

# Drupal, NetFlix, & Chill: Adaptive Bitrate Video Streaming

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# The Problem

- ✦ Existing Site
- ✦ 400 HD videos
- ✦ Slow video loading/buffering/playback latency (10-11 seconds average; sometimes up to 30 seconds!)
- ✦ Stuttering video playback
- ✦ Web server disk space being exhausted
- ✦ Budget
- ✦ Two-Pronged Issue of User Experience (stutter) v. Site Maintainability



# NETFLIX

72%



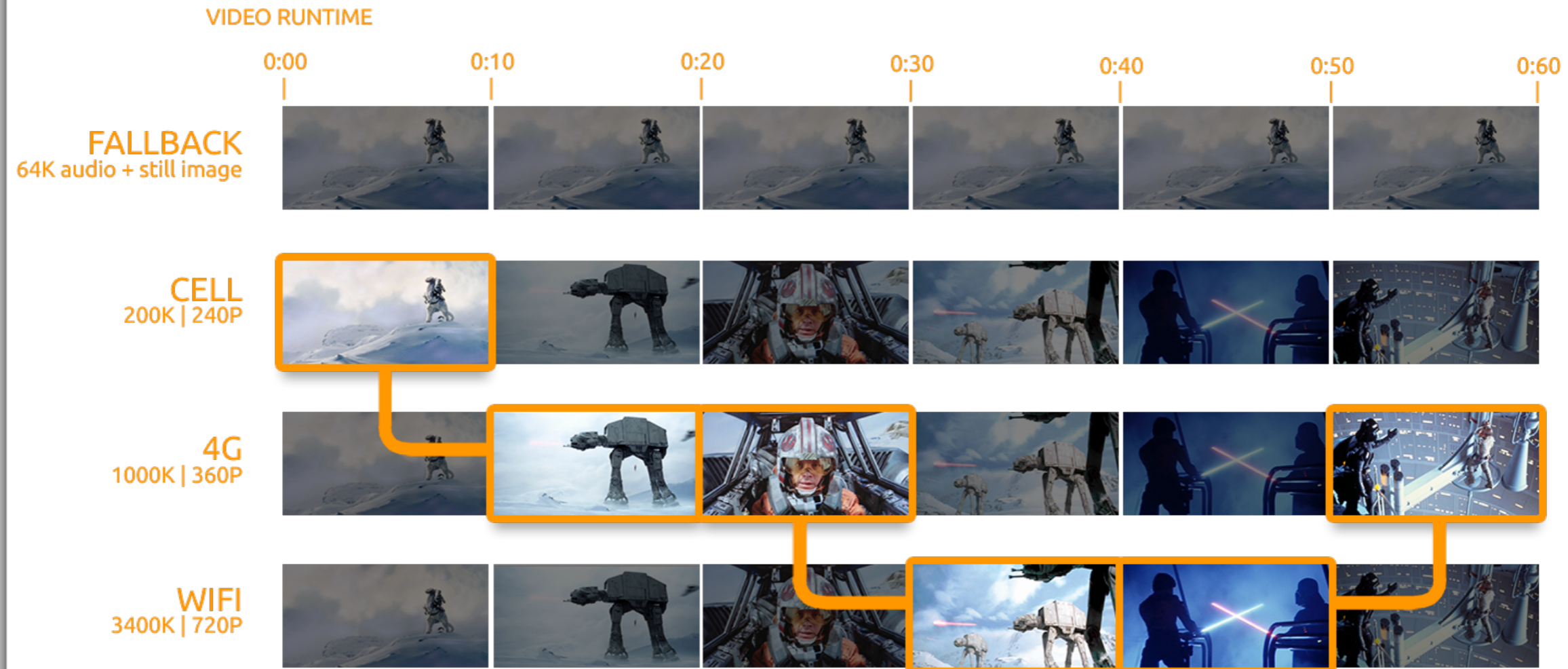
The Verizon network is crowded right now.  
Adjusting video for smoother playback...

## Does NetFlix hate you?



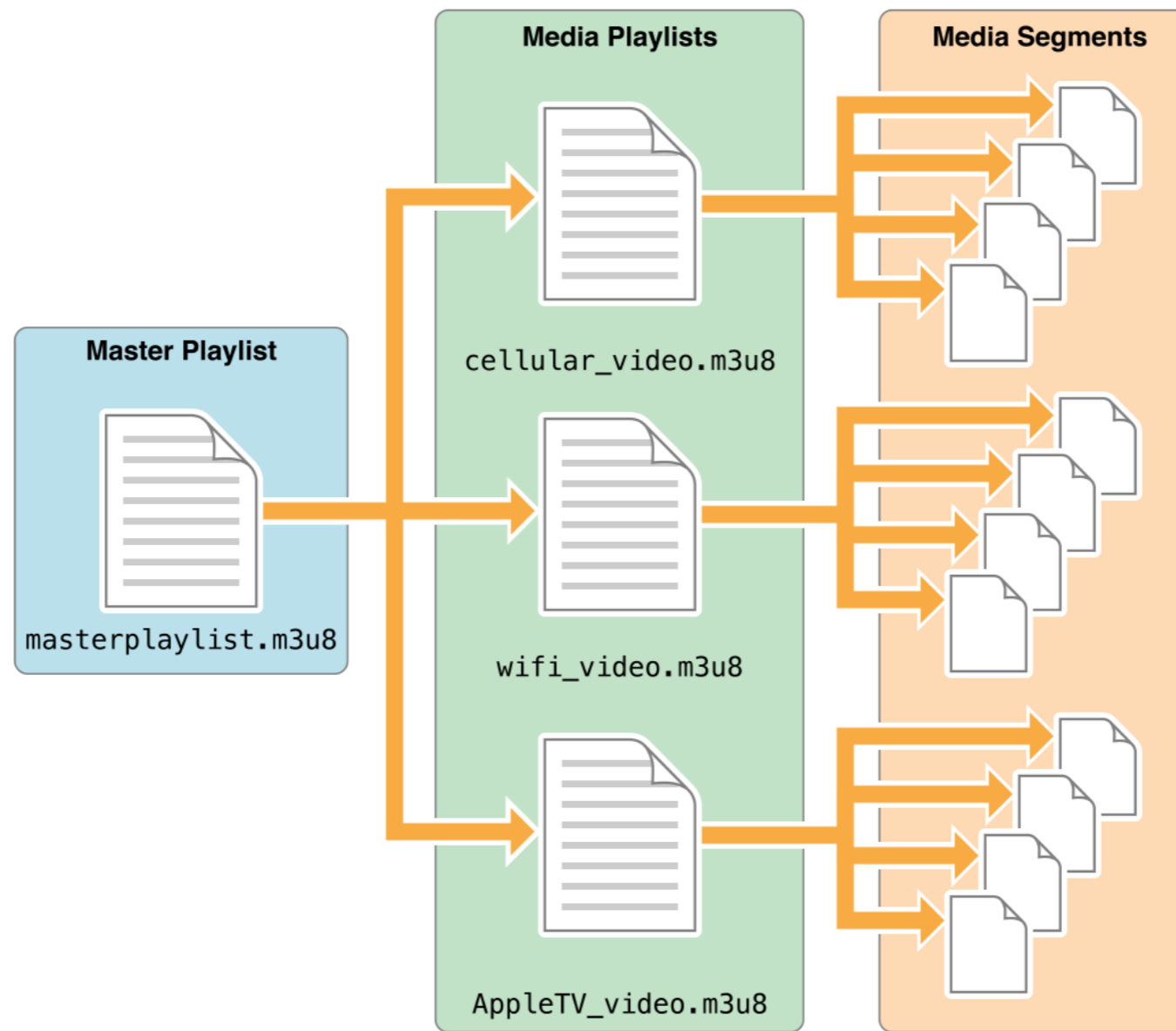
Aisle8, Inc.

Image: [cnet.com](http://cnet.com)




# Adaptive Bitrate Streaming





# HLS Video File Structure

Menu

English ▾ My Account ▾
Sign Up

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PRODUCTS & SERVICES


- [Amazon Elastic Transcoder](#) >
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- [Documentation](#)
- [Management Console](#)
- [Release Notes](#)
- [Discussion Forum](#)

## Amazon Elastic Transcoder



### Try Amazon Elastic Transcoder

Transcode up to 20 minutes of content each month for free. [Read more.](#)

Amazon Elastic Transcoder is media transcoding in [the cloud](#). It is designed to be a highly scalable, easy to use and a cost effective way for developers and businesses to convert (or “transcode”) media files from their source format into versions that will playback on devices like smartphones, tablets and PCs.

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### What's New with Amazon Elastic Transcoder

- [Amazon Elastic Transcoder Adds Support for Closed Captioning Standard Typically Used by Digital Television](#)
- [Amazon Elastic Transcoder Adds Support for XDCAM and FLAC](#)
- [Amazon Elastic Transcoder Adds PlayReady DRM Support for Smooth Streaming and HLS](#)

**Get Started with AWS for Free**

[Create a Free Account](#)

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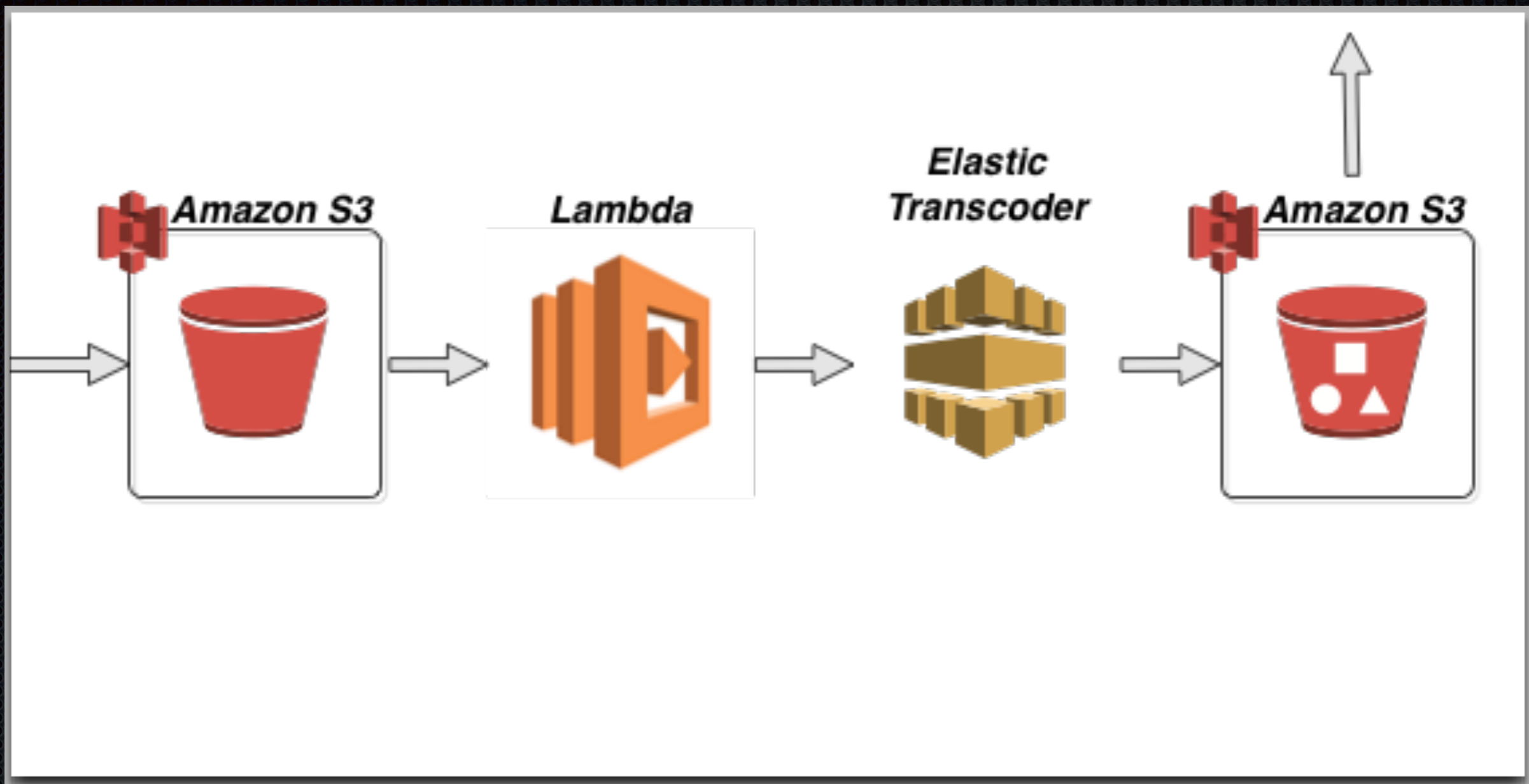
---

Amazon Elastic Transcoder's Free Tier includes up to 20 minutes of transcoding each month.

[View AWS Free Tier Details »](#)

# Stutter Solution: Amazon Elastic Transcoder





# Transcoder Workflow

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Pipelines Jobs Presets

Create New Preset Copy Remove

Filter:  Viewing 53 items

	Name	ID	Container	Description
<input type="checkbox"/>	System preset: HLS 2M	1351620000001-200010	ts	System preset: HLS 2M
<input type="checkbox"/>	System preset: HLS Video - 2M	1351620000001-200015	ts	System preset: HLS Video - 2M
<input type="checkbox"/>	System preset: HLS 1.5M	1351620000001-200020	ts	System preset: HLS 1.5M
<input type="checkbox"/>	System preset: HLS Video - 1.5M	1351620000001-200025	ts	System preset: HLS Video - 1.5M
<input type="checkbox"/>	System preset: HLS 1M	1351620000001-200030	ts	System preset: HLS 1M
<input type="checkbox"/>	System preset: HLS Video - 1M	1351620000001-200035	ts	System preset: HLS Video - 1M
<input type="checkbox"/>	System preset: HLS 600k	1351620000001-200040	ts	System preset: HLS 600k
<input type="checkbox"/>	System preset: HLS Video - 600k	1351620000001-200045	ts	System preset: HLS Video - 600k
<input type="checkbox"/>	System preset: HLS 400k	1351620000001-200050	ts	System preset: HLS 400k
<input type="checkbox"/>	System preset: HLS Video - 400k	1351620000001-200055	ts	System preset: HLS Video - 400k
<input type="checkbox"/>	System preset: HLS Audio - 160k	1351620000001-200060	ts	System Preset: HLS Audio 160 kilobits/second
<input type="checkbox"/>	System preset: HLS Audio - 64k	1351620000001-200071	ts	System preset: HLS Audio 64 kilobits/second
<input type="checkbox"/>	System preset: Audio MP3 - 320k	1351620000001-300010	mp3	System preset: Audio MP3 - 320 kilobits/second

# AWS Elastic Transcoder HLS Presets





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Pipelines Create New Pipeline Create New Job Edit Pause Activate Remove

Jobs Filter: Viewing 1 item

Presets

	Name	Input Bucket	Bucket for Transcoded Files	Bucket for Thumbnails	Status
<input type="checkbox"/>	HLS-transcode	only-agency	only-agency	only-agency	Active

# Pipelines and Jobs



Upload Create Folder Actions
Search by prefix None Properties Transfers

All Buckets / only-agency

Name	Storage Class	Size	Last Modified
System Volume Information	--	--	--
archive	--	--	--
assets	--	--	--
crossdomain.xml	Standard	223 bytes	Wed Dec 16 10:44:36 GMT-500 2015
hls	--	--	--
logs	--	--	--

▼ Events

Event Notifications enable you to send alerts or trigger workflows. Notifications can be sent via Amazon Simple Notification Service (SNS) or Amazon Simple Queue Service (SQS) or to a Lambda function (depending on the bucket location).

Name	Event(s)	Filter	Type
HLS Transcode Trigger	Post,Put,CompleteMultiPartUpload	assets/	Lambda ✓✕

**Name**  ⓘ

**Events**    ⓘ

**Prefix**  ⓘ

**Suffix**  ⓘ

**Send To**  SNS topic  SQS queue  Lambda function ⓘ

**Lambda function**  ▼

S3 will add the necessary permissions to invoke your Lambda function from this source bucket. See the [Developer Guide](#).

Save Cancel

▶ Versioning  
 ▶ Lifecycle

# AmazonS3 Events





# AWS Lambda

Run code without thinking about servers.  
Pay for only the compute time you consume.

Get started with AWS Lambda

Product Details

Pricing

Getting Started

Partners

FAQs

Documentation

AWS Lambda lets you run code without provisioning or managing servers. You pay only for the compute time you consume - there is no charge when your code is not running. With Lambda, you can run code for virtually any type of application or backend service - all with zero administration. Just upload your code and Lambda takes care of everything required to run and scale your code with high availability. You can set up your code to automatically trigger from other AWS services or call it directly from any web or mobile app.



# AWS Lambda

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Lambda > Functions > HLS-Transcode ARN - arn:aws:lambda:us-east-1:267458296996:function:HLS-Transcode

Test Actions

Code Configuration Event sources API endpoints Monitoring

Code entry type  Edit code inline  Upload a .ZIP file  Upload a .ZIP from Amazon S3

```
1 var AWS = require('aws-sdk');
2 var s3 = new AWS.S3({apiVersion: '2006-03-01'});
3 var s3target = new AWS.S3({apiVersion: '2006-03-01'});
4 var eltr = new AWS.ElasticTranscoder({
5   apiVersion: '2012-09-25',
6   region: 'us-east-1'
7 });
8 var pipelineId = '1448312604191-0n6lmd';
9 var webPresets = ['1351620000001-200050', '1351620000001-200040', '1351620000001-200030', '1351620000001-200020', '1351620000001-200010'];
10
11 exports.handler = function(event, context) {
12   var bucket = event.Records[0].s3.bucket.name;
13   var key = event.Records[0].s3.object.key.split('+').join(' ');
14   // console.log('event = ' + JSON.stringify(event));
15   // console.log('context = ' + JSON.stringify(context));
16   // console.log('bucket = ' + bucket);
17   // console.log('key = ' + key);
18   s3.headObject({
19     Bucket:bucket,
20     Key:key // .split('+').join(' ')
21   },
22   function (err, data) {
23     // console.log('data = ' + JSON.stringify(data));
24     if (err) {
25       console.log(err + ' error getting object ' + key + ' from bucket ' + bucket +
26         '. Make sure they exist and your bucket is in the same region as this function.');
```

# Node.js Lambda Function



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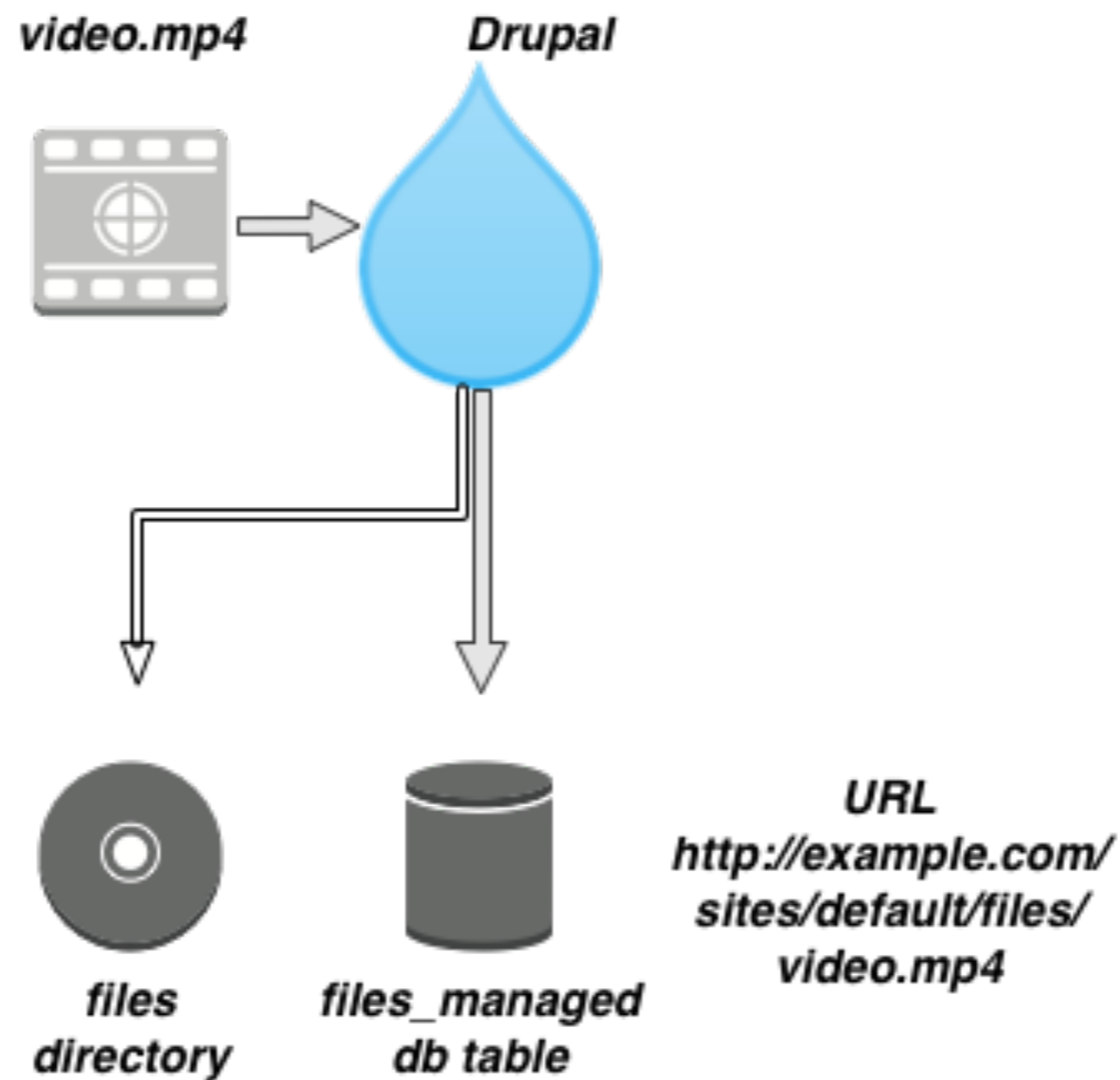
Upload Create Folder Actions Search by prefix None Properties Transfers

All Buckets / only-agency / hls

Name	Storage Class	Size	Last Modified
archive-test-1.mp4.m3u8	Standard	652 bytes	Tue Dec 29 11:27:28 GMT-500 2015
crossdomain.xml	Standard	223 bytes	Wed Dec 16 10:45:11 GMT-500 2015
hls_0_archive-test-1.mp4.m3u8	Standard	1.3 KB	Tue Dec 29 11:27:08 GMT-500 2015
hls_0_archive-test-1.mp400000.ts	Standard	533.8 KB	Tue Dec 29 11:27:08 GMT-500 2015
hls_0_archive-test-1.mp400001.ts	Standard	681.3 KB	Tue Dec 29 11:27:07 GMT-500 2015
hls_0_archive-test-1.mp400002.ts	Standard	414.3 KB	Tue Dec 29 11:27:07 GMT-500 2015
hls_0_archive-test-1.mp400003.ts	Standard	520.6 KB	Tue Dec 29 11:27:08 GMT-500 2015
hls_0_archive-test-1.mp400004.ts	Standard	879.5 KB	Tue Dec 29 11:27:08 GMT-500 2015
hls_0_archive-test-1.mp400005.ts	Standard	429 KB	Tue Dec 29 11:27:08 GMT-500 2015
hls_0_archive-test-1.mp400006.ts	Standard	547.8 KB	Tue Dec 29 11:27:08 GMT-500 2015
hls_0_archive-test-1.mp400007.ts	Standard	680 KB	Tue Dec 29 11:27:08 GMT-500 2015
hls_0_archive-test-1.mp400008.ts	Standard	547.2 KB	Tue Dec 29 11:27:08 GMT-500 2015
hls_0_archive-test-1.mp400009.ts	Standard	629.5 KB	Tue Dec 29 11:27:08 GMT-500 2015
hls_0_archive-test-1.mp400010.ts	Standard	541.4 KB	Tue Dec 29 11:27:08 GMT-500 2015
hls_0_archive-test-1.mp400011.ts	Standard	412.7 KB	Tue Dec 29 11:27:08 GMT-500 2015
hls_0_archive-test-1.mp400012.ts	Standard	726.2 KB	Tue Dec 29 11:27:08 GMT-500 2015
hls_0_archive-test-1.mp400013.ts	Standard	647.9 KB	Tue Dec 29 11:27:08 GMT-500 2015
hls_0_archive-test-1.mp400014.ts	Standard	459.1 KB	Tue Dec 29 11:27:08 GMT-500 2015
hls_0_archive-test-1.mp400015.ts	Standard	684.2 KB	Tue Dec 29 11:27:08 GMT-500 2015
hls_0_archive-test-1.mp400016.ts	Standard	471.6 KB	Tue Dec 29 11:27:08 GMT-500 2015
hls_0_archive-test-1.mp400017.ts	Standard	378.7 KB	Tue Dec 29 11:27:08 GMT-500 2015
hls_0_archive-test-1.mp400018.ts	Standard	713.8 KB	Tue Dec 29 11:27:08 GMT-500 2015
hls_0_archive-test-1.mp400019.ts	Standard	565.9 KB	Tue Dec 29 11:27:08 GMT-500 2015

# Lambda Initiated HLS Files





# Standard Drupal File Handling

AmazonS3 | Drupal.org

https://www.drupal.org/project/amazons3

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## AmazonS3

[View](#) [Version control](#) [Automated Testing](#)

Posted by [justafish](#) on *May 28, 2011 at 10:12am*

Also available on [GitHub](#)

The AmazonS3 module allows the local file system to be replaced with S3. Uploads are saved into the Drupal file table using D7's file/stream wrapper system.

You can also use it with other [S3 compatible cloud storage services](#) such as [Google Cloud Storage](#).

You can switch it on as the default file system scheme, or individually for file and image fields.

### Requirements

- [Composer Manager](#)
- [PHP's cURL extension](#) (nearly always available by default)

### Maintainers for AmazonS3

[deviantintegral](#) - 219 commits  
last: 3 weeks ago, first: 10 months ago

[justafish](#) - 85 commits  
last: 1 year ago, first: 5 years ago

[q0rban](#) - 3 commits  
last: 3 years ago, first: 3 years ago

[View all committers](#)  
[View commits](#)

### Issues for AmazonS3

To avoid duplicates, please search before

# AmazonS3 Module

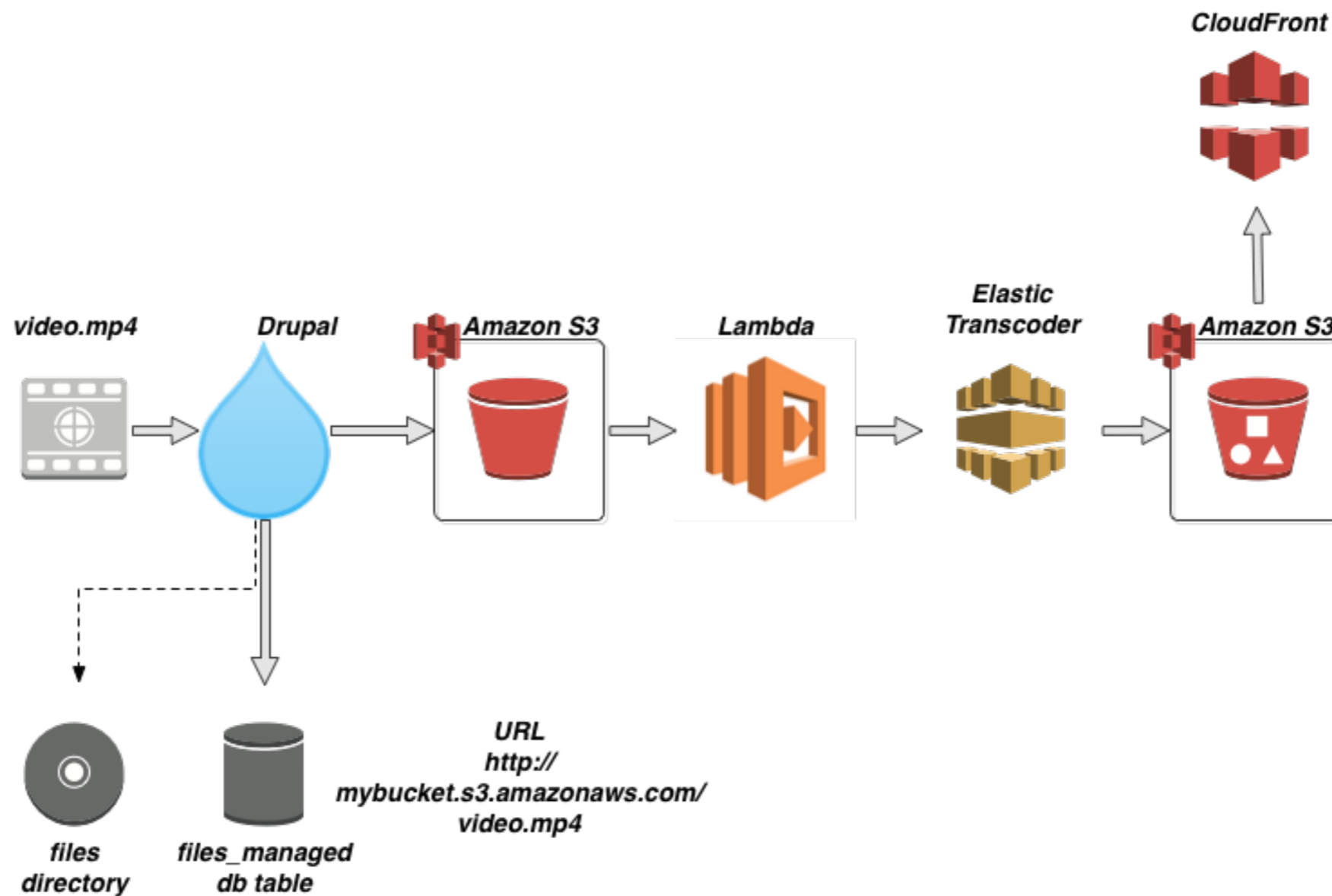


The screenshot shows a web browser window with the URL [https://www.drupal.org/project/amazons3\\_cors](https://www.drupal.org/project/amazons3_cors). The page features the Drupal logo and navigation links: Get Started, Community, Documentation, Support, Download & Extend, Jobs, Marketplace, and About. A search bar is located on the right side of the header. Below the header, the 'Download & Extend' section is active, with sub-links for Download & Extend Home, Drupal Core, Distributions, Modules, and Themes. The main content area is titled 'Amazon S3 CORS Upload' and includes a 'View' button, 'Version control', and 'Automated Testing' links. The text describes the module's functionality, its maintenance by 'ejthebrave', and provides links to maintainers and issues. The browser's address bar and various extension icons are visible at the top.

# AmazonS3 CORS Upload Module







# Tying It All Together



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### Distributions

What's New ✨

### Reports & Analytics

- Cache Statistics
- Monitoring and Alarms
- Popular Objects
- Top Referrers
- Usage
- Viewers

### Private Content

- How-to Guide
- Origin Access Identity

## CloudFront Distributions

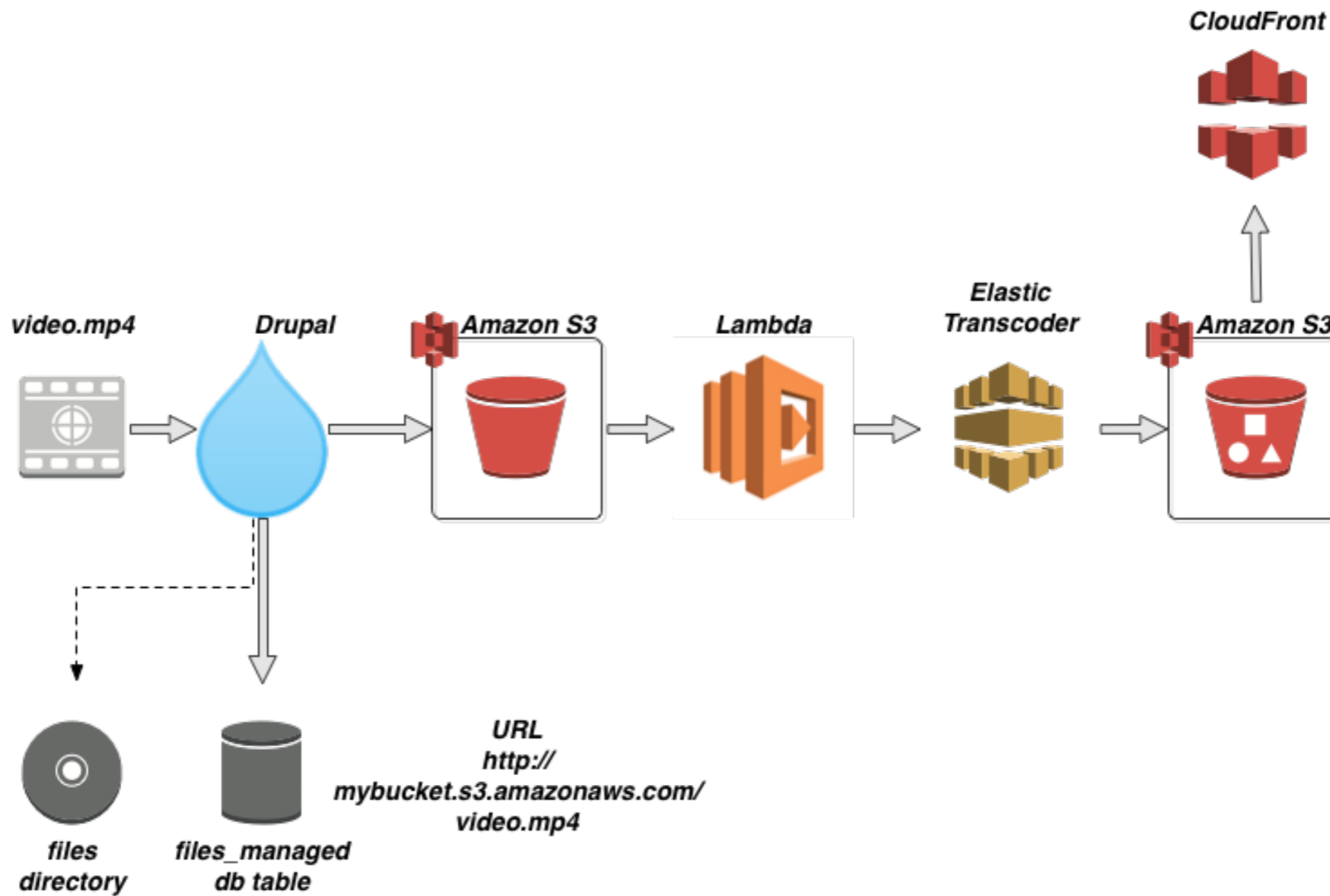
Create Distribution Distribution Settings Delete Enable Disable

Viewing: Any Delivery Method Any Status Viewing 1 to 1 of 1 Items

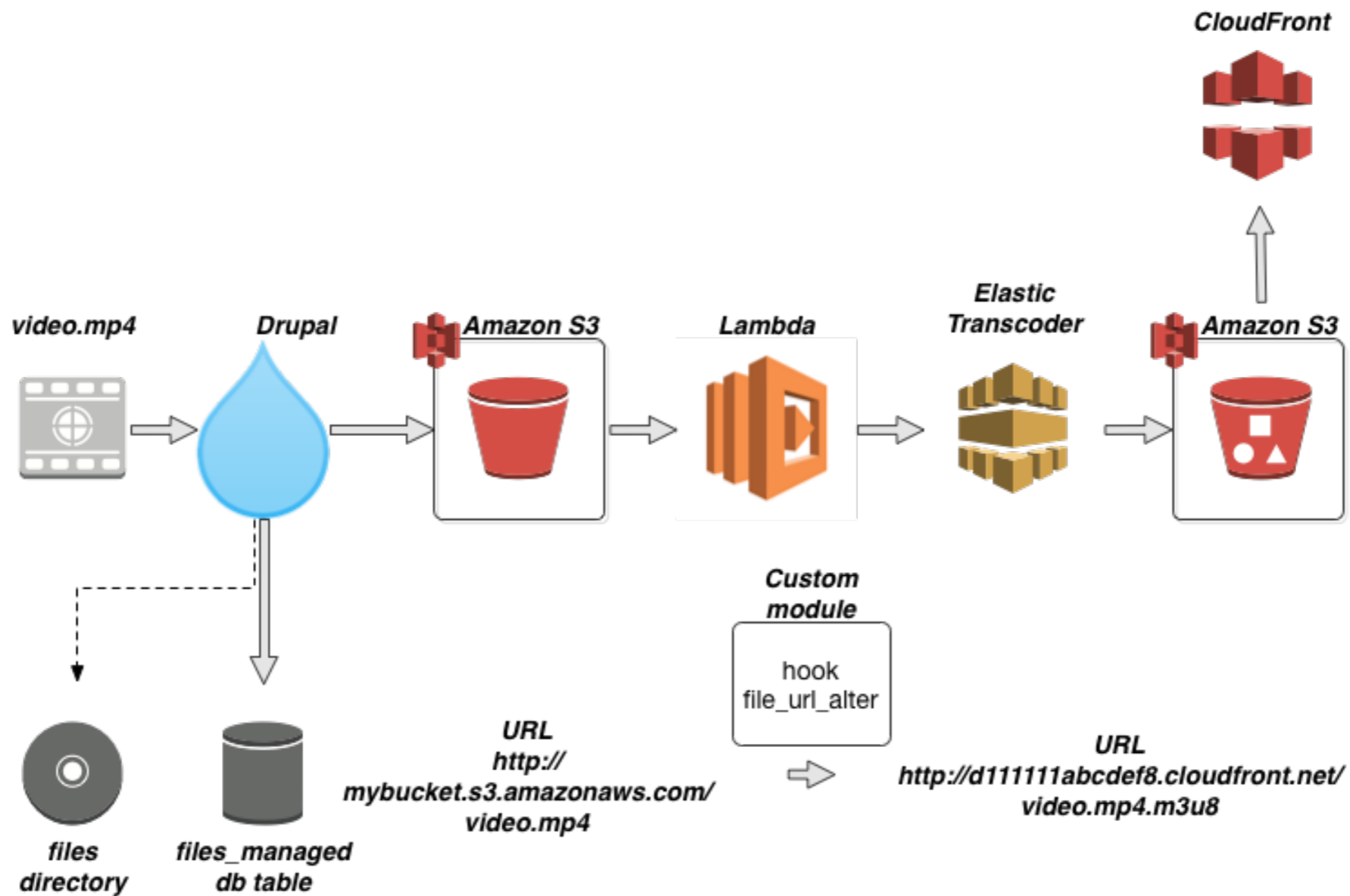
	Delivery Method	ID	Domain Name	Comment	Origin	CNAMEs	Status	State	Last Modified
<input type="checkbox"/>	Web	E2GWCRIYGUPVRA	dzqdz004bpcb.clou	-	only-agency	-	Deployed	Enabled	2015-11-23 16:20 U

# CloudFront CDN Setup in Minutes





# Two URL Issues



# hook\_file\_url\_alter

```

function amazons3_cors_tweaks_file_url_alter(&$uri) {
    // Not needed for now but may be necessary in future to differentiate what should be altered if images are also placed in S3.
    $filter_extensions = array('css', 'js', 'gif', 'jpg', 'jpeg', 'png');
    $pathinfo = pathinfo($uri);

    $schemes = array('s3');

    $scheme = file_uri_scheme($uri);

    // Only serve shipped files and public created files from the CDN.
    if (!$scheme || in_array($scheme, $schemes)) {
        // Shipped files.
        if (!$scheme) {
            $path = $uri;
        }
        // Using S3 scheme. Now check for the file extensions to alter different filetype URIs differently
        else if (isset($pathinfo['extension']) && !in_array($pathinfo['extension'], $filter_extensions)) {
            // Not an image or other filetype. Alter the path to accommodate the S3 transcode filepath and pattern.
            $wrapper = file_stream_wrapper_get_instance_by_scheme($scheme);
            $domain = $wrapper->getDirectoryPath();
            $target = 'hls' . strrchr(file_uri_target($uri), "/");
            // $target = str_replace('assets/', 'hls/', file_uri_target($uri));
            // Don't use s3 bucket directly, call cloudfront @ dzqdqz004bpcb.cloudfront.net
            $domain = 'dzqdqz004bpcb.cloudfront.net';
            $path = 'http://' . $domain . '/' . $target . '.m3u8';
        }

        // Clean up Windows paths.
        $path = str_replace('\\', '/', $path);
        $uri = $path;
    }
}

```

# hook\_file\_url\_alter (cont.)



# Finishing Touches

*Taking care of all existing files.*

- Bulk upload all files from Drupal files directory to S3
- UPDATE file\_managed SET uri = REPLACE(uri, 'public', 's3') WHERE INSTR(filemime, 'video') > 0;

*Lambda cleanup functions.*

- If Elastic Transcoder is successful, then move original mp4 to an Archive bucket.
- If Elastic Transcoder fails send Amazon SNS push notification



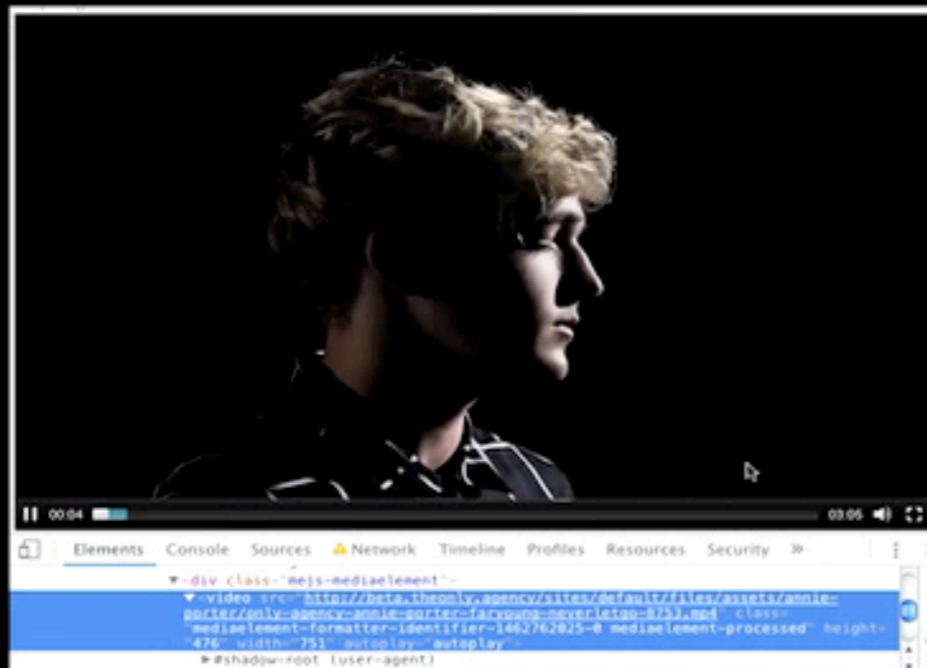
# Results

## Same HD MP4 Source Uploaded Simulated 2G (250kbps) Playback

30 sec. after playback  
started: 4 sec. played

Stutter #5  
@ 1 min. 5.07 sec.

Playback after 39.27 sec.

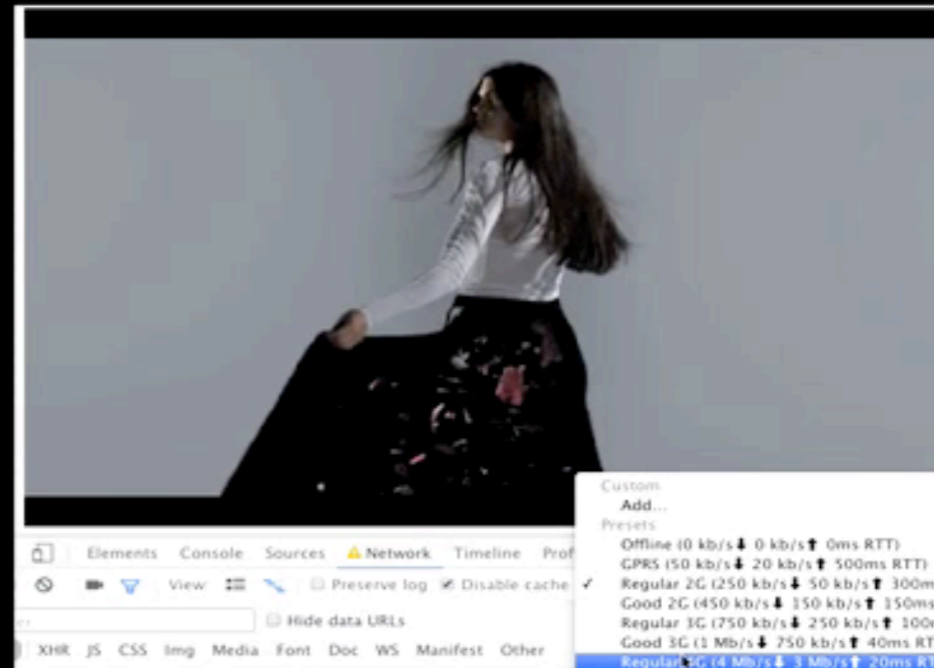


Single MP4 Encoding

30 sec. after playback  
started: 30 sec. played

No Stutters

Playback after 49.13 sec.



Dynamically Selected  
HLS Stream

# Results

- ✦ Both New and Existing Videos now served via fast Amazon CloudFront CDN!
- ✦ End User Experience - No stuttering video playback or video stoppage!
- ✦ Maintainer Experience - No change from standard Drupal node creation. Single video upload.
- ✦ ZERO web server disk space used and nearly infinite S3 expandability!
- ✦ Super cheap and easy to maintain!







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