

# Module 11 - Guided Lab: Streaming Dynamic Content using Amazon CloudFront

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## Lab overview and objectives

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In this lab, you will use Amazon CloudFront to deliver a dynamic, multiple bit-rate stream to a connected device using Apple's HTTP Live Streaming (HLS) protocol. The stream can be played on any browser that supports the HLS protocol. In this lab, you will also use Amazon Elastic Transcoder to convert a source video into multiple bit-rates that will be delivered using CloudFront.

After completing this lab, you should be able to:

- Create multiple bit-rate versions of a given source media file using Amazon Elastic Transcoder.
- Use Amazon CloudFront to deliver the dynamic (multi bit-rate) stream created by Amazon Elastic Transcoder.

At the **end** of this lab, your architecture will look like the following example:



### ##Duration

This lab will require approximately **30 minutes** to complete.

## AWS service restrictions

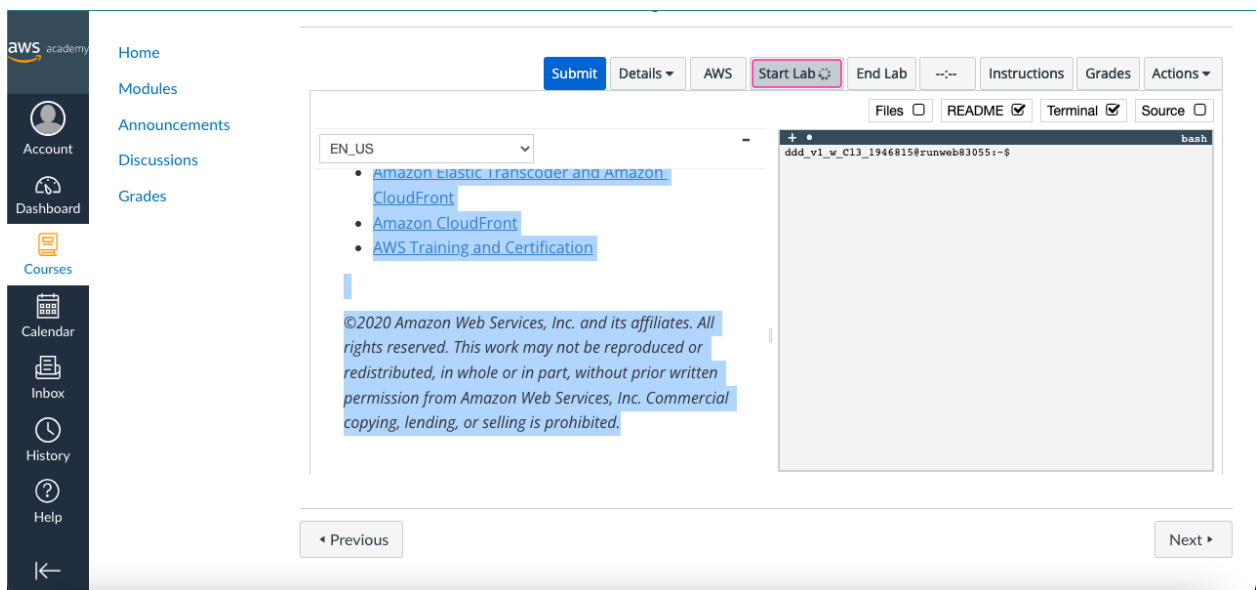
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In this lab environment, access to AWS services and service actions might be restricted to the ones that are needed to complete the lab instructions. You might encounter errors

if you attempt to access other services or perform actions beyond the ones that are described in this lab.

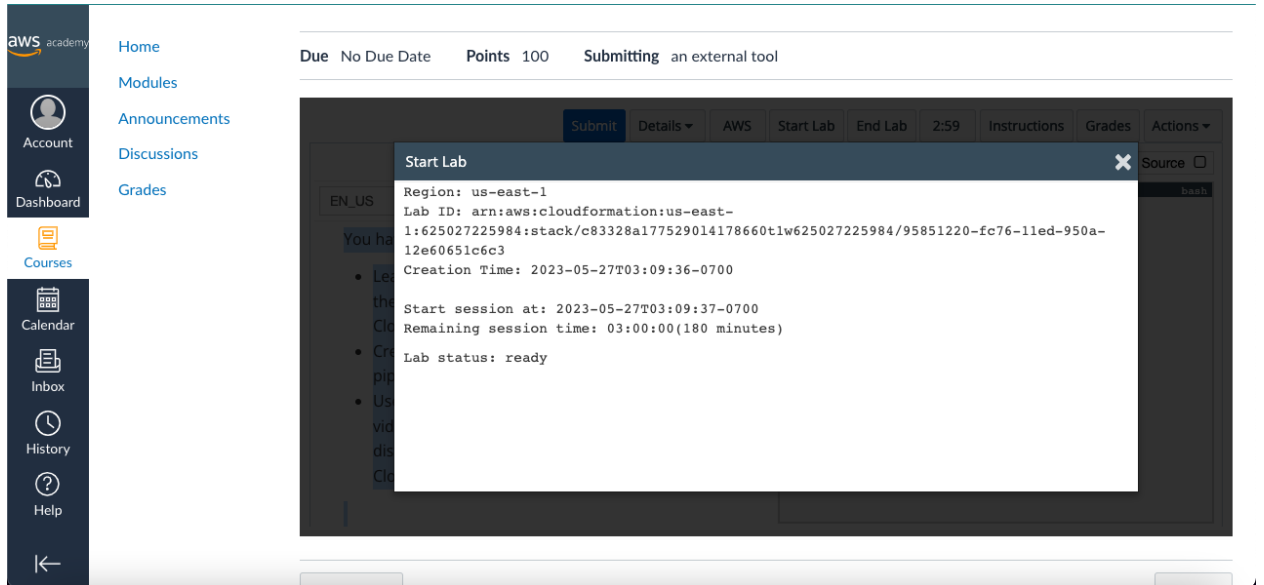
## Accessing the AWS Management Console

1. At the top of these instructions, choose **Start Lab** to launch your lab. A **Start Lab** panel opens, and it displays the lab status.



**Tip:** If you need more time to complete the lab, restart the timer for the environment by choosing the **Start Lab** button again.

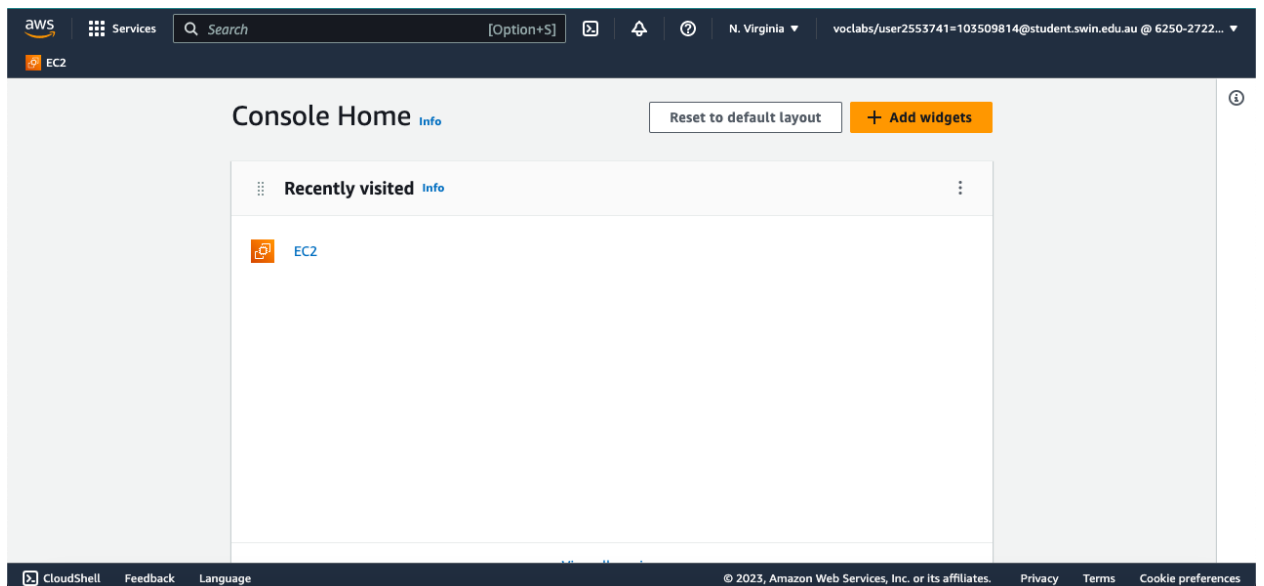
2. Wait until the **Start Lab** panel displays the message *Lab status: ready*, then close the panel by choosing the **X**.



3. At the top of these instructions, choose **AWS**.

This action opens the AWS Management Console in a new browser tab. The system automatically logs you in.

**Tip:** If a new browser tab does not open, a banner or icon is usually at the top of your browser with the message that your browser is preventing the site from opening pop-up windows. Choose the banner or icon, and then choose **Allow pop-ups**.



4. Arrange the **AWS Management Console** tab so that it displays alongside these instructions. Ideally, you will have both browser tabs open at the same time so

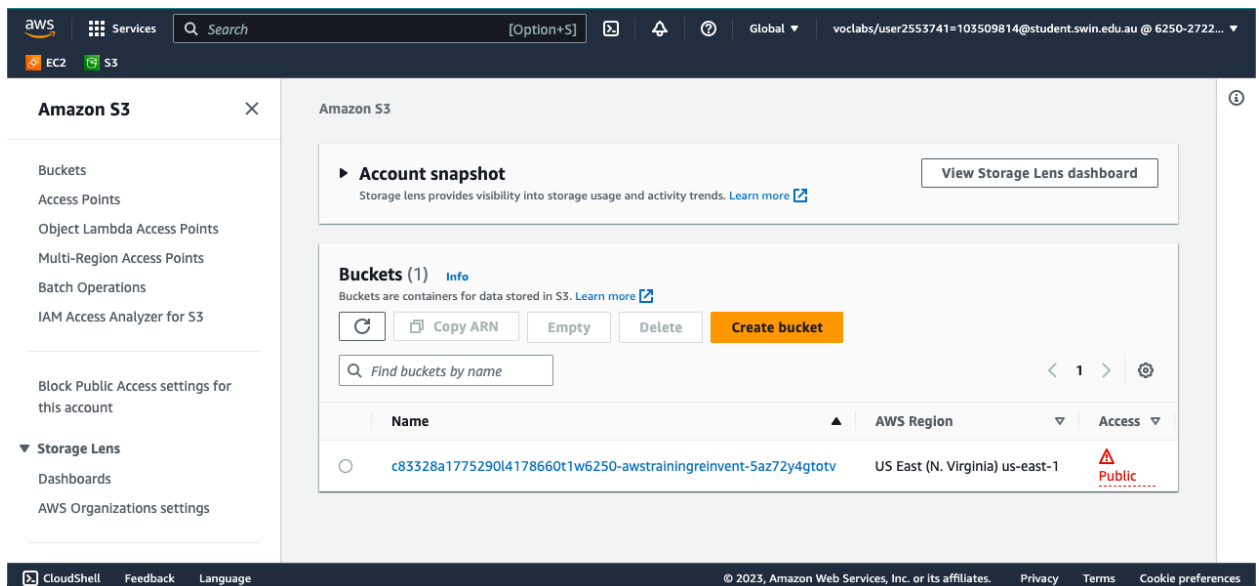
that you can follow the lab steps more easily.

**Do not change the Region unless specifically instructed to do so.**

## Task 1: Lab Preparation

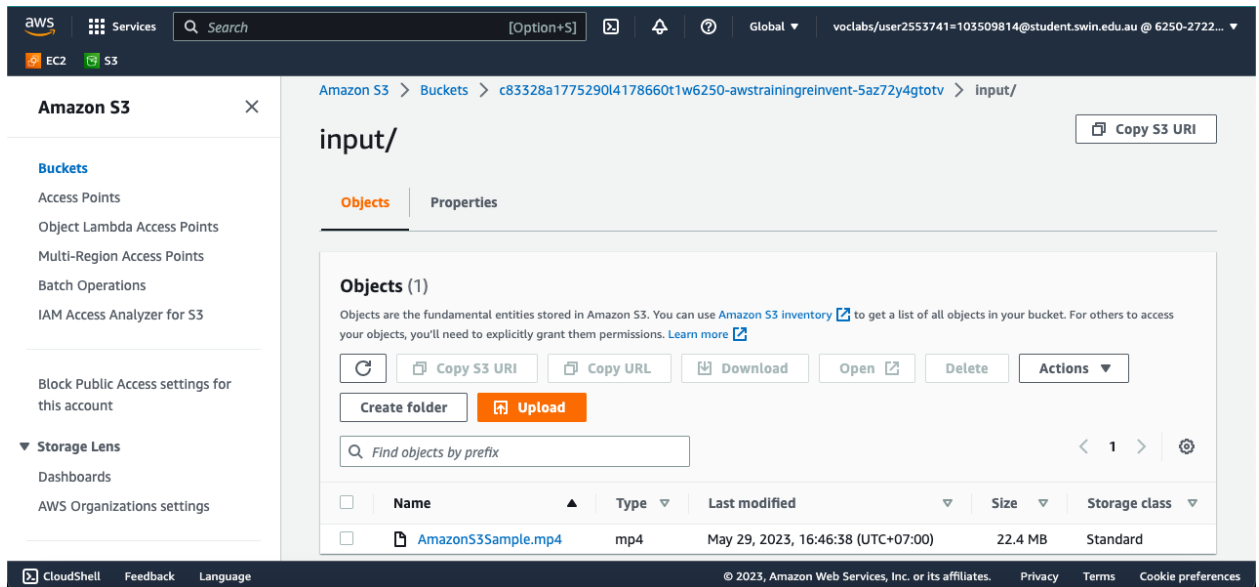
In this lab, you will be using a sample video file to configure a dynamic stream. For your convenience, an Amazon Simple Storage Service (Amazon S3) bucket has already been created.

5. In the AWS Management Console, on the **Services** menu, choose **S3**.  
An S3 bucket containing the string ***aws training reinvent*** should be present.  
Note the Region that the bucket is in, and open the bucket.



6. Open the **input** folder. It contains a video file named **AmazonS3Sample.mp4**.  
**Note:** From the time you log in to the Amazon S3 console, it can take up to ten minutes for the file to appear in the S3 bucket. If you do not see it, select the circular arrow icon on the upper right of the screen to refresh the contents of the

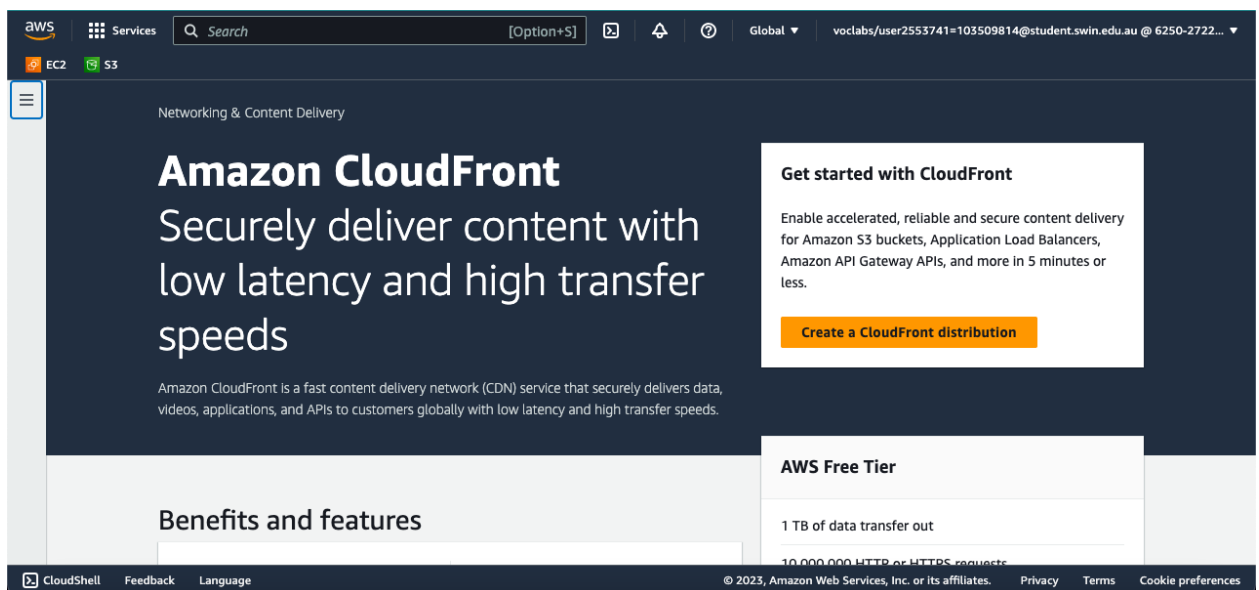
bucket.



## Task 2: Create an Amazon CloudFront Distribution

In this task, you will create an Amazon CloudFront distribution that will be used to deliver the multiple bit-rate files generated by Amazon Elastic Transcoder to end-user devices.

7. On the **Services** menu, choose **CloudFront**.
8. Choose **Create Distribution**.



9. Under the **Web** section of the page, choose **Get Started**.
10. Under **Origin Settings** section of the page, enter the follow information:
  - Select the **Origin Domain Name** field. A list of S3 buckets will appear. Choose the one that was created earlier that has **awstrainingreinvent** as part of the file name.
  - Under **Restrict Bucket Access** select **No**.

aws Services Search [Option+S]

EC2 S3

Name  
Enter a name for this origin.  
c83328a1775290l4178660t1w6250-awstrainingreinvent-5az72y4gtotv.s3.us-east-1.a

Origin access Info

☒ Public  
Bucket must allow public access.

☐ Origin access control settings (recommended)  
Bucket can restrict access to only CloudFront.

☐ Legacy access identities  
Use a CloudFront origin access identity (OAI) to access the S3 bucket.

Add custom header - optional  
CloudFront includes this header in all requests that it sends to your origin.  
Add header

Enable Origin Shield Info  
Origin Shield is an additional caching layer that can help reduce the load on your origin and help protect its availability.  
☒ No  
☐ Yes

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11. Scroll to the bottom of the page, then choose **Create Distribution**.

aws Services Search [Option+S]

EC2 S3

Successfully created new distribution.

Do you have 30 seconds to share your experience? Help us improve CloudFront.

CloudFront > Distributions > E1T63LOHFEGBJF

E1T63LOHFEGBJF View metrics

General Origins Behaviors Error pages Geographic restrictions Invalidations Tags

Details

Distribution domain name d3c6aj65vvludl.cloudfront.net	ARN arn:aws:cloudfront::625027225984:distribution/E1T63LOHFEGBJF	Last modified Deploying
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## Task 3: Create an Amazon Elastic Transcoder Pipeline

### Create a Pipeline

In this section, you will create a pipeline that will manage the jobs to transcode the input file.

12. In the AWS Management Console, on the **Services** menu, choose **Elastic Transcoder**.
13. In the navigation bar of the Amazon Elastic Transcoder console, select the same Region that the S3 bucket was created in.
14. On the Pipelines page, choose **Create a new Pipeline**.

The screenshot shows the AWS Management Console interface for Amazon Elastic Transcoder. At the top, there's a navigation bar with the AWS logo, 'Services' menu, a search bar, and a user profile dropdown. Below the navigation bar, a banner promotes 'Try the New File-Based Video Processing Option' for AWS Elemental MediaConvert. The main content area is titled 'Welcome to Amazon Elastic Transcoder' and features a prominent blue button labeled 'Create a new Pipeline'. To the right, under 'Additional Information', there are links for 'Getting Started with Elastic Transcoder', 'Documentation', 'All Elastic Transcoder Resources', and 'Forums'. Below the welcome message, a paragraph explains that Elastic Transcoder converts digital media from S3 into various formats for playback on different devices. It then lists three components: Pipelines (queues for jobs), Jobs (individual transcoding tasks), and Presets (templates for settings). The footer contains links for CloudShell, Feedback, Language, and copyright information for 2023.

aws Services Search [Option+S] N. Virginia voclabs/user2553741=103509814@student.swin.edu.au @ 6250-2722...

**Try the New File-Based Video Processing Option**  
AWS Elemental MediaConvert is a new file-based video transcoding service that provides a comprehensive suite of advanced transcoding features, with Basic tier rates starting at \$0.0075/minute. [Read more](#) or [try MediaConvert](#)

**Welcome to Amazon Elastic Transcoder**

[Create a new Pipeline](#)

Amazon Elastic Transcoder lets you convert digital media stored in Amazon S3 into the audio and video codecs and the containers required by consumer playback devices. For example, you can convert large, high-quality digital media files into formats that users can play back on mobile devices, tablets, web browsers, and connected televisions.

Elastic Transcoder has three components:

- **Pipelines** are queues that manage your transcoding jobs. Elastic Transcoder begins to process jobs in the order in which you add them to a pipeline. Typically, you'll create at least two pipelines, one for standard-priority jobs and one for high-priority jobs. Most jobs go into the standard-priority pipeline; you use the high-priority pipeline only when you need a file to be transcoded immediately.
- **Jobs** specify the settings that aren't included in the preset, for example, the file to transcode and whether to create thumbnails. Each job converts one file into one different format. When you create a job, Elastic Transcoder adds it to the pipeline you specify. If there are already jobs in the pipeline, Elastic Transcoder begins processing the new job when resources are available.
- **Presets** are templates that specify most of the settings for the transcoded media file. Elastic Transcoder includes some default presets for common formats. You can also create your own presets. When you create a job, you specify which preset to use.

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15. For **Pipeline Name**, enter `InputPipeline`
16. For **Input Bucket**, select the `awstrainingreinvent` S3 bucket.
17. For **IAM Role**, under **Other roles**, select `AmazonElasticTranscoderRole`. This is a role that was pre-created in this lab's CloudFormation template that uses the managed policy `AmazonElasticTranscoderRole`. The Elastic Transcoder service will assume this role to access Amazon S3 and Amazon Simple Notification

Service (Amazon SNS) resources in your lab account.

**Try the New File-Based Video Processing Option**  
AWS Elemental MediaConvert is a new file-based video transcoding service that provides a comprehensive suite of advanced transcoding features, with Basic tier rates starting at \$0.0075/minute. [Read more](#) or [try MediaConvert](#)

**Create New Pipeline**

A pipeline is a queue for your transcoding jobs. You can have more than one pipeline per AWS account. You can use multiple pipelines to organize your transcoding workflow, for example, by having one pipeline for standard-priority jobs and one for high-priority jobs.

Pipeline Name

Input Bucket

IAM Role

This role must have the permissions necessary to access the applicable S3 buckets and SNS topics. [View the policy for the default IAM role.](#)

**Configuration for Amazon S3 Bucket for Transcoded Files and Playlists**

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18. In the **Configuration for Amazon S3 Bucket for Transcoded Files and Playlists** section, enter the follow information:

- Under **Bucket**, select the **awstrainingreinvent** S3 bucket.
- Under **Storage Class**, select **Standard**.

19. In the **Configuration for Amazon S3 Bucket for Thumbnails** section, enter the following information:

- Under **Bucket**, select the **awstrainingreinvent** S3 bucket.
- Under **Storage Class**, select **ReducedRedundancy**.

**Try the New File-Based Video Processing Option**  
AWS Elemental MediaConvert is a new file-based video transcoding service that provides a comprehensive suite of advanced transcoding features, with Basic tier rates starting at \$0.0075/minute. [Read more](#) or [try MediaConvert](#)

**Configuration for Amazon S3 Bucket for Transcoded Files and Playlists**

Bucket

Storage Class

[+ Add Permission](#)

**Configuration for Amazon S3 Bucket for Thumbnails**

Bucket

Storage Class

[+ Add Permission](#)

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20. Choose **Create Pipeline**.



**Try the New File-Based Video Processing Option**  
 AWS Elemental MediaConvert is a new file-based video transcoding service that provides a comprehensive suite of advanced transcoding features, with Basic tier rates starting at \$0.0075/minute. [Read more](#) or [try MediaConvert](#)

**Pipelines** Create New Job Edit Pause Activate Remove

Jobs  
Presets

**Summary**

ARN	arn:aws:elastictranscoder:us-east-1:625027225984:pipeline/1685355033631-42yxe1
Name	InputPipeline
Pipeline ID	1685355033631-42yxe1
Status	Active
Input Bucket	c83328a1775290i4178660t1w6250-awstrainingreinvent-5az72y4gtotv

▶ Configuration for Amazon S3 Bucket for Transcoded Files and Playlists

▶ Configuration for Amazon S3 Bucket for Thumbnails

▶ Job Details

▶ Permissions

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## Create a Job

In this section, you will create a job under the Amazon Elastic Transcoder pipeline that was just created. The job does the work of transcoding the input file into multiple bit-rates as selected.

21. On the Pipelines page, choose **Create New Job** to create a transcoding job. You create the job in the pipeline (queue) that you want to use to transcode the video file.
22. For **Pipeline**, select **InputPipeline**.
23. For **Output Key Prefix**, enter `output/`.

Amazon Elastic Transcoder will prepend this value to the names of all files that the job will create (including output files, thumbnails, and playlists).

24. For **Input Key**, select the input file labeled **input/AmazonS3Sample.mp4**.

The screenshot shows the AWS Elastic Transcoder console. At the top, there's a navigation bar with the AWS logo, 'Services', a search bar, and account information. A banner at the top promotes 'Try the New File-Based Video Processing Option'. Below this, the 'Create a New Transcoding Job' section is visible. It includes a description of a job and a form with the following fields: 'Pipeline' (a dropdown menu set to 'InputPipeline'), 'Output Key Prefix' (a text box with 'output/'), 'Input Details (1 of 1)' section containing 'Input Key' (a text box with 'input/AmazonS3Sample.mp4'), 'Decryption Parameters' (radio buttons for 'None' and 'Enter Information'), and 'Available Settings' (checkboxes for 'Clip' and 'Input Captions'). A footer bar contains 'CloudShell', 'Feedback', 'Language', and copyright information.

Try the New File-Based Video Processing Option  
AWS Elemental MediaConvert is a new file-based video transcoding service that provides a comprehensive suite of advanced transcoding features, with Basic tier rates starting at \$0.0075/minute. [Read more](#) or [try MediaConvert](#)

**Create a New Transcoding Job**

A job contains all of the information that Elastic Transcoder needs to transcode one media file into another format. When you create a job, it's automatically added to the pipeline that you specify.

Pipeline:

Output Key Prefix:

**Input Details (1 of 1)**

Input Key:

Decryption Parameters: ☒ None ☐ Enter Information

Available Settings: ☐ Clip ☐ Input Captions

[+ Add Another Input](#)

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## Configure Output Details

The settings in this section will determine how many output files (bit-rates) are created. You will configure three output files for this demo having three separate bit-rates (2Mbps, 1.5Mbps and 1Mbps). Each output bit-rate will require you to create a separate output details section. This will also output a playlist file for each bit-rate, which lists all the segments that make up the stream.

25. For **Preset:**, select **System preset: HLS 2M**

26. For **Segment Duration**, enter **10** (which is the HLS default).

27. For **Output Key**, enter the unique prefix **HLS20M** to name the segments created using this preset.

The screenshot shows the AWS Elemental MediaConvert console. At the top, there's a navigation bar with the AWS logo, 'Services', a search bar, and account information. Below the navigation bar, there's a banner for 'Try the New File-Based Video Processing Option'. The main content area is titled 'Output Details (1 of 3)' and contains the following fields:

- Preset:** System preset: HLS 2M
- Segment Duration:** 10
- Output Key:** HLS20M
- Segment Filename Preview:** HLS20M00000.ts
- Create Thumbnails:** No (selected)
- Output Rotation (Clockwise):** auto

At the bottom, there's a 'Preset Parameters' section and a footer with 'CloudShell', 'Feedback', 'Language', and copyright information.

28. Click **+ Add Another Output** and repeat the steps above to generate segments for presets **HLS 1.5M** and **HLS 1M** and then provide the respective prefix names:

- **HLS15M**

The screenshot shows the AWS Elemental MediaConvert console. At the top, there's a navigation bar with the AWS logo, 'Services', a search bar, and account information. Below the navigation bar, there's a banner for 'Try the New File-Based Video Processing Option'. The main content area is titled 'Output Details (2 of 3)' and contains the following fields:

- Preset:** System preset: HLS 1.5M
- Segment Duration:** 10
- Output Key:** HLS15M
- Segment Filename Preview:** HLS15M00000.ts
- Create Thumbnails:** No (selected)
- Output Rotation (Clockwise):** auto

At the bottom, there's a 'Preset Parameters' section and a footer with 'CloudShell', 'Feedback', 'Language', and copyright information.

- HLS10M

The screenshot shows the AWS MediaConvert console interface. At the top, there's a navigation bar with the AWS logo, 'Services' menu, a search bar, and user information. A notification banner at the top reads: 'Try the New File-Based Video Processing Option. AWS Elemental MediaConvert is a new file-based video transcoding service that provides a comprehensive suite of advanced transcoding features, with Basic tier rates starting at \$0.0075/minute. [Read more](#) or [try MediaConvert](#)'. Below this, the 'Output Details (3 of 3)' section is visible. It includes a 'Preset' dropdown set to 'System preset: HLS 1M', a 'Segment Duration' input field set to '10', an 'Output Key' input field set to 'HLS10M' (highlighted with a pink border), a 'Segment Filename Preview' showing 'HLS10M00000.ts', 'Create Thumbnails' radio buttons with 'No' selected, and an 'Output Rotation (Clockwise)' dropdown set to 'auto'. A 'Remove Output' link is on the right. At the bottom, there's a footer with 'CloudShell', 'Feedback', 'Language', and copyright information.

Caution: Do not create the job yet! Instead, complete the next few steps in this lab which will have you add a playlist to the job.

## Configure a Playlist

The playlist will combine all the individual bit-rate playlists and provide a single URL for the devices to playback the stream. To configure a playlist, do the following:

29. Under **Playlists (Adaptive Streaming)**, choose **Add Playlist**, then configure:
  - **Playlist Name** `primary`
  - **Playlist Format:** `HLSv3`

30. Select all the three outputs, which were entered in the previous section, to include them in this playlist by selecting the + option.

The screenshot shows the AWS Elemental MediaConvert console. At the top, there's a navigation bar with the AWS logo, 'Services', a search bar, and user information. Below the navigation bar, there's a banner for 'Try the New File-Based Video Processing Option'. The main content area is titled 'Playlist (1 of 1)' and includes a '- Remove Playlist' link. The configuration fields are as follows:

- Master Playlist Name:
- Playlist Format:
- Outputs in Master Playlist:  (with +, x, and i icons)
- Outputs in Master Playlist:  (with +, x, and i icons)
- Outputs in Master Playlist:  (with +, x, and i icons)
- Content Protection: ☒ None ☐ HLS AES ☐ PlayReady DRM

At the bottom, there's a footer with 'CloudShell', 'Feedback', 'Language', and copyright information.

31. Choose **Create New Job**.

The transcoding process should complete within a minute.

The screenshot shows the AWS Elemental MediaConvert console. At the top, there's a navigation bar with the AWS logo, 'Services', a search bar, and user information. Below the navigation bar, there's a banner for 'Try the New File-Based Video Processing Option'. The main content area is titled 'Jobs' and includes a 'Presets' section. The 'Summary' section shows the following details:

Field	Value	Field	Value
ARN	arn:aws:elastictranscoder:us-east-1:625027225984:job/1685355810022-uzq1cs	Number Of Inputs	1
Job ID	1685355810022-uzq1cs	Number Of Outputs	3
Pipeline	InputPipeline	Number Of Playlists	1
Pipeline ID	1685355033631-42yxe1	Job Status	Submitted
Output Key Prefix	output/		

The 'Inputs' section shows the following details:

Input Key	Frame Rate
input/AmazonS3Sample.mp4	

At the bottom, there's a footer with 'CloudShell', 'Feedback', 'Language', and copyright information.

## Task 4: Test Playback of the Dynamic (Multi Bit-Rate) Stream

In this module, you will test the playback of the dynamic stream generated in the previous section using an iOS or Android device. You can also use an Android 4.x device to test the below exercise.

**Note** Certain browsers may not support this feature. Use the default web browser in the device to test.

## Construct the Playback URL

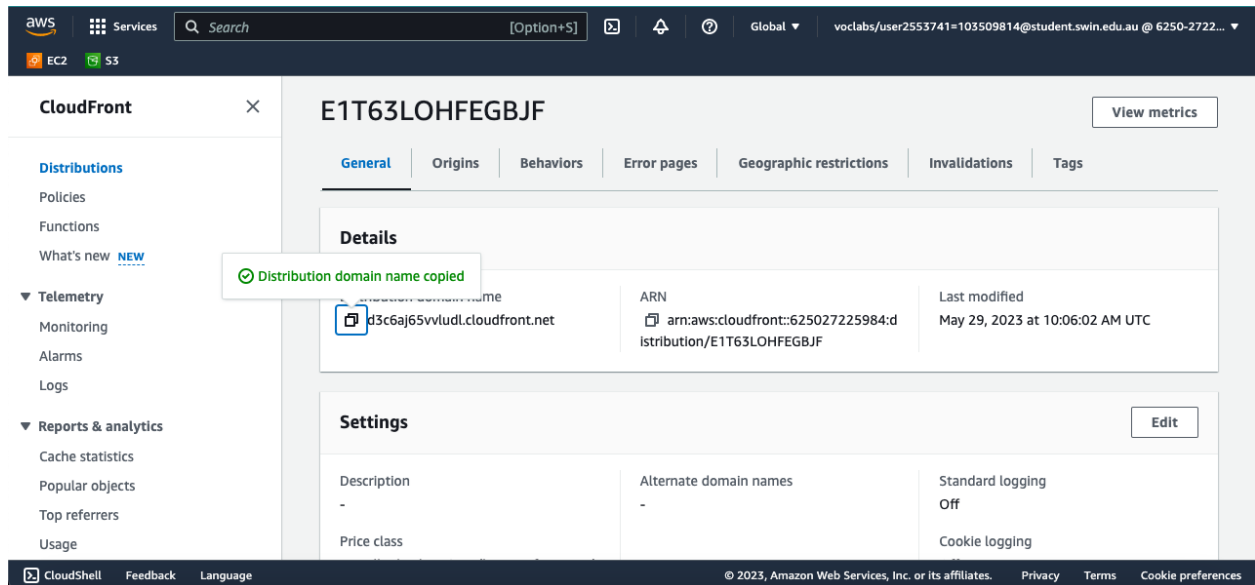
The playback URL that plays through Amazon CloudFront is comprised of two components:

- Amazon CloudFront domain name
- Path of the playlist file in the S3 bucket (output generated by Elastic Transcoder):
- `http://<CloudFront domain name>/<playlist file path in Amazon S3 bucket>`

## Obtain an Amazon CloudFront Domain Name

To obtain an Amazon CloudFront domain name:

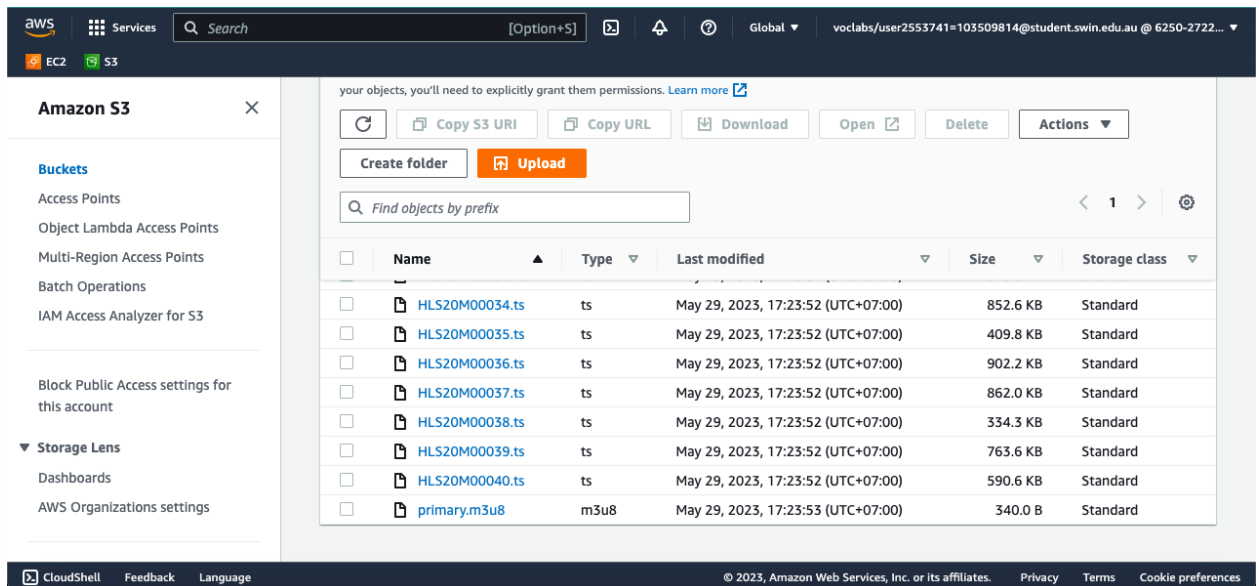
32. In the AWS Management Console, on the **Services** menu, choose **CloudFront**.
33. Select the **Amazon CloudFront** distribution that was previously created, and verify that the **Distribution Status** has changed from *InProgress* to *Deployed*.
34. Proceed to the next step only after the **Status** changes to *Deployed*.
35. Select the Distribution by selecting the square box to the left of the Distribution.
36. Choose **Distribution Settings**.
37. Copy the **Domain Name** and paste it into a text editor.



## Obtain the Playlist File Path

To obtain the playlist file path:

38. On the **Services** menu, choose **S3**.
39. Select the **awstrainingreinvent** S3 bucket.
40. Open the **output** folder (which contains the output of the transcoding job) and select the **primary.m3u8** playlist file.



This is the file that you will play on your mobile device.

17:27



Training and  
Certification



0:03

-6:43



Next, you must create the URL to the file from CloudFront.

41. In a text editor, construct the URL by appending `/output/primary.m3u8` to the end of your CloudFront domain name.

The new URL should look similar to:

`d1ckwesahkbyvu.cloudfront.net/output/primary.m3u8`

42. Type the URL into the default browser of an iOS or Android device. If you do not have a mobile device available, type the URL into a browser on your computer.

**Be aware that standard data rates may apply when playing the video on a mobile device.**

43. The stream should start playing on your device and dynamically request the relevant segments based on your bandwidth and CPU conditions.

You have learned how to use AWS services such as Amazon S3, Amazon Elastic Transcoder, and Amazon CloudFront together to deliver HLS media files to iOS or Android devices.

You have successfully:

- Learned the basic concepts and terminology of the Amazon Elastic Transcoder and Amazon CloudFront services.
- Created your own Amazon Elastic Transcoder pipeline and Amazon CloudFront distribution.
- Used Amazon Elastic Transcoder to transcode a video file into different HLS formats and distributed it to remote devices using Amazon CloudFront.

## Submitting your work

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44. At the top of these instructions, choose **Submit** to record your progress and when prompted, choose **Yes**.

45. If the results don't display after a couple of minutes, return to the top of these instructions and choose **Grades**

**Tip:** You can submit your work multiple times. After you change your work, choose **Submit** again. Your last submission is what will be recorded for this lab.

46. To find detailed feedback on your work, choose **Details** followed by **View Submission Report**.

The screenshot shows the AWS Academy interface. On the left is a sidebar with navigation links: Home, Modules, Announcements, Discussions, Grades, Courses, Calendar, Inbox, History, and Help. The top bar shows the submission status: Due No Due Date, Points 100, Submitting an external tool. The main content area is titled 'Task 1: Lab Preparation' and contains instructions for configuring a dynamic stream using a sample video file and an Amazon S3 bucket. A terminal window on the right shows the output of the lab preparation process, including the creation of a bucket and the upload of a video file. The terminal output is as follows:

```
bash
Testing report - The co
ils.
Testing report - The Ou
Testing report - All of
Testing report - The co
Testing report - The ex
.
gradeFile = /mnt/vocwor
asn1775290_1/tmp/temp_of_05
reportFile = /mnt/vocwor
asn1775290_1/tmp/temp_of_05
/mnt/vocwork2/ccc_v1_g
/tmp/temp_of_052920237.gzoc
len 4
Present working directo
3/asn1775289_15/asn1775290_
Default region: us-east
Back in submit.sh...
end
ddd_v1_w_C13_1946815@runweb
83158:-$
ddd_v1_w_C13_1946815@runweb
83158:-$
```

On the right side of the terminal window, there is a 'Total score' section showing a score of 40/40. Below this, there is a list of tasks and their scores:

Task	Score
[Task 2] Distribution Created	5/5
[Task 3A] Pipeline was created	5/5
[Task 3B] Transcoded File Storage	5/5
[Task 3C] Thumbnail File Storage	5/5
[Task 3D] Output Key Prefix	5/5

## Lab complete

Congratulations! You have completed the lab.

47. Choose **End Lab** at the top of this page, and then select **Yes** to confirm that you want to end the lab.

A panel indicates that *DELETE has been initiated...* You may close this message box now.

48. Select the **X** in the top right corner to close the panel.

The screenshot shows the AWS Academy interface. On the left is a dark sidebar with navigation links: Home, Modules, Announcements, Discussions, Grades, Courses, Calendar, Inbox, History, and Help. The main content area has a header with 'Due No Due Date', 'Points 100', and 'Submitting an external tool'. Below this is a tabbed interface with tabs for 'Submit', 'Details', 'AWS', 'Start Lab', 'End Lab', '00:00:00', 'Instructions', 'Grades', and 'Actions'. The 'End Lab' tab is active, displaying a modal dialog titled 'End Lab' with a close button (X) in the top right corner. The dialog contains the following text: 'Region: us-east-1', 'Lab ID: arn:aws:cloudformation:us-east-1:625027225984:stack/c83328a177529014178660t1w625027225984/9b84d9e0-fe05-11ed-a35c-0e9458226617', 'Creation Time: 2023-05-29T02:45:55-0700', and 'You may close this message box now. Lab resources are terminating ...'. The background shows a task list with various items and their progress.

## Additional Resources

- [Amazon Elastic Transcoder and Amazon CloudFront](#)
- [Amazon CloudFront](#)
- [AWS Training and Certification](#)

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