

[AWS Machine Learning Blog](#)

Discovering and indexing podcast episodes using Amazon Transcribe and Amazon Comprehend

by Angela Wang and Mike Gillespie | on 20 SEP 2018 | in [Amazon Comprehend](#), [Amazon Transcribe](#), [Artificial Intelligence](#), [AWS Step Functions](#) | [Permalink](#) | [💬 Comments](#) | [↪ Share](#)

As an avid podcast listener, I had always wished for an easy way to glimpse at the transcript of an episode to decide whether I should add it to my playlist (not all episode abstracts are equally helpful!). Another challenge with podcasts is that, although they contain a wealth of knowledge that is often not available in blogs and other text formats, there's isn't a readily available search engine like Google to index and search the content. What if we could build a tool that converts the audio to text and then build a searchable index on all of our favorite podcast feeds so users could discover information that interests them, without having to listen to a full episode?

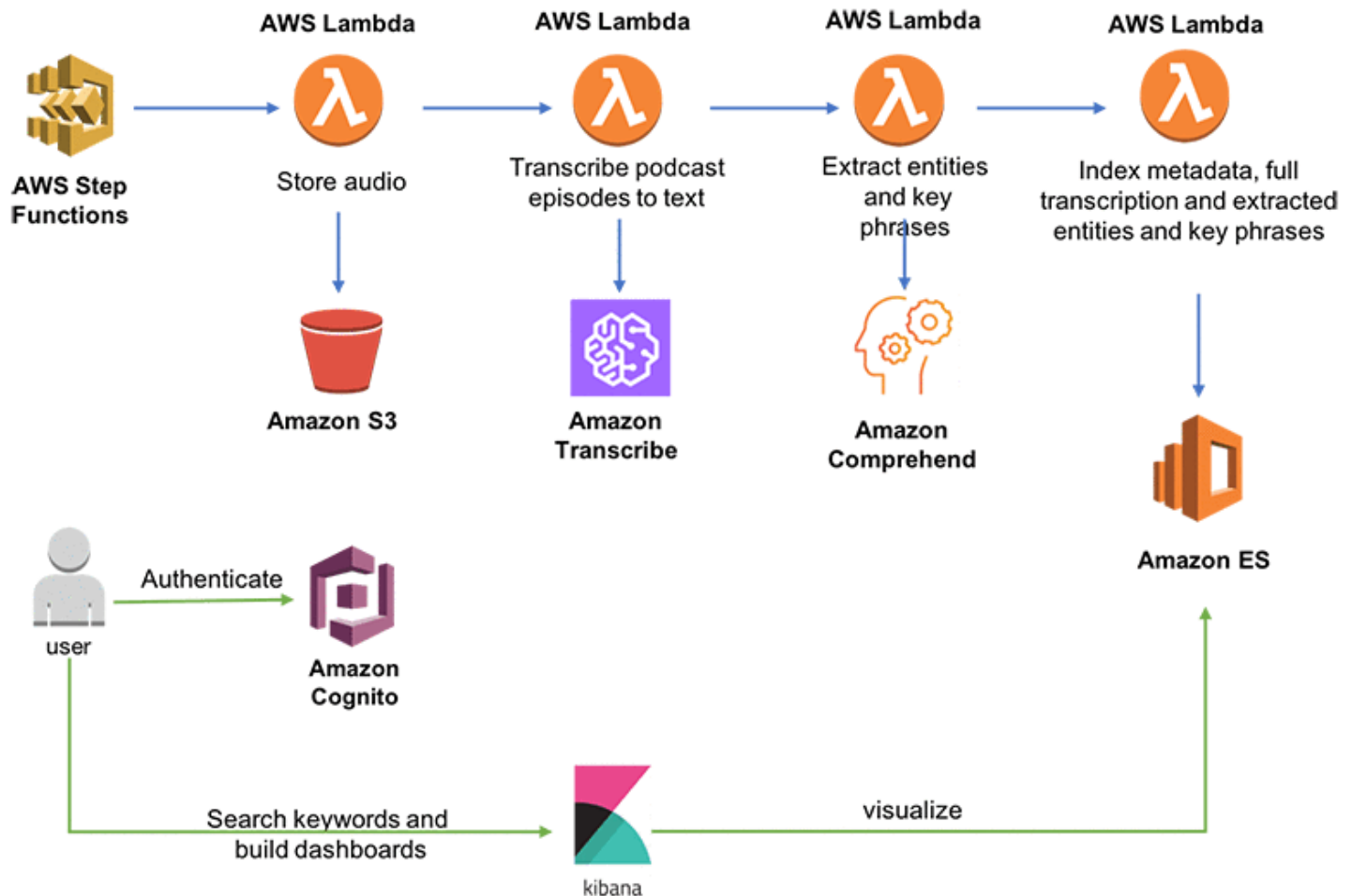
I was very excited when I heard about the launch of Amazon Transcribe and Amazon Comprehend. These machine learning (ML) application services provide pre-trained deep learning-based models as ready-to-use APIs. Amazon Transcribe performs automatic speech recognition(ASR) to transcribes audio into text. Amazon Comprehend provides a range of natural language processing (NLP) services such as entity extraction and sentiment analysis. With the help of these two services, you can now quickly put together an architecture that produces this searchable database of podcasts.

In this blog post, I'll walk you through how you can build a serverless podcast indexing application. When you do a keyword search in this application, it will show you which episodes your keyword appears in and where it appears in the full text transcript. It also will give you a link to the spot in the audio where the keyword was mentioned. In addition, it can analyze a specific podcast feed and visualize keywords and entities mentioned across episodes in that feed. For example, you can use it to compare the frequency of episodes that mention "containers" compared to "serverless". Furthermore, after an index is built, there are many things you can build on top of this data to further extend this application. For example, you may apply machine learning algorithms to build a podcast recommendation engine, so that the podcasts you like the most can be used to identify others that you might find interesting.

Note: This demo is designed to stay within the limits of the AWS Free Tier for AWS Lambda, AWS Step

Functions, Amazon Elasticsearch Service (Amazon ES), and Amazon Transcribe. As of this writing, if your account is not eligible for the Free Tier, running a single transcribe job and running the Elasticsearch cluster for about 2 hours will generate less than \$2.00 in charges.

Here's a high-level diagram of the architecture:



A quick overview of the AWS services used in this application:

- **Amazon Transcribe:** Converts the audio files into a text transcription, including the timestamp of each word spoken. The demo also uses two cool features of Amazon Transcribe: [speaker identification](#) and [custom vocabularies](#).
- **Amazon Comprehend:** Find insights and relationships in text using natural language processing (NLP). It can extract key phrases, places, people, brands, and events.
- **AWS Step Functions:** Coordinates the workflow of processing the podcasts and scheduling Lambda functions.
- **AWS Lambda:** Provides a serverless compute platform to handle the application logic, in this case written in Python.
- **Amazon Elasticsearch Service:** Provides a managed Elasticsearch cluster for searching the podcast transcripts.

- **Amazon Cognito:** Provides user authentication for the Kibana user interface to Amazon ES.
- **AWS CloudFormation:** Provides infrastructure as code in the AWS environment to simplify the deployment of the components.
- **Amazon S3:** Provides shared storage for audio and text files.

Now let's take a look at how to you can quickly deploy this application in your own AWS account to start indexing your favorite podcast feeds!

Launching the application with CloudFormation

To deploy this application in your AWS account, start by launching this CloudFormation stack in the CloudFormation console by using the following button:



In the CloudFormation console, on the **Create stack** page, complete the following:

- **Stack Name:** Provide a unique stack name for this account.
- **AudioOffset:** When you search for a keyword, the search result provides a link to the segment of audio file that mentions the keyword. This parameter controls the number of seconds to seek in the audio before the paragraph containing the keyword starts, to allow more context when hearing the playback. The default is 1 second.
- **kibanaUser:** The username of the user that is used to log into Kibana. Defaults to 'kibana'.
- Acknowledge the stack might create IAM resources by checking these boxes:
 - **I acknowledge that AWS CloudFormation might create IAM resources.**
 - **I acknowledge that AWS CloudFormation might create IAM resources with custom names.**

Choose **Create Change Set** to create the change set for this transform.

CloudFormation > Stacks > Create Stack

Create stack

Template

Template URL

https://s3.amazonaws.com/podcast-transcribe-search/template.yaml

Description

An AWS Serverless Specification template describing your function.

Details

Stack name

podcast-transcribe-index

Parameters

AudioOffset

1

the number of seconds before the keyword that the audio clip will start when hyperlinked.

kibanaUser

kibana

the name of the user that is used to log into kibana.

Capabilities

Transforms might require access capabilities

A transform might add Identity and Access Management (IAM) resources that could provide entities access to make changes to your AWS account. If a transform adds IAM resources, you must acknowledge their capabilities to create or update them. Ensure that you want to create or update the IAM resources, and that they have the minimum required permissions. In addition, if they have custom names, check that the names are unique within your AWS account. [Learn more.](#)

☐

I acknowledge that AWS CloudFormation might create IAM resources.

☐

I acknowledge that AWS CloudFormation might create IAM resources with custom names.

Transforms

Check the following transforms: ["AWS::Serverless-2016-10-31"]

You must use a change set to create this stack because it includes one or more transforms. The change set shows the resources that transforms add to your stack's template. Choose [Create Change Set](#), check the resources that the transforms add, and then choose [Execute](#). [Learn more.](#)

Create Change Set

After the change set is generated, choose **Execute**.

It takes about 15-20 minutes to create the stack, mostly due to the time required to create and configure an Amazon ES cluster.

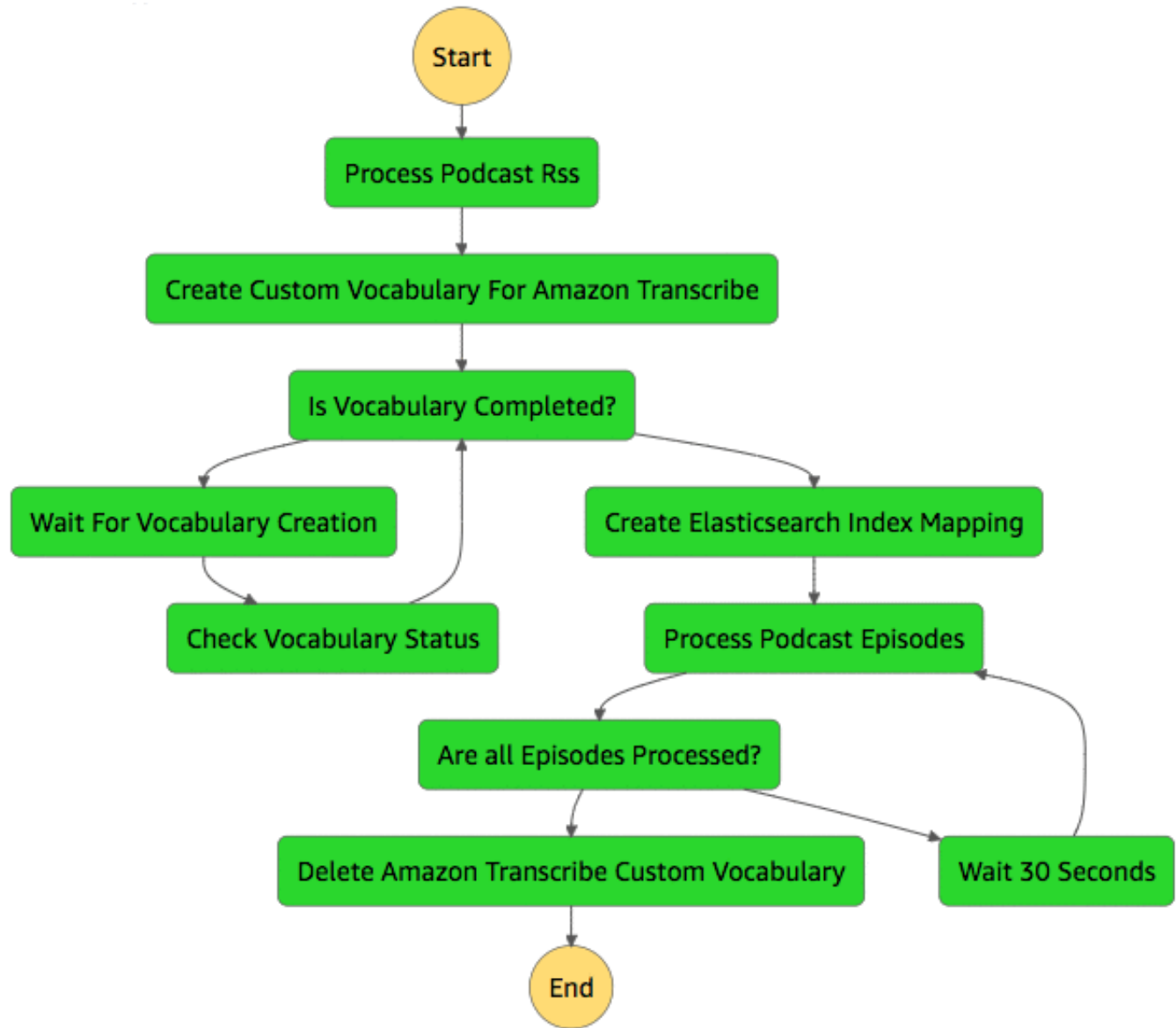
Application components walkthrough

While the AWS CloudFormation stack is being launched, let's step through the details of the components being built:

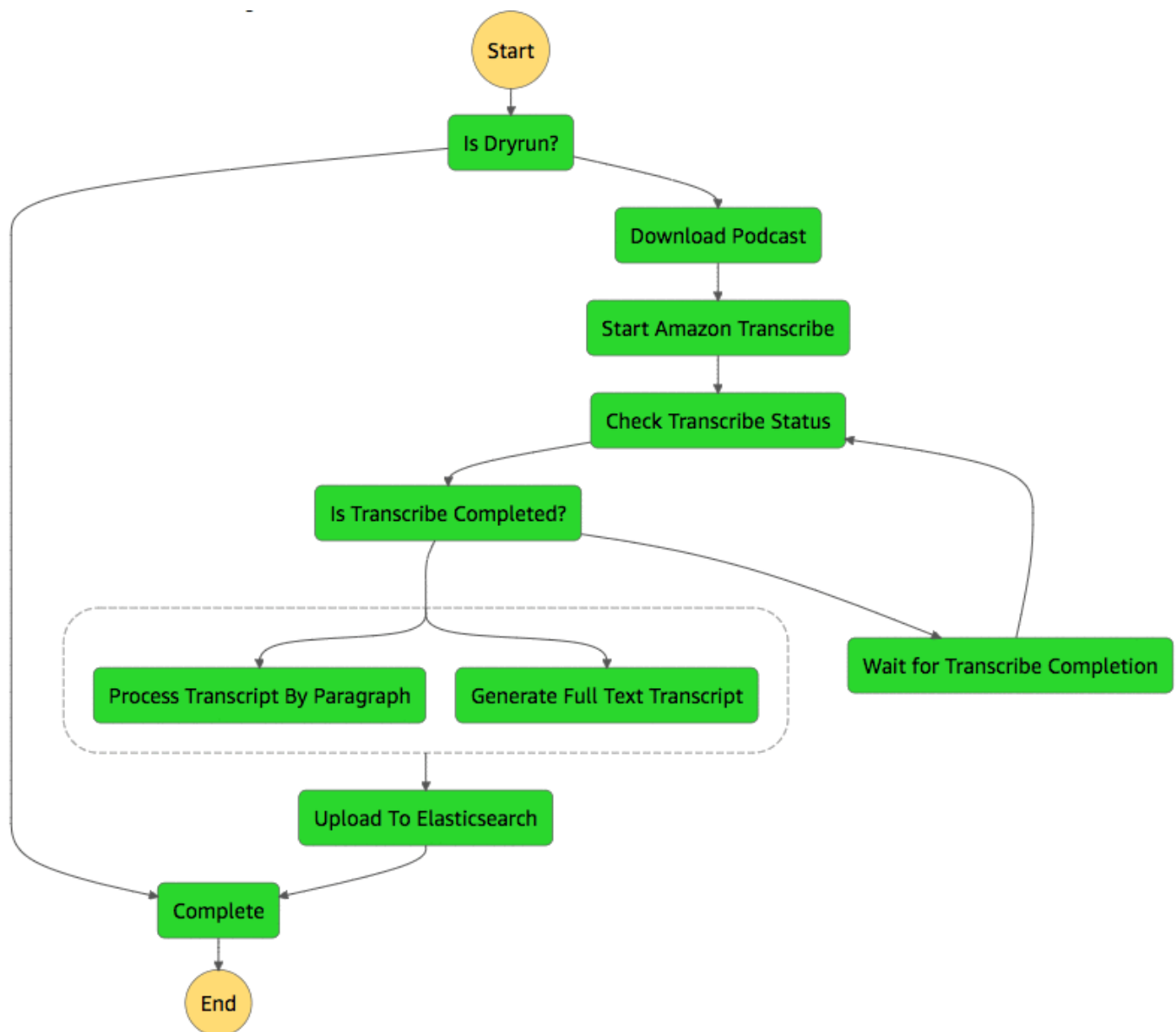
- **Amazon Elasticsearch Cluster:** This provides the persistence and visualization tools for our podcast

index. Visualization is performed by Kibana, which is included as part of Amazon ES.

- **RSS Feed Step Function State Machine:** This is a workflow that processes an RSS feed. It triggers Lambda functions that iterate through the episodes in the RSS feed and create a child state machine to process each episode.



- **Episode Step Functions State Machine:** The workflow that processes each individual podcast episode. The extracted transcription and metadata will be indexed into the Elasticsearch cluster.



Note that in this workflow we used a periodic polling model to wait for completion of the Amazon Transcribe job. This works well in the model where AWS Step Functions is keeping state and orchestrating the entire workflow. In an alternative architecture, you can leverage [Amazon Transcribe's integration with Amazon CloudWatch Events](#) and trigger subsequent processing from the "Transcribe job complete" CloudWatch Event in an event-driven model.

Each of the processes in these state machines is implemented using a Lambda function. We'll explore the implementation of these processes in more detail later.

Start a podcast indexing workflow

Wait until the CloudFormation stack you created has a status of CREATE COMPLETE.

After the CloudFormation stack is created, the next step is to kick off a job to start indexing a podcast feed.

First, navigate to the **RSS Step Functions State Machine**. To do so, find the console URL by going to the output section of the CloudFormation stack. There are 4 outputs to the CloudFormation stack:

- **KibanaUser**: The username for the Kibana login.
- **KibanaPassword**: A random password for the first login into Kibana. You will be forced to change the password on the initial login.
- **KibanaUrl**: A hyperlink to the Kibana site
- **RssStateMachineUrl**: The URL to the Step Functions console that processes the RSS feed.

CloudFormation

Stacks

Stack Detail

podcast-transcribe

Other ActionsUpdate Stack

Stack name:

podcast-transcribe

Stack ID:

arn:aws:cloudformation:us-east-1:podcast-transcribe/77938740-7028-11e8-889a-50faeae44fd

Status:

UPDATE_COMPLETE

Status reason:

Termination protection:

Disabled

IAM role:

Description

An AWS Serverless Specification template describing your function.

▼ Outputs

Key	Value	Description	Export Name
KibanaUser	kibana	The username for the kibana user	
KibanaUrl	https://search-podcast-esdoma-xwrw85ttxuc3-sohyumavco7oaukgqjffj5yygol.us-east-1.es.amazonaws.com/_plugin/kibana/	A hyperlink to the Kibana tool	
KibanaPassword	kF9[eS0\$	The password for the kibana user	
RssStateMachineUrl	https://console.aws.amazon.com/states/home?region=us-east-1#/statemachines/view/arn:aws:states:us-east-1:stateMachine:RssStepFunction-nne35UBJGu6N	A hyperlink to the Step Function Console	

► Resources

To go to the **RSS Step Functions State Machine**, choose the RssStateMachineUrl link in the CloudFormation Stack's Output.

Create an execution using the **Start execution** button and provide the input payload:


```
{  
  "PodcastName": "AWS Podcast",  
  "rss": "https://d3gih7jbfe3j1q.cloudfront.net/aws-podcast.rss",  
  "maxEpisodesToProcess": 10,  
  "dryrun": "FALSE"  
}
```

New execution

×

Enter an execution name - optional

Enter your execution id here

Input - optional

Enter input values for this execution in JSON format

```
1 {  
2   "PodcastName": "AWS Podcast",  
3   "rss": "https://d3gih7jbfe3j1q.cloudfront.net/aws-podcast.rss",  
4   "maxEpisodesToProcess": 10,  
5   "dryrun": "FALSE"  
6 }  
7
```

☐ Open in a new browser tab

Cancel Start execution

This input will process the latest 10 episodes of the AWS Podcast.

Note: You can choose a different podcast feed by changing the `rss` input parameter. The `maxEpisodesToProcess` input parameter lets you control the number of episodes to process from this feed. This helps keep down the cost of this demo. For reference, Amazon Transcribe costs \$0.0004/second, which comes to \$0.36 for a 15 minute audio. The `dryrun` flag will test the state machine without calling the AI functions. Leave is to FALSE to fully process the podcast.

Amazon Transcribe can take about 10-15 minutes to process the 10 episodes. Although you can request to increase the number of concurrent jobs, Amazon Transcribe limits each account/AWS Region to 10 concurrent jobs by default (see [Amazon Transcribe Service Limits documentation](#)). This means that additional jobs need to be queued and wait for earlier jobs to finish before they can be run. In our demo application, we control the rate of job submission in the Rss Step Functions State Machine's "Process Podcast Episodes" step and also leverage [Exponential Backoff](#) on the "Start Transcribe" step in the Episode Step Functions State Machine.

While this process is running, let's look at the code.

Review code of AWS Lambda functions

You can review the source code at <https://github.com/aws-samples/amazon-transcribe-comprehend-podcast> or in the AWS Lambda console following these instructions:

1. In the AWS CloudFormation console, expand the **Resources** section and find the Lambda function you want to review. Choose the hyperlink for the details page for the function.
2. In the AWS Lambda console, scroll to the **Function code** section to review the code.

podcast-searcher

Other Actions ▾ Update Stack

Stack name: podcast-searcher

Stack ID: arn:aws:cloudformation:us-east-1:123456789012:stack/podcast-searcher/54460c50-6d9d-11e8-b399-500c212ff6fd

Status: UPDATE_COMPLETE

Status reason:

Termination protection: Disabled

IAM role:

Description: An AWS Serverless Specification template describing your function.

► Outputs

▼ Resources

Logical ID	Physical ID	Type	Status	Status Reason
Bucket	podcast-searcher-bucket-15f93v7usb8r3	AWS::S3::Bucket	CREATE_COMPL...	
ESDomain	podcast--438fc715	AWS::Elasticsearch::Do...	UPDATE_COMPL...	
ESName	3972d251-35a8-4b52-ab99-51ea08063ebb	Custom::ESName	CREATE_COMPL...	
LambdaRolePolicy	arn:aws:iam::123456789012:policy/podcast-searcher-LambdaRolePolicy-K0002FWGH7R5	AWS::IAM::ManagedPol...	CREATE_COMPL...	
LambdaServiceRole	podcast-searcher-LambdaServiceRole-4S621F7VI48U	AWS::IAM::Role	CREATE_COMPL...	
PodcastStepFunc...	arn:aws:states:us-east-1:123456789012:stateMachine:PodcastStepFunction-fVsGKr1T1TMg	AWS::StepFunctions::St...	CREATE_COMPL...	
RssStepFunction	arn:aws:states:us-east-1:123456789012:stateMachine:RssStepFunction-MrBJO0OsePp0	AWS::StepFunctions::St...	CREATE_COMPL...	
StatesExecutionR...	podcast-searcher-StatesExecutionRole-18SONWMLIA5CA	AWS::IAM::Role	CREATE_COMPL...	
checkTranscribe	podcast-searcher-checkTranscribe-1AHUKG5JZ6G0S	AWS::Lambda::Function	UPDATE_COMPL...	
downloadPodcast	podcast-searcher-downloadPodcast-1DMHN5XPBN70W	AWS::Lambda::Function	UPDATE_COMPL...	
monitorPodcastPr...	podcast-searcher-monitorPodcastProcessing-N24FAIH38V48	AWS::Lambda::Function	UPDATE_COMPL...	
podcastTranscribe	podcast-searcher-podcastTranscribe-UD8ZYZND3QQL	AWS::Lambda::Function	UPDATE_COMPL...	

Repeat the process for the following Lambda functions that process the **RSS Feed Step Function State Machine**:

- **processPodcastRss**: Downloads the RSS file and parses it to determine the episodes to download. This function also leverages the Amazon Comprehend **entity extraction feature** for two use cases:

- To compute an estimate of the number of speakers in each episode. We do this by using Amazon Comprehend to find people's names in each episode's abstract. We find that many podcast hosts like to mention their guest speakers' names in the abstract. This helps us later when we use Amazon Transcribe to break out the transcription into multiple speakers. If no names are found in the abstract, we will assume the episode has a single speaker.
- To build a domain-specific custom vocabulary list. If a podcast is about AWS, you will hear lots of expressions unique to the specific domain (e.g., EC2, S3) that are completely different from expressions found in a podcast about astronomy (e.g., Milky Way, Hubble). Providing a custom vocabulary list to Amazon Transcribe can help guide the service in identifying an audio segment that sounds like "easy too" to its actual meaning "EC2." In this blog post, we automatically generate the custom vocabulary list by using the named entities extracted from episode abstracts to make Amazon Transcribe more domain aware. Keep in mind that this approach may not cover all jargon that could appear in the transcripts. To get more accurate transcriptions, you can complement this approach by drafting a list of common domain-specific terms so that you can construct a custom vocabulary list for Amazon Transcribe.
- **createTranscribeVocabulary:** Creates a [custom vocabulary](#) for the Amazon Transcribe jobs so it will better understand when an AWS term is mentioned. The custom vocabulary is created using the method mentioned earlier.
- **monitorTranscribeVocabulary:** Polls Amazon Transcribe to determine if the custom vocabulary creation is complete.
- **createElasticsearchIndex:** Creates [index mappings](#) in Elasticsearch.
- **processPodcastItem:** Creates a child state machine execution for each episode while maintaining a maximum of 10 concurrent child processes. This function keeps track of how many processes are active and throttles the downstream calls once the maximum is hit. Amazon S3 is used to store additional state about each episode.
- **deleteTranscribeVocabulary:** Cleans up the custom vocabulary after the processing of all episodes is complete. Note that we added this step to minimize artifacts that stay around in your account after you run the demo application. However, when you build your own apps with Amazon Transcribe, you should consider keeping the custom vocabulary around for future processing jobs.

Review the Lambda functions that make up the **Episode Step Functions State Machine**.

- **downloadPodcast:** Downloads the podcast from the publisher and stages it in Amazon S3 for further processing.
- **podcastTranscribe:** Makes the call to Amazon Transcribe to create the transcription job. Notice how we pass in parameters extracted from previous steps, such as the custom vocabulary to use and number of speakers for the episode.
- **checkTranscript:** Polls the transcription job for status. Returns the status, and the step function will retry if the job is in progress.
- **processTranscriptionParagraph:** This is the most complicated function in the application. It downloads the transcription data from Amazon Transcribe and break it into paragraphs. The paragraphs are broken by speaker, punctuation, or a maximum length. The output of this function is a

file that contains all of the paragraphs in the transcription job. It also includes the start time for when the phrases were spoken in the audio file, and it includes the speaker that the paragraph is attributed to.

- **processTranscriptionFullText:** This function contains logic that is similar to **processTranscriptionParagraph**, but the output is a full text transcription in a readable format.
- **UploadToElasticsearch:** Parses the output of the previous steps and performs a bulk load of the indexes into the Elasticsearch cluster. The connection to Elasticsearch uses a SigV4 signature to perform IAM-based authentication into the cluster.

If the state machine execution you created several steps ago is not yet complete, wait a few minutes and recheck the status. Note that you will be able to see results appear in the Elasticsearch index as soon as some executions of the child workflow **EpisodeStateMachine** is complete, even while the parent **RssStateMachine** is still waiting for the rest of the episodes to finish.

Search and visualize podcasts with Kibana

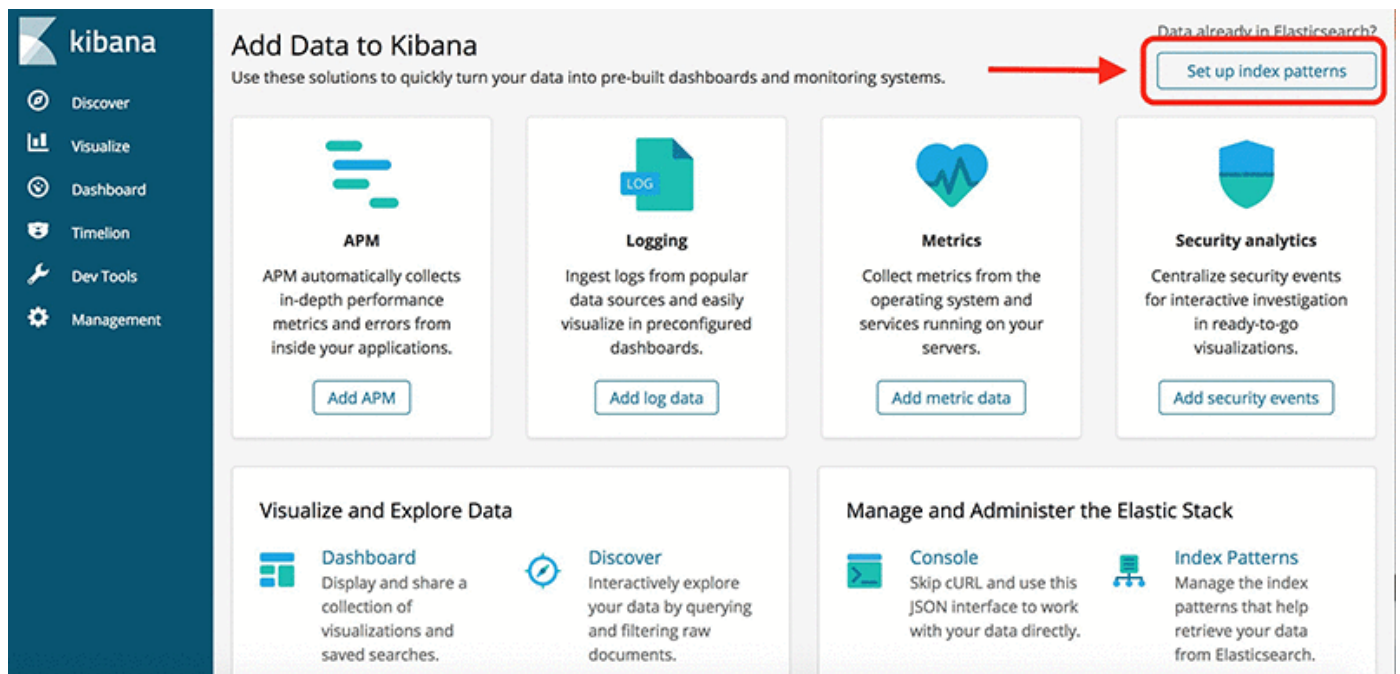
This application creates two Elasticsearch indexes:

- **Episodes index:** Each document in this index is a single episode. You can search and review attributes such as the episode's title, readable transcript of the full episode, publish date, entities extracted from the transcript, etc.
- **Paragraphs index:** Each document in this index is a single paragraph of an episode. You can search for keywords at a paragraph level, review the episode the paragraph appears in, and find the URL that directly links to the position of the paragraph in the audio.

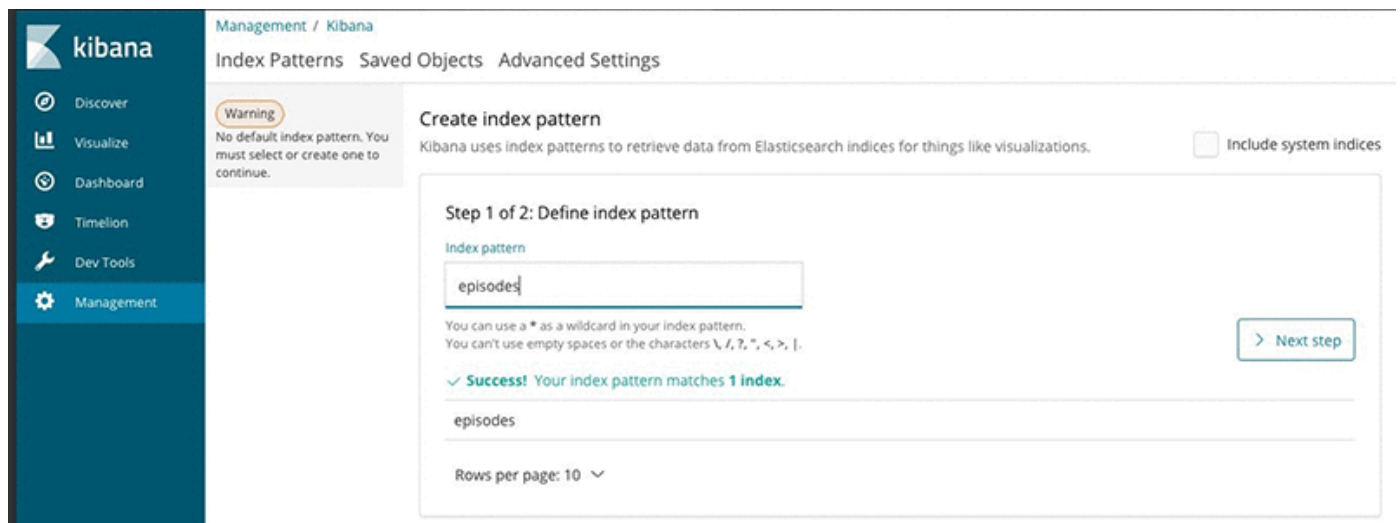
To configure Kibana to search and visualize these indexes, follow these steps:

Setting up the episode index

1. Navigate to the URL for Kibana. (You can find the KibanaUrl in the **Output** section of the CloudFormation stack.)
2. To log in to Kibana, use the username and password from the CloudFormation output. You will be required to enter a new password on the initial login.
3. After Kibana opens, choose **Set up index patterns**



4. In the index pattern textbox, type **episodes**, then choose **Next Step**:



5. In the second step, if you are asked to pick a Time Filter Field, choose "I don't want to use the Time Filter", then choose **Create Index Pattern**.

Searching the episode index and read the transcript

Click the **Discover** entry on the left-hand toolbar.

Enter search terms you are interested in, and you can explore the episodes that mention your terms and read the transcript of the episode!

To take advantage of the query capabilities of Kibana, refer to the documentation [here](#) for more supported syntaxes. See the following chart for some example queries:

	Search Criteria	Notes
1	natural language processing	Any episode with either “natural”, “language” or “processing”
2	“natural language processing”	Any episode with phrase “natural language processing” in the title or text
3	nlp OR “natural language processing”	Any episode with either “nlp” or the “natural language processing” phrase in the title or text
4	+text:“natural language processing” - Episode:“240: AWS Answers”	Any episode with the phrase “natural language processing” except Episode 240

In the example that follows, I used the query `nlp OR "natural language processing"` to search for episodes that mention either the word “nlp” or the phrase “natural language processing”.

Use the ▼ to expand the full document to look through the transcript. If you like it, find the link to the episode from the `audio_url` field to listen to the full show!

kibana
rip OR "natural language processing"
Uses lucene query syntax

Discover

Visualize

Dashboard

Timeline

Dev Tools

Management

Add a filter +

episodes

Selected Fields

- ? _source

Available Fields

- _id
- _index
- # _score
- _type
- audio_s3_location
- audio_type
- audio_url
- published_time
- source_feed
- speakerNames
- summary
- title
- transcript
- transcript_entities.DATE
- transcript_entities.LOCATION
- transcript_entities.ORGANIZATION
- transcript_entities.OTHER
- transcript_entities.PERSON
- transcript_entities.Products_and_Titles

Table	JSON
_id	http://d1le29qzhu1u4.cloudfront.net/AWS_Podcast_Episode_254.mp3
_index	episodes
# _score	4.92
_type	episode
audio_s3_location	s3://podcast-mike-bucket-1plus79wqvpt/podcasts/audio/78C85E-AWS_Podcast_Episode_254.mp3
audio_type	audio/mpeg
audio_url	http://d1le29qzhu1u4.cloudfront.net/AWS_Podcast_Episode_254.mp3
published_time	2018-07-15 21:37:28
source_feed	https://d3gh7jbfef3jlq.cloudfront.net/aws-podcast.rss
speakerNames	Sinon, Siresha Muppola
summary	Do you want to unlock the meaning in text files? Have you wanted to understand and act upon customer sentiment from comments, reviews or even call-centre recordings? Sinon is joined by Siresha Muppola (AWS Solutions Architect) to show you how.
title	R254: Understanding Amazon Comprehend
transcript	<p>spk_0 : This is episode two hundred fifty four of the AWS</p> <p>spk_1 : podcast released</p> <p>spk_0 : on July fifteenth twenty eighteen</p> <p>spk_1 : about ron a welcome back to the edit his podcast unless you here with your great to have you back and I'm joined by a very special guest I'm joined by suresh a napola who's the solutions I could take based out of Colorado in the US welcome seriesha spk_0 : hi sinon thank you spk_1 : good to have you here on the podcast and you've come along because you have so pretty deep expertise in the machine learning spice and have been working with some of their customers lately to apply it and I guess one of the really interesting services eve what would likely something called Amazon Comprehend so maybe let's start by explaining what is emma Amazon Comprehend and we'll talk about how you applied it spk_0 : absolutely Amazon Comprehend is basically a Natural Language Processing service it uses machine learning behind the scenes in order to find insights and relationship in a in a text spk_1 : so it's kind of understanding what's happening within the text it's beyond ah just converting some audio to text it's actually saying what's what's the text it about what's the context or some keywords it was saying etcetera correct</p> <p>spk_0 : souvo can pass along a piece of text to two Amazon Comprehend and what Comprehend comes back to you is with the detail analysis of the text and it analyzes entities basically so entities you can think off like proper noun so these could be brand names or people names or country names exit it also detect key phrases which I mostly think of these as common sense like it huh detect that we're talking about books or the taxi's about a particular product better and additionally it can also detect the language of the texter currently we support english and spanish language detection and one of the most interesting things are Amazon Comprehend can do is sentiment analysis this is so when you give it a piece of text it can analyze this text and come back to you seeing whether the text is positive negative or neutral or mixed right so it has very cool use cases for that particular features. So for example if you look at the customer reviews on your website if you want to understand of what your customers are feeling about your particular product this is the API you would use on friday</p>

View single document

If you scroll past the transcript, you will also see some of the named entities extracted from the transcript. We can later use these keywords to build some visualization/tag clouds:

```
spk_0 : absolutely it is a very prize effective and very cost effective to use this API on just for an example a 2a prototype I built a sentiment analysis tool that I u
sed to an analyze the customer review comments on amazon dot com this is the data set that is publicly available I think for about ten years worth off customer review
analysis I was able to do it just about the three hundred dollars dollars dollars of so so it's very cost effective yes yeah

spk_1 : it's what I think it's one of those ones where the cost of the meeting to agree to do the actual projects probably will cost yeah

spk_0 : ROS and the cool thing about this is and the more you use the better price point you get just like any other Amazon service

spk_1 : yeah that that is a great point it is it is tea so you get you get better better values as you go absolutely

spk_0 : fantastic

spk_1 : well sorry sha thanks for coeing on then explaining to us a little bit about how it works and what you can do with it

spk_0 : thank you agreed to be here thanks

spk_1 : everyone for listening we do love to get your feedback AWS podcast that Amazon dot com and until next time keep on building
```

t	transcript_entities.DATE	🔍 🔍 📅	July Fifteenth twenty eighteen, this week
t	transcript_entities.LOCATION	🔍 🔍 📍	Colorado, US
t	transcript_entities.ORGANIZATION	🔍 🔍 🏢	ISO, Amazon, FBI, AWS, Twitter
t	transcript_entities.OTHER	🔍 🔍 🗣️	spanish, english
t	transcript_entities.PERSON	🔍 🔍 👤	Dan, Justin, Howard
t	transcript_entities.Products_and_Titles	🔍 🔍 📺	DynamoDB, Siri, alexa, Lambda

Setting up the paragraph index

Now let's set up the second index we built. This index lets you search at a paragraph level where a keyword appears in, and links you to the exact spot in the audio where it was discussed.

1. Navigate to **Management** → **Index Patterns** → **Create Index**.
2. In the index pattern textbox, type **paragraphs**, then choose **Next Step**.

3. Accept the defaults and choose **Create Index Pattern**.
4. Scroll down to the **Url** field and choose the edit icon on the right.
5. Set the **Format** to **Url**, and the type to **Link**. Then choose **Update Field**.

url

Type

string

Format (Default: String)

⚠ Warning

Url

Type

Link

☐ Open link in current tab

Url Template

[i Url Template Help](#)

Label Template

[i Label Template Help](#)

Samples

Input	Formatted
john	john
/some/pathname/asset.png	/some/pathname/asset.png
1234	1234

Popularity

2

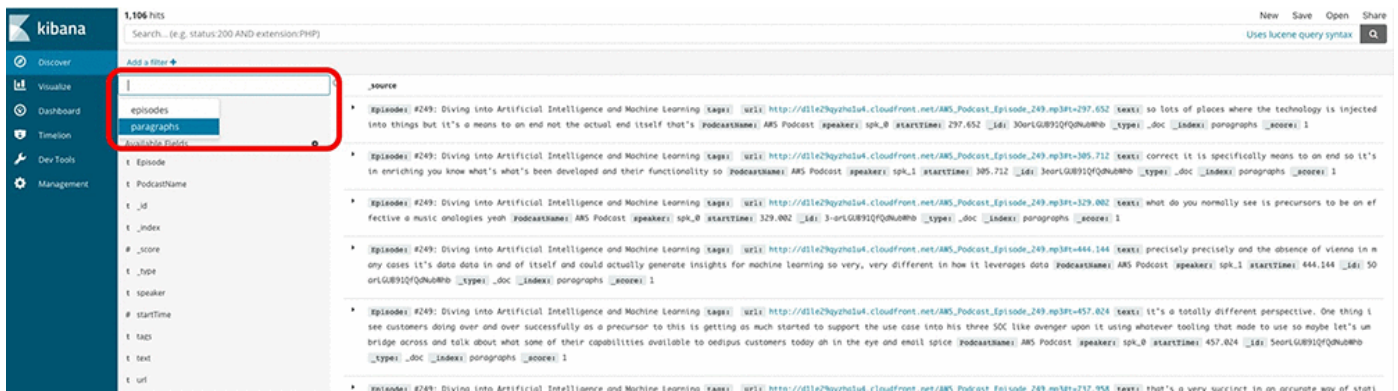
+

-

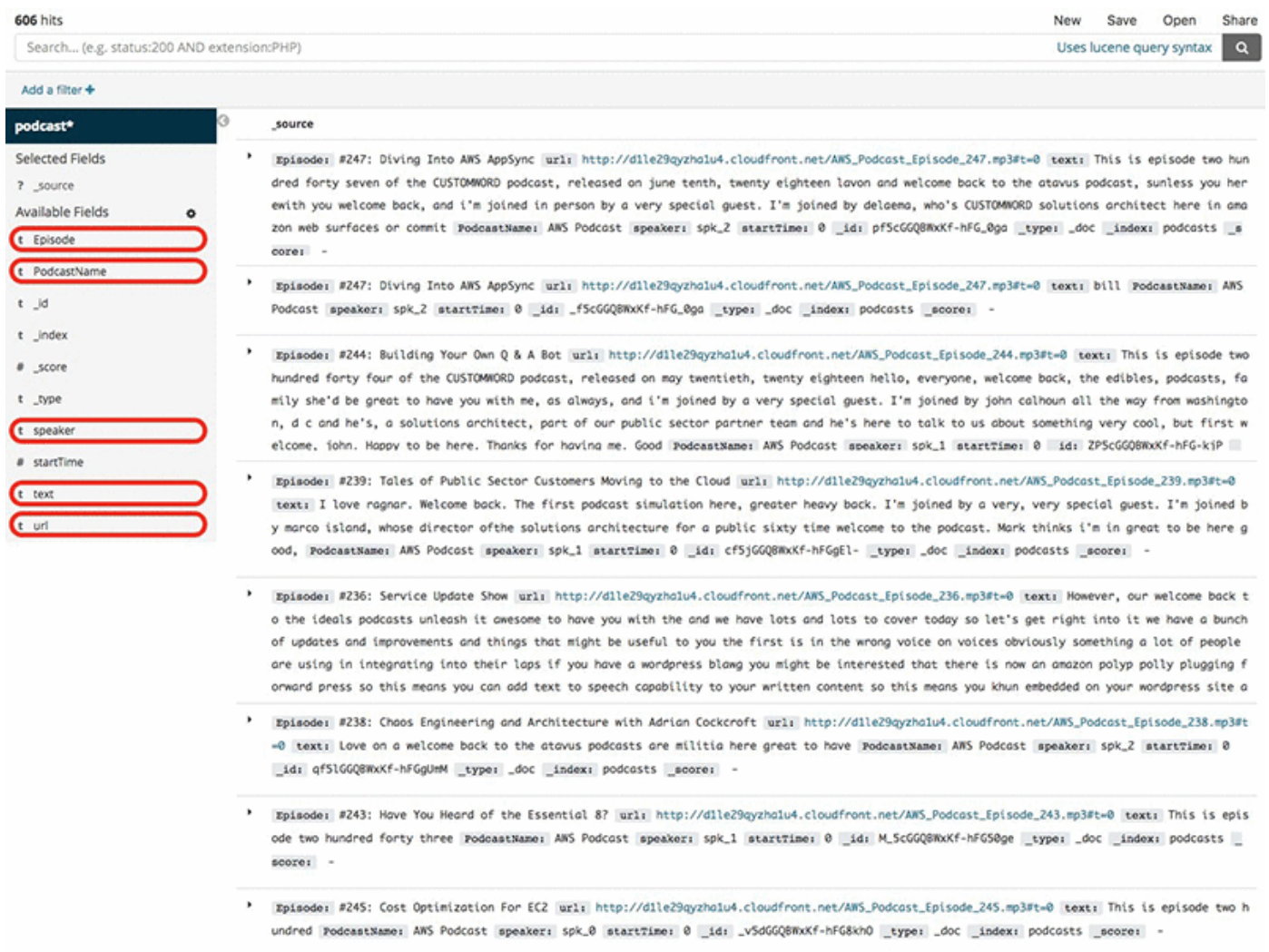
Update Field

Cancel

6. In the **Discover** section, ensure you have picked the paragraph



7. Now customize the search columns by adding the **PodcastName** . Repeat this for **Episode** , **speaker** , **text** , and **url** .



8. You now have a screen that looks like this:

56 hits

New Save Open Share

"machine learning" Uses lucene query syntax

Add a filter +

Episode	PodcastName	speaker	text	url
#249: Diving into Artificial Intelligence and	ARS Podcast	spk_1	it's a great question and you know i think there's some miss know more about the type of data and the quantity and quality of the evidence required for machine learning a lot of people confused is this intelligence and analytics with with machine learning whereby if you're doing something like does this intelligence and you need too you know understand you know building safe financial report you need that financial data in order to build the financial report right? It's ah it's a binary either have it or you don't when it comes to machine learning when the nice thing is data does not have too be exactly what you'd expect if you're you know trying to detect fraud needed have cases where there's you know where this fraud or no fraud but having all of the data is not a requirement um the second thing that's actually very nice about about machine learning and in the sense is you don't need all of the data s o the machine learning we use the data that's available to it to do the best job in predicting and as you add more data those	http://dl.e29ayzhalu4.clo.udfro nt.ne
#249: Diving into Artificial Intelligence and	ARS Podcast	spk_1	ah it was on uses a IAM l in several different ways including keep learning SOC just a few examples for those have used Amazon dot com the recommendations that you see at the bottom of the page are all driven by machine learning um you could go to the fulfillment centers and there are robots that used deep corning too basically move materials around in the warehouse ah Amazon prime air includes machine learning , departing and their drones a cz well as Amazon go which is a new ah frictionless store retail store are we could go buy groceries and things of that nature also uses a combination of machine learning and deep learning um and finally for anybody who has an echo Amazon alexa is a ah machine learning departing powered device	http://dl.e29ayzhalu4.clo.udfro nt.ne
#249: Diving into Artificial Intelligence and	ARS Podcast	spk_1	for machine learning welcome crease thank you good	http://dl.e29ayzhalu4.clo.udfro nt.ne
#249: Diving into Artificial Intelligence and	ARS Podcast	spk_1	precisely precisely and the absence of vienna in many cases it's data data in and of itself and could actually generate insights for machine learning so very, very different in how it leverages data	http://dl.e29ayzhalu4.clo.udfro nt.ne
#249: Diving into Artificial Intelligence and	ARS Podcast	spk_1	we have a few options we have something called the machine learning solutions lab or ml labs as we call them that can help win brainstorming ideas so if you know ah one of our customers is unsure where to get started exactly! The ml solutions lab can help identify those business use cases with them conduct poc US ah perform hackathons with the developers and data scientists or you know get get some value in some other way out of the machine learning um so that's ah that's one easy way for folks to get started our customers to get started with machine learning the other way is simply to dive in for everyone of the layers that i mentioned there is self training out there there are ah sample workspaces where you can actually pick up actual code for instance and Python and jupyter notebooks on ah and use those as a baseline to start solving some business problems	http://dl.e29ayzhalu4.clo.udfro nt.ne
#254: Understanding Amazon Comprehend	ARS Podcast	spk_1	absolutely Amazon Comprehend is basically a natural language processing service it uses machine learning behind the scenes in order to find insights and relationship in a in a text	http://dl.e29ayzhalu4.clo.udfro nt.ne
#249: Diving into Artificial Intelligence and	ARS Podcast	spk_1	artificial intelligence machine learning and keep learning are all related artificial intelligence is really the top layer that defines basically taking what humans do on automating it through business rules or statistical analysis or things of that nature	http://dl.e29ayzhalu4.clo.udfro nt.ne
#249: Diving into Artificial Intelligence and	ARS Podcast	spk_1	machine learning is a subset of artificial intelligence that uses statistical in mathematical models on top of typically textual information so using things like linear regression and neural nets and things of that nature to predict outcomes also of course to automate decision ing and things of that nature and then a subset of machine learning is departing which effectively uses the same types of technologies, ml convolution, all neural networks and other types of school in mathematical algorithms but instead of contextual data it does so on unstructured data like images videos and audio files	http://dl.e29ayzhalu4.clo.udfro nt.ne
#249: Diving into Artificial Intelligence and	ARS Podcast	spk_1	sure we know when businesses think about howto apply artificial intelligence and machine learning um there are really three domains in which they could apply it the first and this is the most common and typically the kind of a little hanging fruit is an automation on and that is right taking existing process identify what's being done today in ah manual manual way you know the humans and then identifying how machine worrying can take um data in this processes and automate them so you could think of something very simple like spam filtering right your spam filters have machine learning built in in the old days then create business rules to ah right not to answer that spam now it's all automated behind the scenes ah yes yes	http://dl.e29ayzhalu4.clo

Searching the paragraph index

Now, have some fun searching for things. When you click the link in the url column, the browser will open the audio and seek to a point shortly before the word is mentioned. There are occasions where the browser will drop you slightly after, so you may need to move back a few seconds.

Import a Kibana Dashboard

Now for some fun visualizations!

1. Download the Kibana Dashboard file [here](#)
2. On the Kibana home page, choose **Management** on the left side toolbar.
3. On the management page, choose **Import** and select kibana.json, which was downloaded in #1.

Management / Kibana

Index Patterns [Saved Objects](#) Advanced Settings

Edit Saved Objects

From here you can delete saved objects, such as saved searches. You can also edit the raw data of saved objects. Typically objects are only modified via their associated application, which is probably what you should use instead of this screen. Each tab is limited to 100 results. You can use the filter to find objects not in the default list.

Export Everything Import

Dashboards (0) Searches (0) Visualizations (0)

Search...

Delete Export

No dashboards matched your search.

4. You need to map the visualization objects to the indices in your Kibana application as shown in the following screenshot. Confirm **Yes, overwrite all objects** when the pop-up appears.

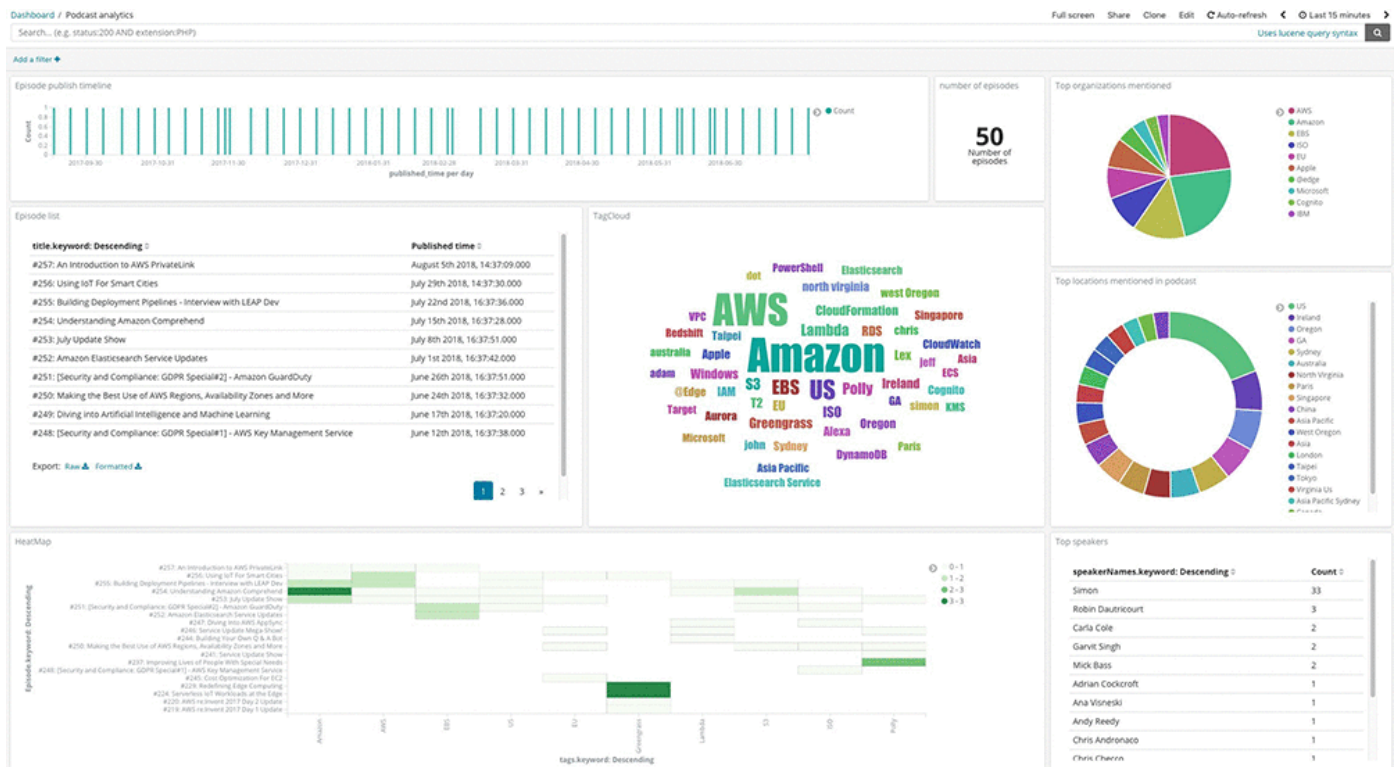
Index Pattern Conflicts

The following saved objects use index patterns that do not exist. Please select the index patterns you'd like re-associated them with.

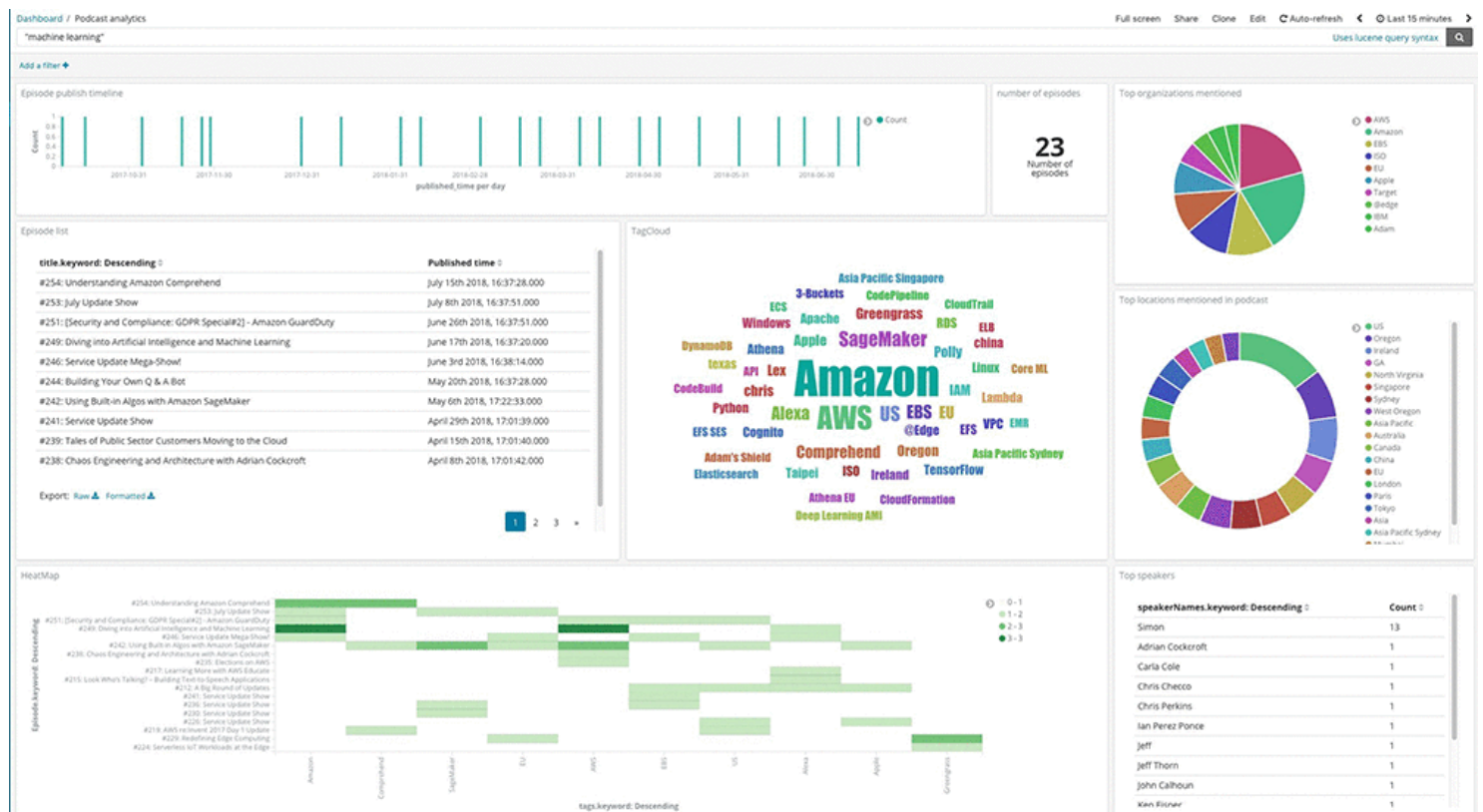
ID	Count	Sample of affected objects	New index pattern
3a7460e0-9dbf-11e8-afe0-9d62d25a7fe1	7	Episode publish timeline Top speakers Top locations mentioned in... Top organizations mention... number of episodes	episodes
565d4710-9dc2-11e8-afe0-9d62d25a7fe1	3	TagCloud HeatMap PieChart	paragraphs

Cancel Confirm all changes

5. You can now find the imported dashboard under **Dashboard** → **Podcast analytics**.



You can do analysis using the dashboard by leveraging the search functionality. For example, by using the search term **machine learning**, we update the analytics to visualize only episodes that contains the phrase “machine learning.”



When you have finished exploring the demo application, remember to delete the CloudFormation stack to prevent unnecessary charges.

Conclusion

In this blog post, we showed you how to leverage the power of Amazon Transcribe and Amazon Comprehend to transcribe podcast episodes, extract keywords and entities from the podcast, and build a search index and dashboard using Amazon Elasticsearch Service. Combined with the serverless compute platform using AWS Lambda, you can build a system like this quickly with zero servers to manage, while AWS Step Functions makes the orchestration of various steps easily manageable in a visualizable workflow.

With the range of machine learning capabilities provided by the AWS platform, there are many ways you can take this demo further. You can, for example:

- Build a recommendation engine for podcast episodes by training a model based on user's ratings on episodes they have listened to. See <https://aws.amazon.com/blogs/machine-learning/build-a-movie-recommender-with-factorization-machines-on-amazon-sagemaker/> for some approaches on building recommendation engines.
 - Group the episodes using Neural Topic Modeling. See <https://aws.amazon.com/blogs/machine-learning/introduction-to-the-amazon-sagemaker-neural-topic-model/> for an example on doing topic modeling using Amazon SageMaker. Amazon Comprehend also provide a ready-to-use API for topic modeling: <https://docs.aws.amazon.com/comprehend/latest/dg/topic-modeling.html>.
-

About the authors



Angela Wang is a Solutions Architect at Amazon Web Services based in Chicago. She helps customers build scalable and resilient architectures on the AWS cloud and is especially passionate about serverless technologies. Outside of work, she loves climbing, backcountry skiing, traveling – while listening to lots of podcasts along the way.



Mike Gillespie is a solutions architect at Amazon Web Services. He works with the AWS customers to provide guidance and technical assistance helping them improve the value of their solutions when using AWS. Mike specializes in helping customers with serverless, containerized, and machine learning applications. Outside of work, Mike enjoys being outdoors running and paddling, listening to podcasts, and photography.



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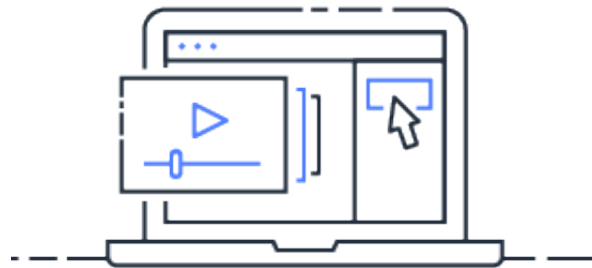
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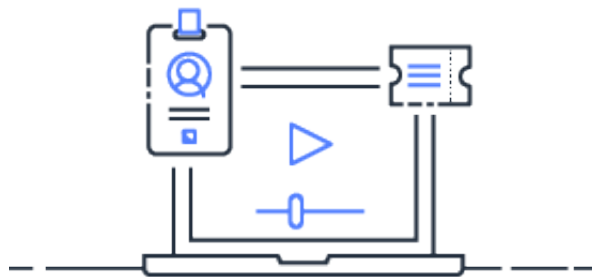
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