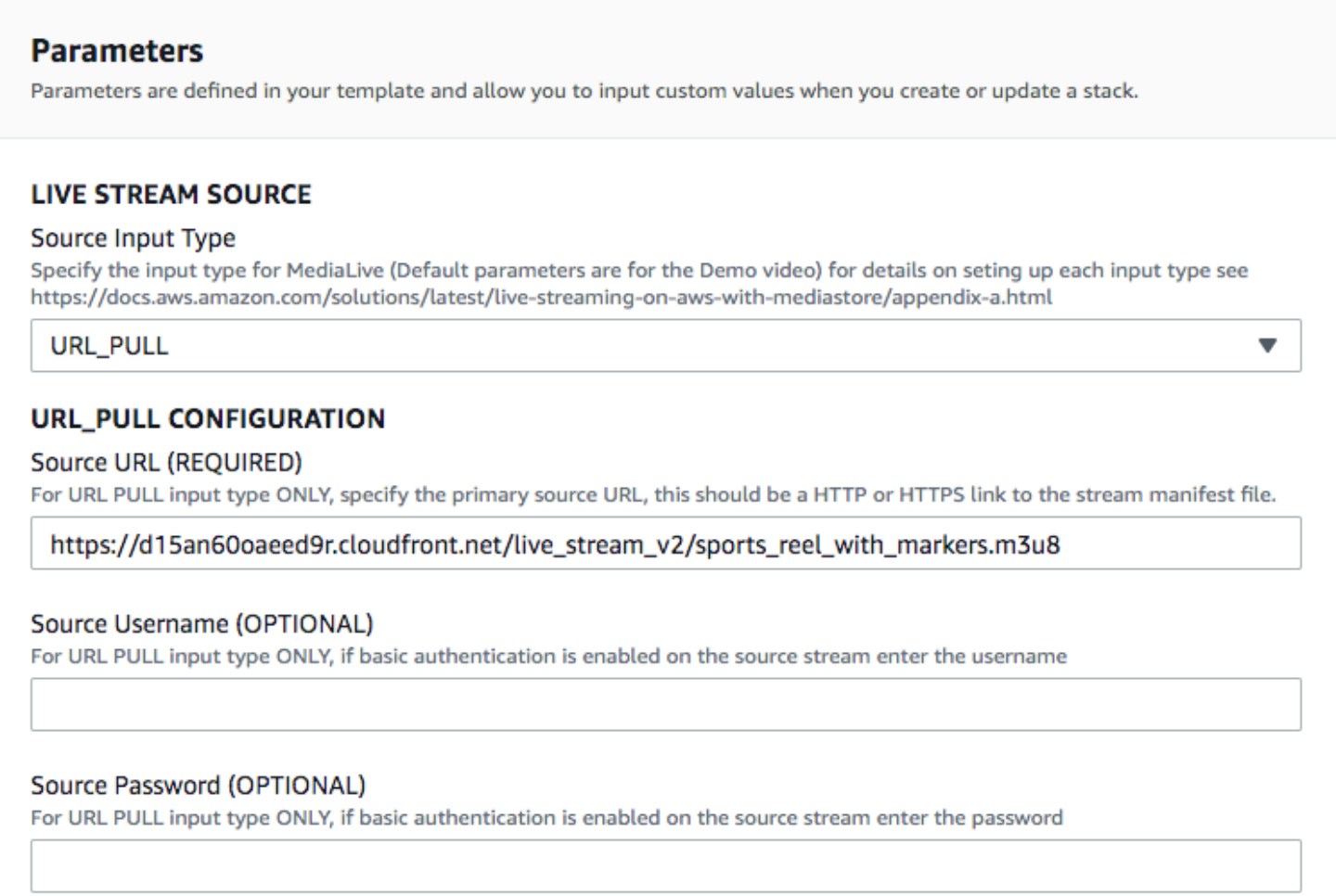
URL Pull (HLS) input configuration

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 Creating an input in the *AWS Elemental MediaLive User Guide* for a full list of input types and configuration details.

URL Pull (HLS) input configuration



RTMP Push and RTP Push input configuration

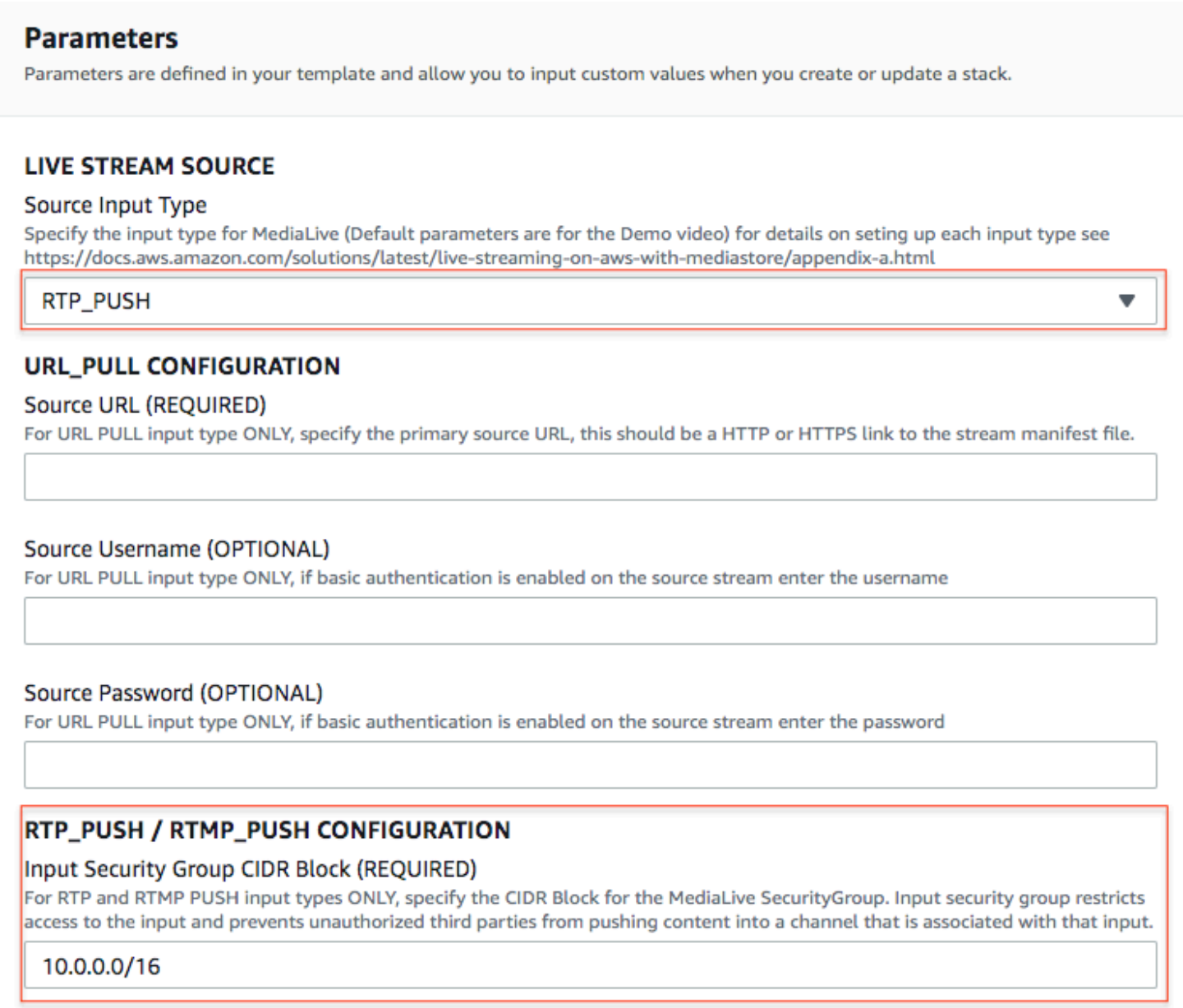
RTP and RTMP Push provide the option to push a transport stream (TS) MediaLive. In both options, the following parameters are required to configure the solution:

- **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.

RTMP Push and RTP Push input configuration



Amazon CloudWatch metrics

The Live Streaming on AWS with Amazon S3 solution activates Amazon CloudWatch metrics to monitor Amazon S3 requests made to the live stream distribution bucket. Out of the 16 metrics available for Amazon S3 requests, the following metrics are used for this solution:

- All requests
- PUT requests
- DELETE requests
- HEAD requests
- LIST requests
- Bytes downloaded
- Bytes uploaded
- 4xx errors
- 5xx errors
- First byte latency
- Total request latency

To deactivate CloudWatch metrics for the live stream distribution bucket, remove the metrics filter:

1. Sign in to the AWS CloudFormation console.
2. On the **Stacks** page, select the solution stack.
3. Select the **Outputs** tab.
4. View bucket metrics by selecting the hyperlink for the **BucketMetrics** output.
5. Choose **Manage filters**, then select the filter.
6. Choose **Delete**.

AWS services in this solution

AWS service	Description
AWS Elemental MediaLive	**Core.** Ingests an input feed and transcodes your content into one adaptive bitrate (ABR) HTTP Live Streaming (HLS) stream as output.
Amazon S3	**Core.** Provides storage to host the encoded segments.
Amazon CloudFront	**Core.** Delivers your live stream to viewers with low latency and high transfer speeds.
Amazon CloudWatch	**Supporting.** Monitors S3 requests made to the distribution bucket.
AWS CloudFormation	**Supporting.** This solution is distributed as a CloudFormation template and stack, which deploy the AWS resources for the solution.
AWS IAM	**Supporting.** Allows for fine-grained access permissions.
AWS Systems Manager	**Supporting.** Provides application-level resource monitoring and visualization of resource operations and cost data.
AWS Elemental Link	**Optional.** Device to connect a video source on-premises to MediaLive.

Plan your deployment

This section describes the cost, security, Regions, and other considerations prior to deploying the solution.

Cost

You are responsible for the cost of the AWS services used while running this solution. As of this revision, the cost for running this solution with default settings in the US East (N. Virginia) Region with:

- Approximately 1,000 viewers for a one-hour live event using a standard definition (SD)-540p encoding profile is approximately **$1.76** for live encoding and packaging + **$67.24** for 791 GB distribution = **$69.00 for the one-hour event**.
- Approximately 10,000 viewers for a one-hour live event using a high definition (HD)-1080p encoding profile is approximately **$3.18** for live encoding and packaging + **$1531.49** for 18,017 GB distribution = **$1,534.67 for the one-hour event**.

These cost estimates depend on many factors, which are detailed in the following cost examples.

> **Note**
>
> The examples provided are likely *higher* than the actual costs of running this solution. The intent was to provide a guide to the pricing that is easily understood. Where assumptions were needed, we used factors that were straightforward to calculate and also likely be more expensive than the actual cost.

For an additional cost example for streaming a live event, refer to FAQs about live streaming on AWS in the *AWS Media Blog*.

Cost example 1

Cost example 1 covers a use case of approximately 1,000 viewers viewing a live event for about one hour with a **SD-540p** encoding profile selected in the CloudFormation template. This cost example is based on the following factors:

- Pricing Region: US-East-1, assuming standard pricing (no free-tier or discounts).
- Viewers consume the highest bitrate: While bitrate consumption is a mix of all the streams, we used the highest bitrate in the calculation to show the upper cost range. Additionally, the Quality-Defined Variable Bitrate (QVBR) and variable video complexity can result in an output bandwidth that is 10-50% lower in price than the estimate provided in Table 1.
- 99% cache/hit ratio between the content delivery network (CDN) and Amazon S3.

> **Note**
>
> Storage of the test player is not included in this cost estimate.

Table 1 summarizes the total pricing for the live streaming event. Tables 2 through 4 breaks down the cost for each AWS service.

Table 1: Cost breakdown for 1,000 viewers for a one-hour live event

AWS service	Function	Cost per hour [USD]
AWS Elemental MediaLive	Input and outputs for channel	$1.71
Amazon S3	Storage	$0.01
	Requests	$0.04
Amazon CloudFront	Distribution	$67.24
	Total:	$69.00

AWS Elemental MediaLive pricing

Table 2 breaks down the MediaLive pricing which assumes HD AVC input and SD AVC outputs with less than 10 Mbps bitrate and less than 30 frames per second (fps) frame rate.

Table 2: MediaLive pricing

Input / output	Cost per hour [USD]
HD Input (AVC 10-20Mbps)	$0.294
Output 1 SD (512x288, 400k)	$0.354
Output 2 SD (640x360, 800k)	$0.354
Output 3 SD (768x432, 1,200k)	$0.354
Output 4 SD (960x540, 1,800k)	$0.354
Total:	$1.71

Amazon S3 pricing

Amazon S3 charges $0.023 per Gigabyte (GB) per month for the first 50 Terabytes (TB) stored in the bucket. The volume of storage billed in a month is based on the average storage used throughout the month. This can be determined by size of objects and how long they are stored. For this example, 21 segments for 4 bitrates are stored at all times. The cost of storage per hour is as follows:

1. Add the bitrate of all streams in Kbps:
   - 400k + 800k + 1,200k + 1,800k = 4,200 Kbps
2. Calculate size of four-second segment (for all bitrates combined):
   - 4,200 Kbps * 4 seconds = 16,800 Kb
3. Total size of segments stored at a time:
   - 16,800 Kb * 21 segments = 352,800 Kb
4. Total Kb-hour usage:
   - 352,800 Kb * 1 hour storage = 352,800 Kb-hours
5. Convert to GB-months:
   - 352,800 Kb-hours / 8 bits per byte / 1,000,000 Kb per GB / 744 hours in month = 0.00006 GB-months

0.00006 GB-months * $0.023 = $0.000001 per hour of storage

The cost will continue to accumulate per hour as long as the objects are not removed from the bucket. Cost of storage is billed monthly.

Table 3: Amazon S3 storage pricing

Input / output	Kbps
Output 1 SD (512x288, 400k)	400
Output 2 SD (640x360, 800k)	800
Output 3 SD (768x432, 1,200k)	1,200
Output 4 SD (960x540, 1,800k)	1,800
Total Kbps:	4,200
Compute total Kb stored **4200 kbps * 4 seconds * 21 segments**	352,800 Kb
GB-month usage for one hour	0.00006 GB
Cost (GB/hour *$0.023)	$0.000001/hour

Amazon S3 charges $0.005 per 1,000 requests for PUT, COPY, POST, and LIST requests. This example has four input streams, so the number of requests can be approximated by the following:

1. Calculate the number of segments:
   - 3,600 seconds of content / 4 second segments = 900 segments
   - 900 segments * 4 input streams = 3,600 segments
2. Calculate the number of manifest updates:
   - 4 input streams * 3,600 seconds of content / updates every 4 seconds = 3,600 manifest updates
3. Add total segments to total manifest updates to get the number of PUT requests:
   - 3,600 + 3,600 = 7,200 PUT requests per hour

Table 4: Amazon S3 request pricing

Request	Quantity
PUT ts segments	3,600
PUT manifest files	3,600
Total requests:	7,200
Cost (total requests/1000 * $0.005)	$0.036/hour

Data transfers from S3 to Amazon CloudFront are free of charge.

Viewer traffic pricing

The cost estimate for viewer traffic assumes that all viewers get the highest bitrate for the one-hour live streaming event.

Table 5: Viewer traffic pricing

AWS service	Function	Cost per hour [USD]
Amazon CloudFront	Average Mbps per viewer	1.8
	Total MB per second (1,000 x 1.8 / 8)	225
	Total egress per hour (225 / 1,024 x 60 x 60)	791 GB/hour
	Total (791 GB * $0.085):	$67.24

Cost example 2

Cost example 2 covers a use case of approximately 10,000 viewers viewing a live event for about one hour with an **HD-1080p** encoding profile selected in the CloudFormation template. This cost example is based on the following factors:

- Pricing Region: US-East-1, assuming standard pricing (no free-tier or discounts).

- Viewers consume the highest bitrate: Note that bitrate consumption is a mix of all the streams, but the highest bitrate is used in the calculation to show the upper cost range. Additionally, the QVBR and variable video complexity can result in an output bandwidth that is 10-50% lower in price than the estimate provided in Table 6.
- 99% cache/hit ratio between the CDN and Amazon S3.

Note: Storage of the test player is not included in this cost estimate.

Table 6 summarizes the total pricing for the live streaming event. Tables 7 through 10 break down the cost for each AWS service.

Table 6: Cost breakdown for 10,000 viewers for a one-hour live event

AWS service	Function	Cost per hour [USD]
AWS Elemental MediaLive	Input and outputs for channel	$3.11
Amazon S3	Storage	$0.01
	Requests	$0.06
Amazon CloudFront	Distribution	$1,531.49
	Total:	$1,534.67

AWS Elemental MediaLive pricing

Table 7 breaks down the MediaLive pricing which assumes HD AVC input and both SD and HD AVC outputs with less than 10 Mbps bit rate and less than 30 fps frame rate.

Table 7: MediaLive pricing

Input / output	Cost per hour [USD]
HD Input (AVC, 10-20Mpbs)	$0.294
Output 1 SD (512x288, 400k)	$0.354
Output 2 SD (640x360, 800k)	$0.354

Input / output	Cost per hour [USD]
Output 3 SD (768x432, 1,200k)	$0.354
Output 4 SD (960x540, 1,800k)	$0.354
Output 5 HD (1280x720p, 2,700k)	$0.702
Output 6 HD (1920x1080p, 4,100k)	$0.702
Total:	$3.11

Amazon S3 pricing

As detailed in Cost Example 1, Amazon S3 pricing is based on GB of storage per month. Table 8 shows the conversion from Kbps to Kb stored to GB/month usage to get the total GB of storage for the hour-long stream.

Table 8 : Amazon S3 storage pricing

Input / output	Kbps
Output 1 (512x288_400k)	400
Output 2 (640x360_800k)	800
Output 3 (768x432_1,200k)	1,200
Output 4 (960x540_1,800k)	1,800
Output 5 (1280x720p_2,700k)	2,700
Output 6 (1920x1080p_4,100k)	4,100
Total Kbps	11,000
Compute total Kb stored **11,000 Kbps * 4 seconds * 21 segments**	924,000 Kb
GB-month usage for one hour	0.0002

Input / output	Kbps
924,000 Kb-hours / 8 bits per byte / 1,000,000 Kb per GB / 744 hours	
Total (GB/hour * $0.023)	$ 0.000005

Table 9: Amazon S3 request pricing

Request	Quantity
PUT ts segments	5,400
PUT manifest files	5,400
Total requests:	10,800
Cost (total requests/1000 * $0.005)	$0.054/hour

Estimating the viewer traffic

The cost estimate for viewer traffic assumes that all viewers get the highest bitrate for the one-hour live streaming event.

Table 10: Viewer traffic pricing

AWS service	Function	Total
Amazon CloudFront	Average Mbps per viewer	4.10
	Total MB per sec (10,000 x 4.1 / 8)	5,125
	Total egress per hour (5,125 / 1,024 x 60 x 60)	18,017 GB/hour
	Total cost (18,017 GB * $0.085):	$1,531.49

Note

Pricing is per minute, with a minimum of 10 minutes. Prices are subject to change.

Amazon CloudWatch metrics cost

Amazon CloudWatch charges $0.30 per metric per month for the first 10,000 metrics. This solution uses 11 metrics, so the cost for an hour-long stream can be determined by:

11 (number of metrics) * 1 (hours of streaming) / 720 (hours per month) * $0.30 = $0.005

For more information about metrics, refer to Amazon CloudWatch metrics.

We recommend creating a budget through AWS Cost Explorer to help manage costs. Prices are subject to change. For full details, refer to the pricing webpages for each AWS service used in this solution.

Security

When you build systems on AWS infrastructure, security responsibilities are shared between you and AWS. This shared responsibility model reduces your operational burden because AWS operates, manages, and controls the components including the host operating system, the virtualization layer, and the physical security of the facilities in which the services operate. For more information about AWS security, visit AWS Cloud Security.

IAM roles

IAM roles allow customers to assign granular access policies and permissions to services and users on the AWS Cloud. This solution creates IAM roles that grant the solution's AWS Lambda functions access to create Regional resources.

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 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 in the *Amazon CloudFront Developer Guide*.

Supported AWS Regions

This solution uses the MediaLive service, which is not currently available in all AWS Regions. For the most current availability of AWS services by Region, see the AWS Regional Services List.

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

Live Streaming on AWS with Amazon S3 is available in the following AWS Regions:

Region name	
US East (Ohio)	Canada (Central)
US East (N. Virginia)	Europe (Frankfurt)
US West (Oregon)	Europe (Ireland)
Asia Pacific (Mumbai)	Europe (London)
Asia Pacific (Seoul)	Europe (Paris)
Asia Pacific (Singapore)	Europe (Stockholm)
Asia Pacific (Sydney)	South America (Sao Paulo)
Asia Pacific (Tokyo)	

Quotas

Service quotas, also referred to as limits, are the maximum number of service resources or operations for your AWS account.

Quotas for AWS services in this solution

Make sure you have sufficient quota for each of the services implemented in this solution. For more information, see AWS service quotas.

Use the following links to go to the page for that service. To view the service quotas for all AWS services in the documentation without switching pages, view the information in the Service endpoints and quotas page in the PDF instead.

AWS CloudFormation quotas

Your AWS account has AWS CloudFormation quotas that you should be aware of when launching the stack in this solution. By understanding these quotas, you can avoid limitation errors that would prevent you from deploying this solution successfully. For more information, see AWS CloudFormation quotas in the in the *AWS CloudFormation User's Guide*.

Encoding profiles

The Live Streaming on AWS with Amazon S3 solution configures 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

Demo content

The solution includes a link to a demo HTTP Live Streaming (HLS) stream hosted in an Amazon S3 bucket, which lets you test the solution without having to set up and configure a live stream. Deploying the solution with default parameters, launches the demo.

Solution updates

To continue using this solution with the latest features and improvements, you must deploy the latest version of the AWS CloudFormation template as a new stack. This solution does not support updating an existing stack. For information to deploy the latest AWS CloudFormation template as a new stack, refer to Launch the stack. After the new stack completes deployment, we recommend uninstalling the previous version to save on costs.

Deploy the solution

This solution uses AWS CloudFormation templates and stacks to automate its deployment. The CloudFormation template specifies the AWS resources included in this solution and their properties. The CloudFormation stack provisions the resources that are described in the template.

Before you launch the solution, review the cost, architecture, network security, and other considerations discussed earlier in this guide.

Time to deploy: Approximately five minutes

Important

This solution includes an option to send anonymized operational metrics to AWS. We use this data to better understand how customers use this solution and related services and products. AWS owns the data gathered though this survey. Data collection is subject to the AWS Privacy Notice.

To opt out of this feature, download the template, modify the AWS CloudFormation mapping section, and then use the AWS CloudFormation console to upload your updated template and deploy the solution. For more information, see the Anonymized data collection section of this guide.

AWS CloudFormation template

You can download the CloudFormation template for this solution before deploying it.

View template

live-streaming-on-aws-with-amazon-s3.template - Use this template to launch the solution and all associated components. The default configuration deploys the core and supporting services found in the AWS services in this solution section, but you can customize the template to meet your specific needs.

Note

AWS CloudFormation resources are created from AWS CDK constructs.

Launch the stack

Follow the step-by-step instructions in this section to configure and deploy the solution into your account.

Time to deploy: Approximately five minutes

1. Sign in to the AWS Management Console and select the button to launch the `live-streaming-on-aws-with-amazon-s3.template` AWS CloudFormation template.

   Launch solution

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

   > **Note**
   >
   > This solution uses MediaLive, which is currently available in specific AWS Regions only. Therefore, you must launch this solution in an AWS Region where this service is available. For the most current service availability by Region, refer to the AWS Regional Services List.

3. On the **Create stack** page, verify that the correct template URL is in the **Amazon S3 URL** text box and choose **Next**.
4. On the **Specify stack details** page, assign a name to your solution stack. For information about naming character limitations, see IAM and AWS STS quotas, name requirements, and character limits in the *AWS Identity and Access Management User Guide*.
5. Under **Parameters**, review the parameters for this solution template and modify them as necessary. This solution uses the following default values.

Parameter	Default	Description
Source Input Type	URL_PULL	Specify the input type for MediaLive: RTP_PUSH, RTMP_PUSH , URL_PULL (HLS), or INPUT_DEVICE (AWS Elemental Link).

Parameter	Default	Description
		Detailed instructions for each input type can be found in the appendix.
Source URL	*<Optional input>*	If you selected URL_PULL for **Source Input Type**, enter the URL for your source stream. By default, this parameter contains the primary demo source URL.
Source Username	*<Optional input>*	If you selected URL_PULL for **Source Input Type**, enter the username for your source stream if using authentic ation. This value will be stored securely in AWS Systems Manager Parameter Store.
Source Password	*<Optional input>*	If you selected URL_PULL for **Source Input Type**, enter the password for you source stream if using authentic ation. This value will be stored securely in AWS Systems Manager Parameter Store.

Parameter	Default	Description
Input Security Group CIDR Block	*<Optional input>*	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 you your source stream location/network.
Encoding Profile	HD-720p	Specify the encoding profile to use with MediaLive.
Start MediaLive Channel	No	Choose whether to start the MediaLive channel when the solution is created. We recommend starting the channel if using the demo preview player.

6. Select **Next**.
7. On the **Configure stack options** page, choose **Next**.
8. On the **Review and create** page, review and confirm the settings. Select the box acknowledging that the template will create IAM resources.
9. Choose **Submit** to deploy the stack.

You can view the status of the stack in the AWS CloudFormation console in the **Status** column. You should receive a CREATE_COMPLETE status 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, refer to Amazon CloudWatch metrics.

Monitor the solution with Service Catalog AppRegistry

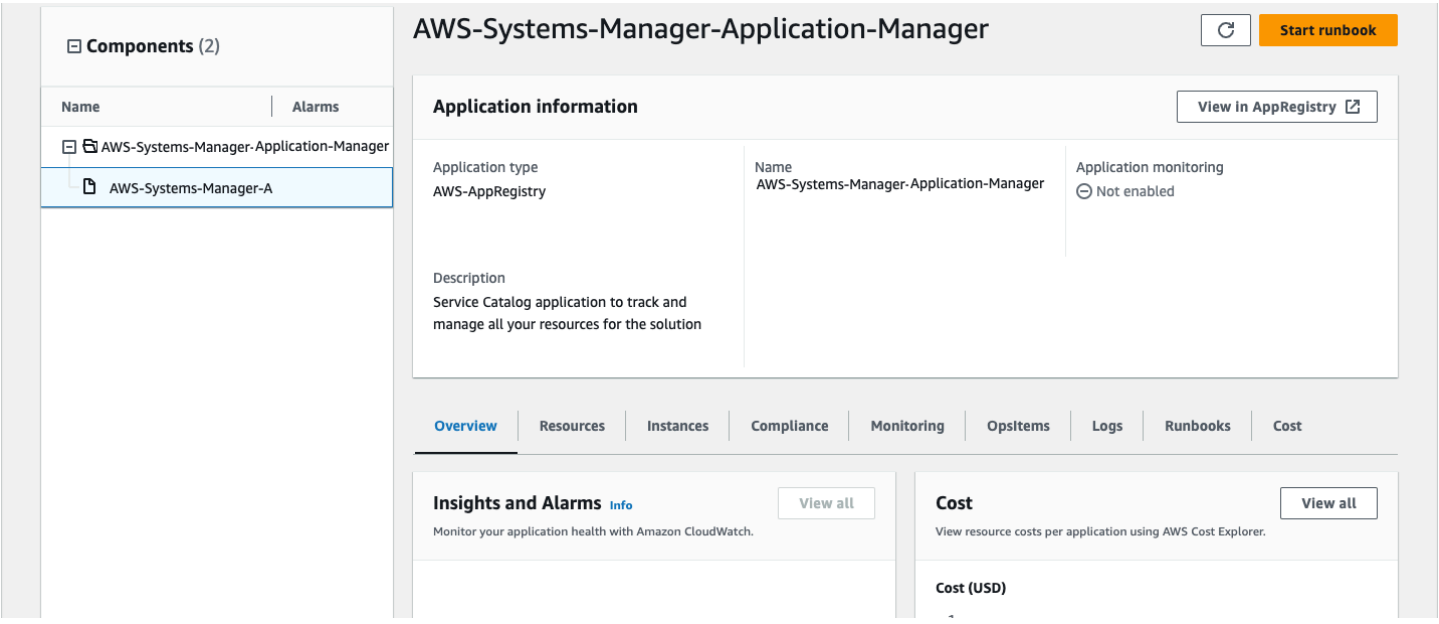
The solution includes a Service Catalog AppRegistry resource to register the CloudFormation template and underlying resources as an application in both Service Catalog AppRegistry and AWS Systems Manager Application Manager.

AWS Systems Manager Application Manager gives you an application-level view into this solution and its resources so that you can:

- Monitor its resources, costs for the deployed resources across stacks and AWS accounts, and logs associated with this solution from a central location.
- View operations data for the resources of this solution in the context of an application. For example, deployment status, CloudWatch alarms, resource configurations, and operational issues.

The following figure depicts an example of the application view for the solution stack in Application Manager.

Depicts solution stack in Application Manager



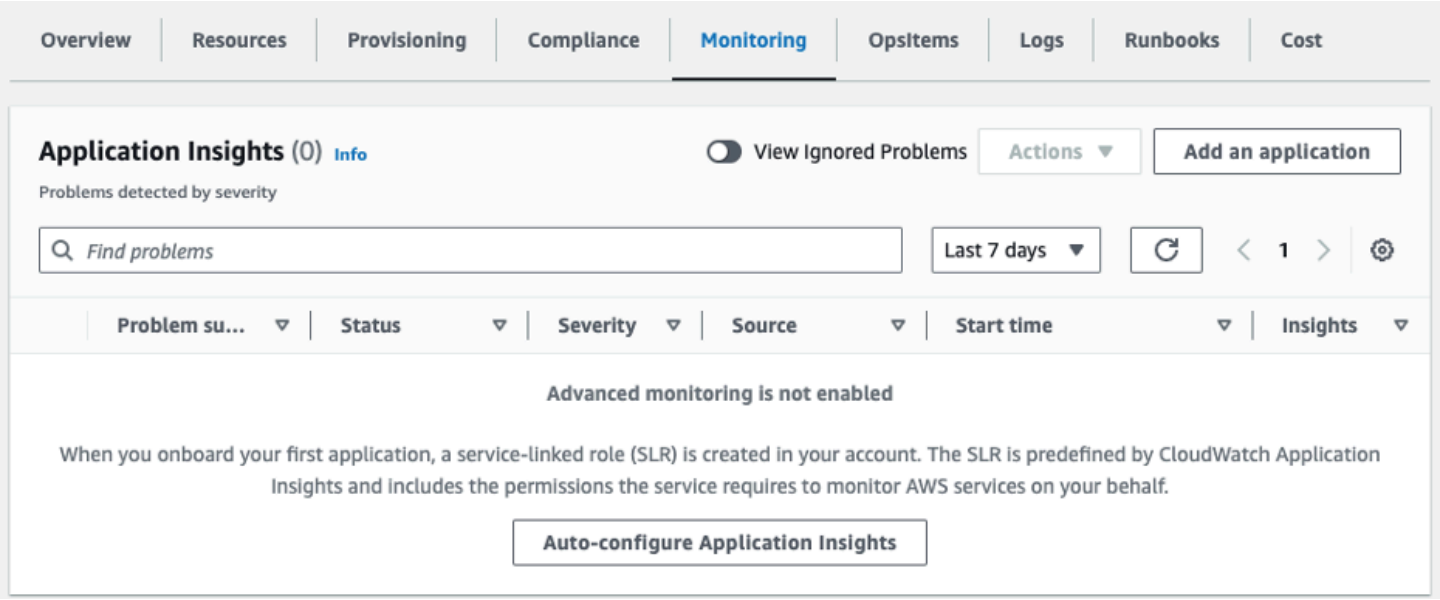
Activate CloudWatch Application Insights

1. Sign in to the Systems Manager console.

2. In the navigation pane, choose **Application Manager**.
3. In **Applications**, search for the application name for this solution and select it.

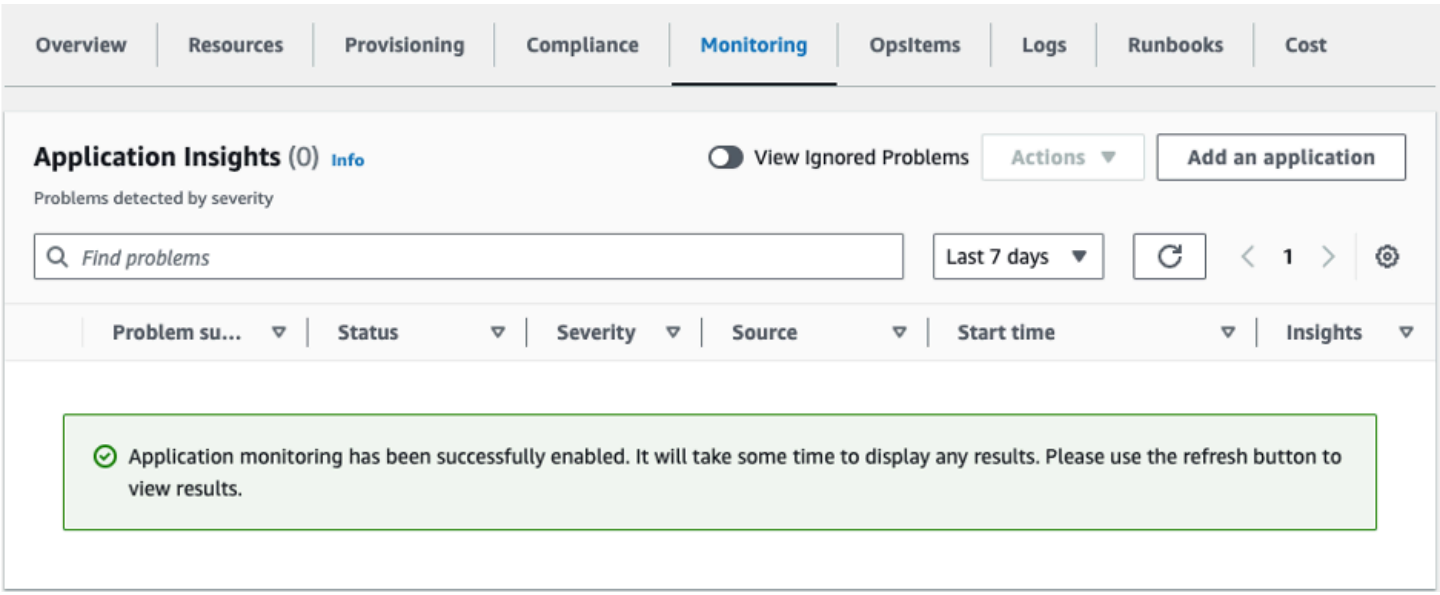
   The application name will have **App Registry** in the **Application Source** column, and will have a combination of the solution name, Region, account ID, or stack name.
4. In the **Components** tree, choose the application stack you want to activate.
5. In the **Monitoring** tab, in **Application Insights**, select **Auto-configure Application Insights**.

Application Insights dashboard showing no detected problems and option to auto-configure.



Monitoring for your applications is now activated and the following status box appears:

Application Insights dashboard showing successful monitoring activation message.



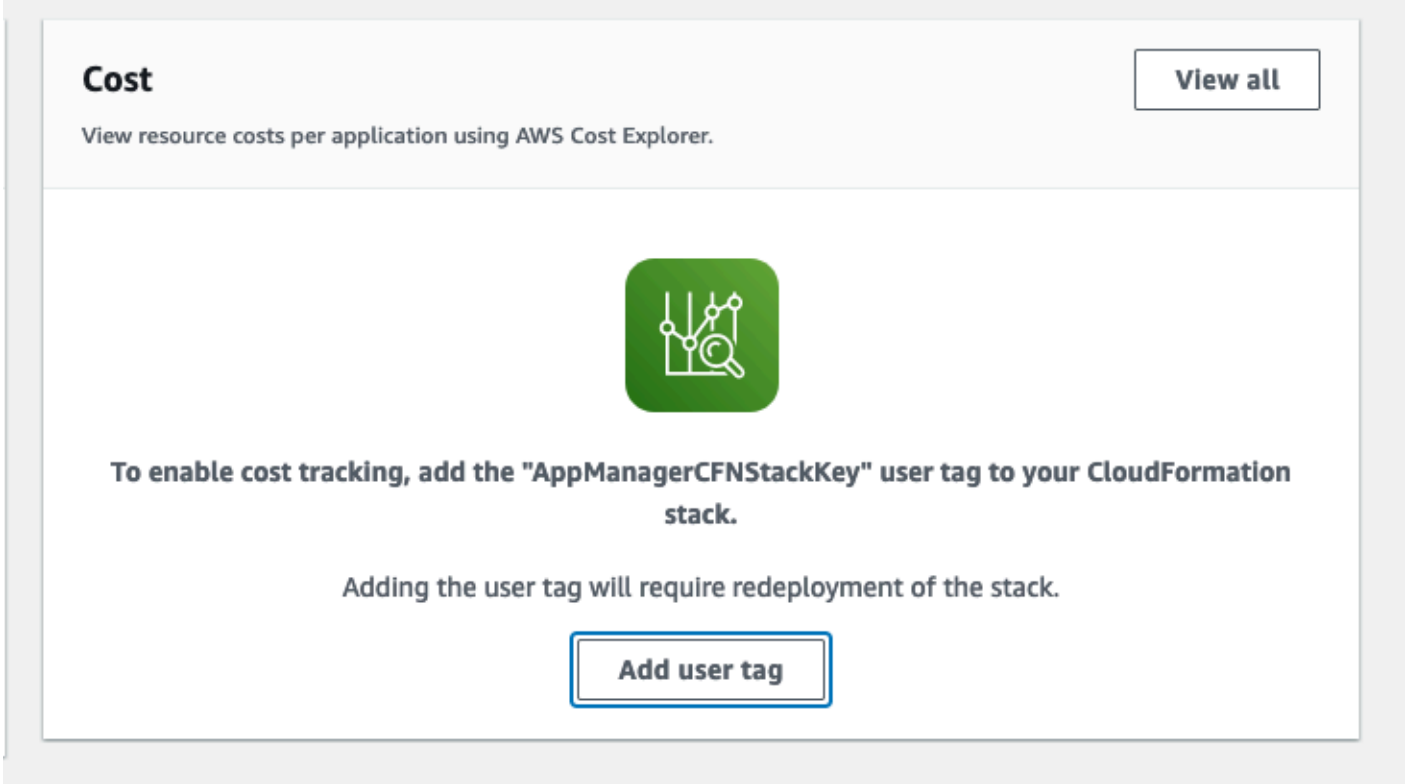
Confirm cost tags associated with the solution

After you activate cost allocation tags associated with the solution, you must confirm the cost allocation tags to see the costs for this solution. To confirm cost allocation tags:

1. Sign in to the Systems Manager console.
2. In the navigation pane, choose **Application Manager**.
3. In **Applications**, choose the application name for this solution and select it.

   The application name will have **App Registry** in the **Application Source** column, and will have a combination of the solution name, Region, account ID, or stack name.
4. In the **Overview** tab, in **Cost**, select **Add user tag**.

   Screenshot depicting the Application Cost add user tag screen



5. On the **Add user tag** page, enter `confirm`, then select **Add user tag**.

The activation process can take up to 24 hours to complete and the tag data to appear.

Activate cost allocation tags associated with the solution

After you activate Cost Explorer, you must activate the cost allocation tags associated with this solution to see the costs for this solution. The cost allocation tags can only be activated from the management account for the organization. To activate cost allocation tags:

1. Sign in to the AWS Billing and Cost Management and Cost Management console.
2. In the navigation pane, select **Cost Allocation Tags**.
3. On the **Cost allocation tags** page, filter for the AppManagerCFNStackKey tag, then select the tag from the results shown.
4. Choose **Activate**.

AWS Cost Explorer

You can see the overview of the costs associated with the application and application components within the Application Manager console through integration with AWS Cost Explorer, which must be first activated. Cost Explorer helps you manage costs by providing a view of your AWS resource costs and usage over time. To activate Cost Explorer for the solution:

1. Sign in to the AWS Cost Management console.
2. In the navigation pane, select **Cost Explorer** to view the solution's costs and usage over time.

Update the solution

If you have previously deployed the solution, use the following instructions to upgrade your solution to the latest version:

1. Uninstall the previously deployed solution. Refer to Uninstall the solution.
2. Launch the latest template. Refer to Launch the stack.

Troubleshooting

If you need help with this solution, contact Support to open a support case for this solution.

Contact Support

If you have AWS Developer Support, AWS Business Support, or AWS Enterprise Support, you can use the Support Center to get expert assistance with this solution. The following sections provide instructions.

Create case

1. Sign in to Support Center.
2. Choose **Create case**.

How can we help?

1. Choose **Technical**.
2. For **Service**, select **Solutions**.
3. For **Category**, select **Other Solutions**.
4. For **Severity**, select the option that best matches your use case.
5. When you enter the **Service**, **Category**, and **Severity**, the interface populates links to common troubleshooting questions. If you can't resolve your question with these links, choose **Next step: Additional information**.

Additional information

1. For **Subject**, enter text summarizing your question or issue.
2. For **Description**, describe the issue in detail.
3. Choose **Attach files**.
4. Attach the information that Support needs to process the request.

Help us resolve your case faster

1. Enter the requested information.
2. Choose **Next step: Solve now or contact us**.

Solve now or contact us

1. Review the **Solve now** solutions.
2. If you can't resolve your issue with these solutions, choose **Contact us**, enter the requested information, and choose **Submit**.

Uninstall the solution

You can uninstall the Live Streaming on AWS with Amazon S3 solution from the AWS Management Console, or by using the AWS Command Line Interface (AWS CLI). You must manually delete the Amazon S3 buckets created by this solution. AWS Solutions do not automatically delete these resources in case you have stored data to retain.

Using the AWS Management Console

1. Sign in to the CloudFormation console.
2. On the **Stacks** page, select this solution's installation stack.
3. Choose **Delete**.

Using AWS Command Line Interface

Determine whether the AWS Command Line Interface (AWS CLI) is available in your environment. For installation instructions, see What Is the AWS Command Line Interface in the *AWS CLI User Guide*. After confirming that the AWS CLI is available, run the following command.

```
$ aws cloudformation delete-stack --stack-name <installation-stack-name>
```

Deleting the Amazon S3 buckets

This solution is configured to retain the solution-created Amazon S3 buckets if you decide to delete the AWS CloudFormation stack to prevent accidental data loss. After uninstalling the solution, you can manually delete this S3 bucket if you do not need to retain the data. Follow these steps to delete the Amazon S3 buckets.

1. Sign in to the Amazon S3 console.
2. Choose **Buckets** from the left navigation pane.
3. Locate the *<stack-name>* S3 buckets.
4. Select the S3 buckets and choose **Delete**.

To delete the S3 buckets using AWS CLI, run the following command:

```
$ aws s3 rb s3://<bucket-name> --force
```

Alternatively, you can configure the AWS CloudFormation template to delete the Amazon S3 buckets automatically. Before deleting the stack, change the deletion behavior in the AWS CloudFormation DeletionPolicy attribute.

Developer guide

This section provides the source code for the solution.

Source code

Visit our GitHub repository to download the source files for this solution and to share your customizations with others.

The AWS CDK generates the Live Streaming on AWS with Amazon S3 template. See the README.md file on the GitHub repository for additional information.

Reference

This section includes information about an optional feature for collecting unique metrics for this solution and a list of builders who contributed to this solution.

Anonymized data collection

This solution includes an option to send anonymized operational metrics to AWS. We use this data to better understand how customers use this solution and related services and products. When invoked, 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 on AWS with Amazon S3 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

AWS owns the data gathered though this survey. Data collection is subject to the Privacy Notice. To opt out of this feature, complete the following steps before launching the AWS CloudFormation template.

1. Download the `live-streaming-on-aws-with-amazon-s3.template` AWS CloudFormation template to your local hard drive.
2. Open the CloudFormation template with a text editor.
3. Modify the CloudFormation template mapping section from:

```
AnonymizedData:
 SendAnonymizedData:
 Data: Yes
```

to:

```
AnonymizedData:
 SendAnonymizedData:
 Data: No
```

4. Sign in to the AWS CloudFormation console.
5. Select **Create stack**.
6. On the **Create stack** page, **Specify template** section, select **Upload a template file**.
7. Under **Upload a template file**, choose **Choose file** and select the edited template from your local drive.
8. Choose **Next** and follow the steps in Launch the stack in the Deploy the solution section of this guide.

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Revisions

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Visit the CHANGELOG.md in our GitHub repository to track version-specific improvements and fixes.

Notices

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