

# Serverless Web Apps using Amazon DynamoDB - Part 3

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## Overview

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Complete your mission! In this lab, you will complete and publish a mission dossier generator using DynamoDB. This is Part 3 of a three-part series of labs. In Part 1, you created a DynamoDB table and entered mission data. In Part 2, you created and tested Lambda functions to retrieve mission data. In Part 3, you will conclude this three-part series by configuring an API using Amazon API Gateway and setting up a public website to retrieve information from your DynamoDB table via Lambda functions, using what you learned in all three labs to send super heroes off to save the world!

## Topics covered

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By the end of this lab you will be able to:

- Create an API for Lambda functions to access a DynamoDB table using Amazon API Gateway
- Generate the SDK for your API
- Configure and publish content with Amazon S3

... and give super heroes details about the missions they face!

## Lab Pre-requisites

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This is the third in a three-part series of labs. Each of the three labs can stand alone, but because the labs build upon what you learned previously, taking **Serverless Web Apps using Amazon DynamoDB - Part 1** and **Serverless Web Apps using Amazon DynamoDB - Part 2** prior to this lab is the best learning experience.

## Other AWS Services

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Other AWS Services than the ones needed for this lab are disabled by an IAM policy during your access time in this lab. In addition, the capabilities of the services used in this lab are limited to what's required by the lab and in some cases are even further limited as an

intentional aspect of the lab design. Expect errors when accessing other services or performing actions beyond those provided in this lab guide.

## **Amazon DynamoDB**

Amazon DynamoDB is a fast and flexible NoSQL database service for all applications that need consistent, single-digit millisecond latency at any scale. It is a fully managed cloud database and supports both document and key-value store models. Its flexible data model and reliable performance make it a great fit for mobile, web, gaming, ad tech, IoT, and many other applications.

You can use Amazon DynamoDB to create a database table that can store and retrieve any amount of data, and serve any level of request traffic. Amazon DynamoDB automatically spreads the data and traffic for the table over a sufficient number of servers to handle the request capacity specified by the customer and the amount of data stored, while maintaining consistent and fast performance.

For more information about Amazon DynamoDB, see

<https://aws.amazon.com/documentation/dynamodb/>.

For pricing, see

<https://aws.amazon.com/dynamodb/pricing/>.

## **AWS Lambda**

AWS Lambda is a compute service that provides resizable compute capacity in the cloud to make web-scale computing easier for developers. Upload your code to AWS Lambda and AWS Lambda takes care of provisioning and managing the servers that you use to run the code. AWS Lambda supports multiple coding languages: Node.js, Java, or Python.

You can use AWS Lambda in two ways:

- As an event-driven compute service where AWS Lambda runs your code in response to events, such as uploading image files as you'll see in this lab.
- As a compute service to run your code in response to HTTP requests using Amazon API Gateway or API calls.

AWS Lambda passes on the financial benefits of Amazon's scale to you. Lambda executes your code only when needed and scales automatically, from a few requests per day to thousands per second. Lambda makes it easy to build data processing triggers for AWS services like Amazon S3 and Amazon DynamoDB, process streaming data stored in Amazon Kinesis, or create your own back end that operates at AWS scale, performance, and security.

This lab guide explains basic concepts of AWS in a step by step fashion. However, it can only give a brief overview of Lambda concepts. For further information, see the official Amazon Web Services Documentation for Lambda at

<https://aws.amazon.com/documentation/lambda/>.

For pricing details, see

<https://aws.amazon.com/lambda/pricing/>.

## **Amazon API Gateway**

Amazon API Gateway is a fully managed service that makes it easy for developers to create, publish, maintain, monitor, and secure APIs at any scale. With a few clicks in the AWS Management Console, you can create an API that acts as a "front door" for applications to access data, business logic, or functionality from your back-end services. You can use it with workloads running on Amazon Elastic Compute Cloud (Amazon EC2), code running on AWS Lambda (as you will see in this lab), or any Web application. Amazon API Gateway handles all the tasks involved in accepting and processing up to hundreds of thousands of concurrent API calls, including traffic management, authorization and access control, monitoring, and API version management.

For documentation, see

<https://aws.amazon.com/documentation/apigateway/>.

For pricing details, see

<https://aws.amazon.com/api-gateway/pricing/>.

## Start Lab

- Open <https://808477742599.signin.aws.amazon.com/console>
- Enter login credentials

## Task 1: Verify Your Region

With Amazon EC2, you can place instances in multiple locations. Amazon EC2 locations are composed of *regions* that contain *Availability Zones*. Regions are dispersed and located in separate geographic areas

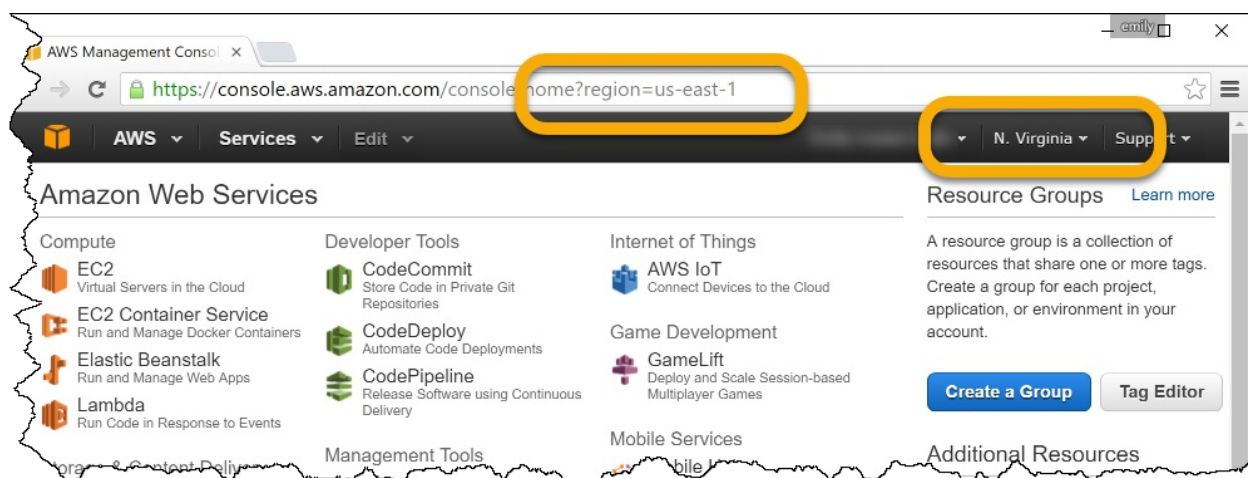
(US, EU, etc.). In this case, your lab is configured to run in US East

(N. Virginia) because the lab requires resources that are only available

in certain regions. For more information about regions, see

<http://docs.aws.amazon.com/general/latest/gr/rande.html>.

The AWS region name is always listed in the upper-right corner of the AWS Management Console, in the navigation bar. This lab is configured to run in US East (N. Virginia). If your region is something different, click the region name and select "N. Virginia".



**Important** Make sure your region is set to "N. Virginia".

## Task 2: Verify Resources

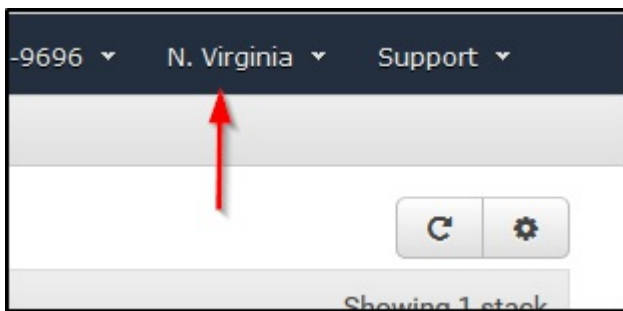
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3. In the **AWS Management Console**, on the Services menu, click **CloudFormation**.

You should see one stack with a status of **CREATE\_IN\_PROGRESS**.

4. Wait for the status to change to **CREATE\_COMPLETE** before you proceed.

If you do not see a stack being created, double check that you are in the "N. Virginia" region. The CloudFormation template is preparing what you need to complete this lab. It may take a few minutes for all the resources to be ready. While you wait, you can observe the creation process for the following resources.



### Verify Your DynamoDB Table

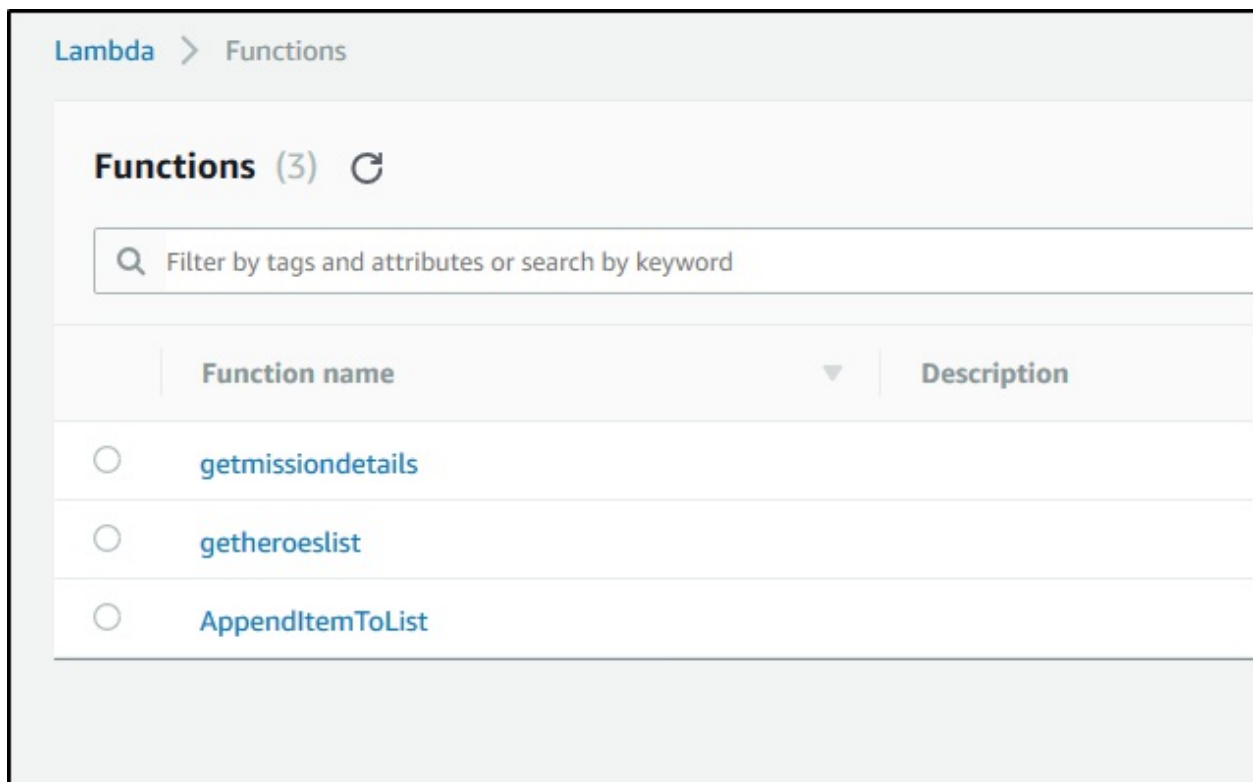
5. On the Services menu, click **DynamoDB**.
6. In the left navigation pane, click **Tables**.

You will see a table named *SuperMission* in the process of being created. Once the *SuperMission* DynamoDB table has been created, you will see that items have been added to the table.

### Verify Your Lambda Functions

7. On the Services menu, click **Lambda**.

The items in the DynamoDB table were added by a Lambda function, which you can see in the Lambda Console. You will also see two more Lambda functions, **getheroeslist** and **getmissiondetails**, which you will recognize from taking the Part 2 lab.



## Verify Your IAM Policies and Roles

Two IAM roles and two IAM policies have been created for you.

8. On the Services menu, click **IAM**.

9. In the left navigation pane, click **Roles**.

You will see two IAM roles: *SuperDynamoDBScanRole* and *SuperDynamoDBQueryRole*.

10. Click on the **SuperDynamoDBQueryRole**, then:

- o Notice that the **SuperDynamoDBQueryPolicy** is attached to the **SuperDynamoDBQueryRole**
- o What does this policy allow ?

11. Click on the **SuperDynamoDBScanRole**, then:

- o Notice that the **SuperDynamoDBScanPolicy** is attached to the **SuperDynamoDBScanRole**
- o What does this policy allow ?

## Task 3: Create and Deploy an API

In this task of the lab, you will learn how to create and configure a new API. Amazon API Gateway helps developers to create and manage APIs to back-end systems running on Amazon EC2, AWS Lambda, or any public-facing web service. In this lab, you will create and configure an API to connect your DynamoDB table to your Lambda functions.

12. On the Services menu, click **API Gateway**.

13. Click Get Started

## Create Your API

14. On the **Create Example API** screen, click OK

This example API is prepopulated for you by AWS. It is a good reference if you are new to working with Amazon API Gateway, but you will not use this example for your lab.

15. Click the **New API** radio button, then configure:

- **API name:** SuperheroesMission
- **Description:** Demo
- Click Create API

You will see what looks like a file explorer.

16. Click /

This is the root of the folder.

## Create Your Getheroeslist Resources

17. On the Actions menu, click **Create Resource**, then configure:

- **Resource Name:** getheroeslist
- Click Create Resource

Next you will create another child resource.

18. Click / (again, the root of the folder).

19. On the Actions menu, click **Create Resource**, then configure:

- **Resource Name:** getmissiondetails
- Click Create Resource

## Create getheroeslist Method

Next you will create the methods to call the Lambda functions you created in Part 2 of this series of labs. Recall that the Lambda functions pull mission data from the DynamoDB table in several different ways.

20. Click **getheroeslist** resource.

21. On the Actions menu, click **Create Method**, then configure:

- Click the drop-down arrow and select **POST**
- Click the **check mark** next to **POST**

Next you will set up your method.

In the **Post - Setup** window, configure:

- **Integration type: Lambda Function**
- **Lambda Region:** *us-east-1*
- **Lambda Function:** ``
- Click Save

You will see a warning that you are about to give the API Gateway service permission to invoke your Lambda function.

22. Click OK

## Create getmissiondetails Method

23. Click the **getmissiondetails** resource.

24. On the Actions menu, click **Create Method**, then configure:

- Click the drop-down arrow and select **POST**.
- Click the **check mark** next to **POST**.

In the **Post - Setup** window, configure:

- **Integration type: Lambda Function**
- **Lambda Region:** *us-east-1*
- **Lambda Function:**
- Click Save

You will see the same warning.

25. Click OK

Next, you will enable CORS for the methods you just created in the API Gateway. Cross-Origin Resource Sharing (CORS) allows browsers to make HTTP requests to servers with a different domain/origin.

## Enable CORS For getheroeslist

26. Click the **getheroeslist** resource.

27. On the Actions menu, click **Enable CORS**, then configure:

- Ensure **Post** and **Options**, are selected
- Click Enable CORS and replace existing CORS headers

26. Click Yes, replace existing values

## Enable CORS for getmissiondetails

29. Click the **getmissiondetails** resource.

30. On the Actions menu, click **Enable CORS**, then configure:

- Ensure **Post** and **Options**, are selected.
- Click Enable CORS and replace existing CORS headers

29. Click Yes, replace existing values

30. Click the root folder, */*.

31. On the Actions menu, click **Deploy API**, then configure:

- **Deployment stage:** *New Stage*
- **Stage name:** *Demo1*
- Click Deploy

**Congratulations**, you have deployed the API!

## Task 4: Generate the SDK For Your API

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In this task, you will generate the SDK for your API. After deploying the API, you will be redirected to the Demo1 Stage Editor.

34. On the stage editor, click the **SDK Generation** tab, then configure:

- **Platform:** *Javascript*
- Click Generate SDK

35. Save the zip file to a location on your computer.

36. Extract the content of the JavaScript zip file you downloaded.

Next, you will retrieve an HTML page that you will use to test your API.

37. Copy this the following link into a new browser tab:

```
https://s3-us-west-2.amazonaws.com/us-west-2-aws-training/awsu-spl/spl134-dynamodb-webapp-part3/static/index.html
```

38. Press **Enter** to go to the page.

39. In your browser, type **Ctrl + S** on your keyboard (Windows) or **Command + S** (Mac) to save the web page as HTML.

40. Save the HTML file as `index.html` and place it in the **apiGateway-js-sdk** folder.

**Important** When you save the `index.html` file, make sure you save it as a web page, **HTML only**. You only need the HTML of this page.

Recall that you downloaded the ZIP file and extracted the contents to your local computer in previous steps.

41. Open `index.html` in your browser.

42. Using the index web page, retrieve mission details.

43. Review the output.



Today's Super Hero Mission

The Winchester Brothers

GO

Mission Status

Complete

Mission Dossier

Vampires

Ghosts

Werewolves

You will notice that the dropdown list uses the API Gateway resource **getheroeslist** to invoke the **getheroeslistFunction** Lambda function.

**Note** To retrieve mission details using the index web page, select the Super Hero name in the dropdown list and then click **GO** to display the Mission Status and Mission Dossier

44. Challenge yourself! Identify which API Gateway resources and Lambda functions are invoked to return results for **Mission Status** and **Mission Dossier**.

Congratulations! You successfully developed the contents of your website. You're almost ready to start sending super heroes on missions!

## Task 5: Publish With S3

45. On the Services menu, click **S3**.

46. Click `Create bucket` then configure:

- **Bucket name:** `mybucketNUMBER`
- Replace **NUMBER** with a random number - bucket names must be unique
- Copy the name of the bucket to your editor
- **Region:** US East (N. Virginia)
- Click Create

47. Click your bucket to open it.
48. Click the **Permissions** tab.
49. Below **Public access settings for this bucket**, click Edit.
50. De-select all of the boxes.
51. Click Save then:
  - o Enter `confirm`
  - o Click Confirm
52. Click Bucket Policy
53. Copy the following bucket policy and paste it into the editor:

```
{
  "Version": "2012-10-17",
  "Statement": [{
    "Sid": "PublicReadForGetBucketObjects",
    "Effect": "Allow",
    "Principal": "*",
    "Action": "s3:GetObject",
    "Resource": "arn:aws:s3::BUCKET/*"
  }]
}
```

54. Replace **BUCKET** with the name of your bucket.
55. Click Save

Overview Properties Permissions Management

Access Control List Bucket Policy CORS configuration

Bucket policy editor ARN: arn:aws:s3::mybucket452345234

Type to add a new policy or edit an existing policy in the text area below.

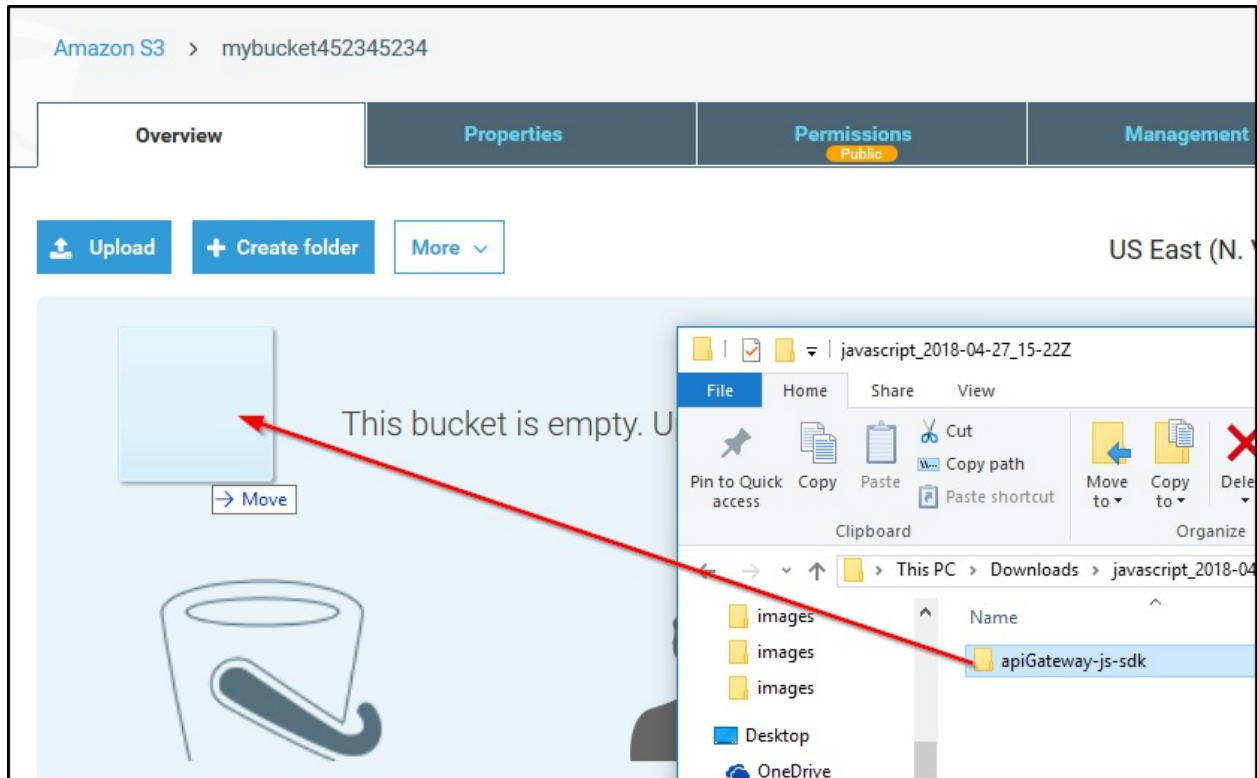
Delete Cancel Save

```
1 {
2   "Version": "2012-10-17",
3   "Statement": [{
4     "Sid": "PublicReadForGetBucketObjects",
5     "Effect": "Allow",
6     "Principal": "*",
7     "Action": "s3:GetObject",
8     "Resource": "arn:aws:s3::mybucket452345234/*"
9   }]
10 }
11
12
```

56. Click the **Properties** tab.
57. Click **Static website hosting**, then configure:
  - o Select **Use this bucket to host a website**.
  - o **Index document:** `index.html`
  - o Click Save

58. click the **Overview** tab, then:

- Using your computer's file system explorer, locate the folder (*apiGateway-jf-sdk*) that you saved the **index.html** file in
- Drag and then drop the entire **apiGateway-jf-sdk** folder to the **Overview** tab area.



59. Click Upload

This will upload the folder and its contents to your S3 bucket.

60. Wait until the upload is complete.

61. Open a new browser tab/window, then:

- Paste the following URL: `http://BUCKET.s3-website-us-east-1.amazonaws.com/apiGateway-js-sdk/index.html`
- Replace **BUCKET** with the name of your bucket
- Press **Enter**

Today's Super Hero Mission

Superman

GO

Mission Status

In progress

Mission Dossier

Doomsday

General Zod

Lex Luthor

62. You can now look up mission dossier data stored in your DynamoDB database.

## If you have time...

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- Add your own mission dossiers to the SuperMission DynamoDB table. How many super hero plot lines can you remember?
- Then, refresh your web app and see your new missions

## Conclusion

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Congratulations! You have completed this three lab series. You created a DynamoDB table and added records (Part 1 of the series). You created Lambda functions to retrieve data from the table in several different ways (Part 2). Finally, you configured an API using Amazon API Gateway and set up a public website to retrieve information from your DynamoDB table (Part 3), using what you learned in all three labs. Now start directing missions before it's too late!

You now know how to:

- Create an API for Lambda functions to access a DynamoDB table using Amazon API Gateway
- Generate and use the SDK for your API

- Publish content using S3

... and save the world from villainy!

## End Lab

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Follow these steps to close the console, end your lab, and evaluate the experience.

63. Return to the AWS Management Console.

64. On the navigation bar, click `<yourusername>@<AccountNumber>`, and then click **Sign Out**.