Create API Gateway for Backend Operation

(LAB-M09-01)

Version Control	
Document	Create API Gateway for Backend Operation
Owner	Ahmad Majeed Zahoory
Version	3.1
Last Change	28th May 2024
Description of Change	Code version updated

Lab duration: **60 minutes**

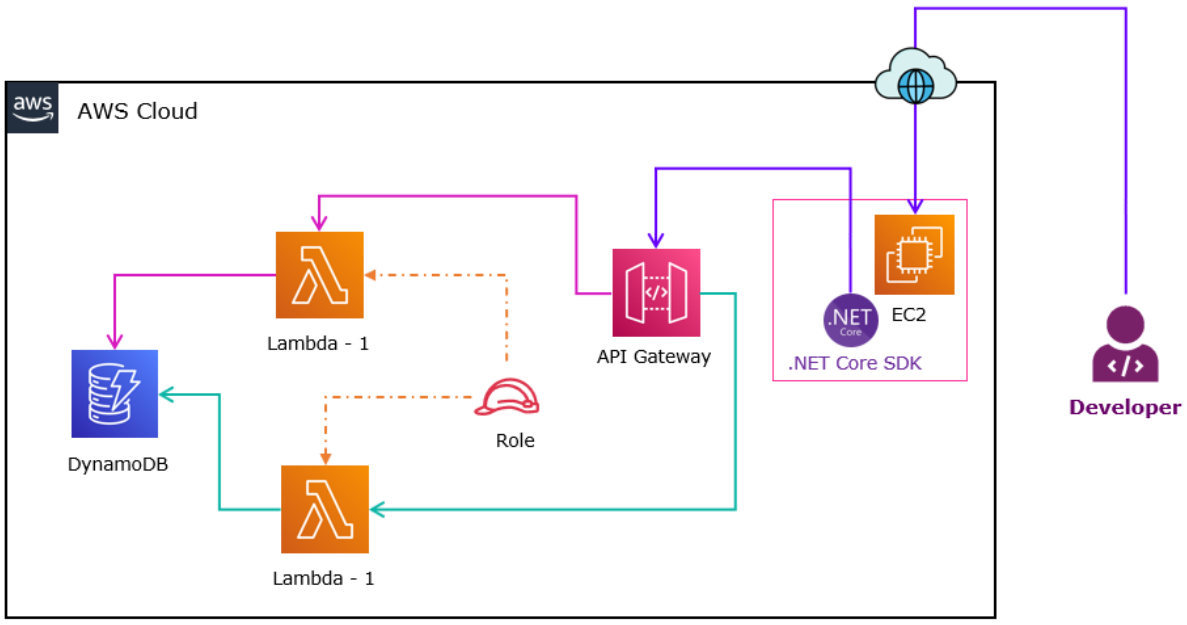
Lab scenario

In this lab, you will learn how to use AWS Lambda to trigger a Lambda function and update the DynamoDB. You will also integrate the Lambda function with API gateway and trigger a Lambda function via API Gateway.

Objectives

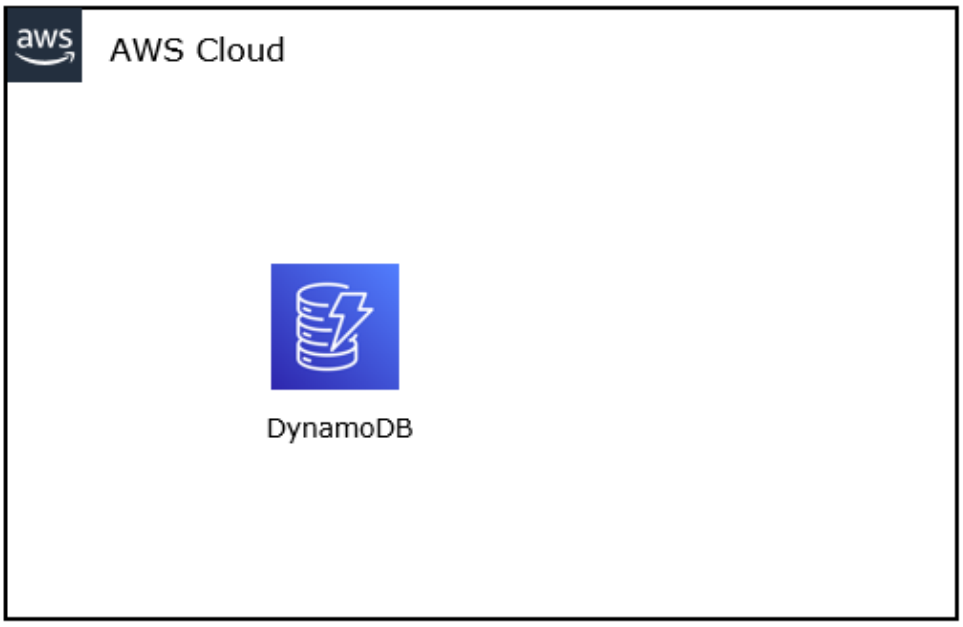
After you complete this lab, you will be able to:

- Create DynamoDB table.
- Create Lambda function.
- Add the data to the DynamoDB table.
- Integrate the Lambda function with API gateway.



Task 1: Create Database

In this task, you will create the DynamoDB table to host items.



Step 1: Create a DynamoDB Table

1. In the **AWS Management Console**, on the **Services** menu, search and select **DynamoDB**.
2. Choose the **YOUR ALLOCATED REGION** list to the right of your account information on the navigation bar.
3. Choose **Create Table**.
    a. In the **Create table** page:
        i. In the **Table details** section:
            a) **Table name**: Write **empdata**.
            b) **Primary key**: Write **empid**.
                1) Set the data type to **String**.

Note: **Write** the **table name** and **primary key** in the **lower case** only.

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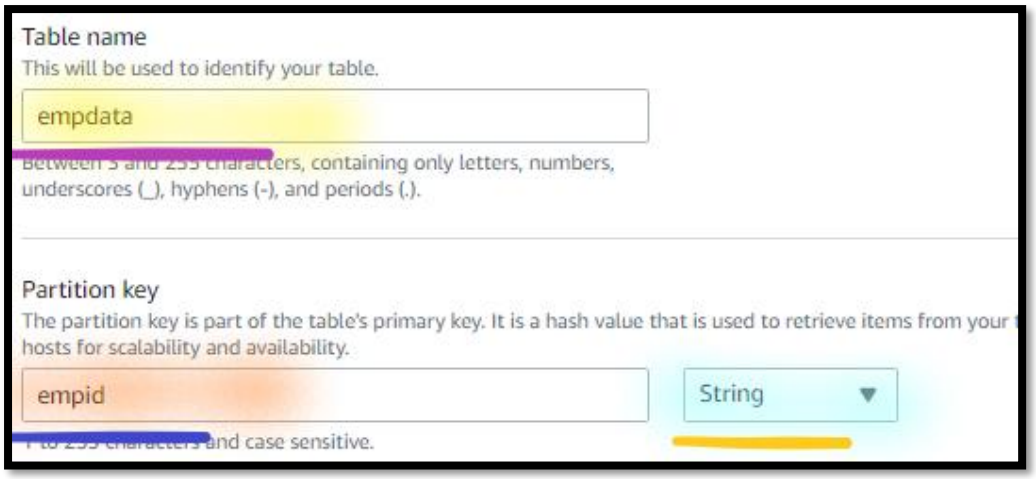


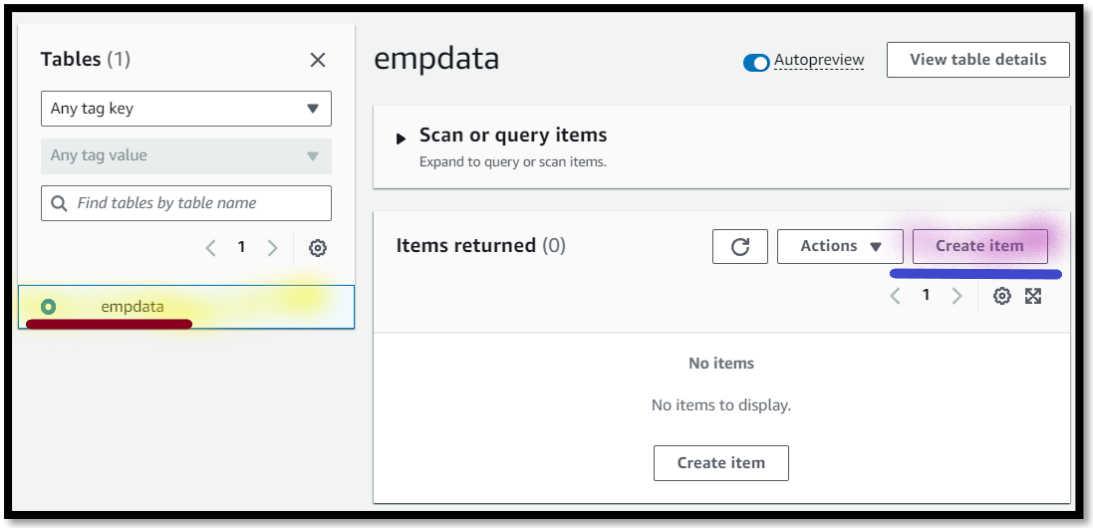
Note: Leave the other details as default.

c) Select **Create table**.

Note: **Wait** till **DynamoDB table** gets **created**.

Step 2: Add Items into DynamoDB Table

4. **From** the **DynamoDB** console.
5. Select **Explore items**.
    a. Select **empdata**.
        i. Select **Create item**.



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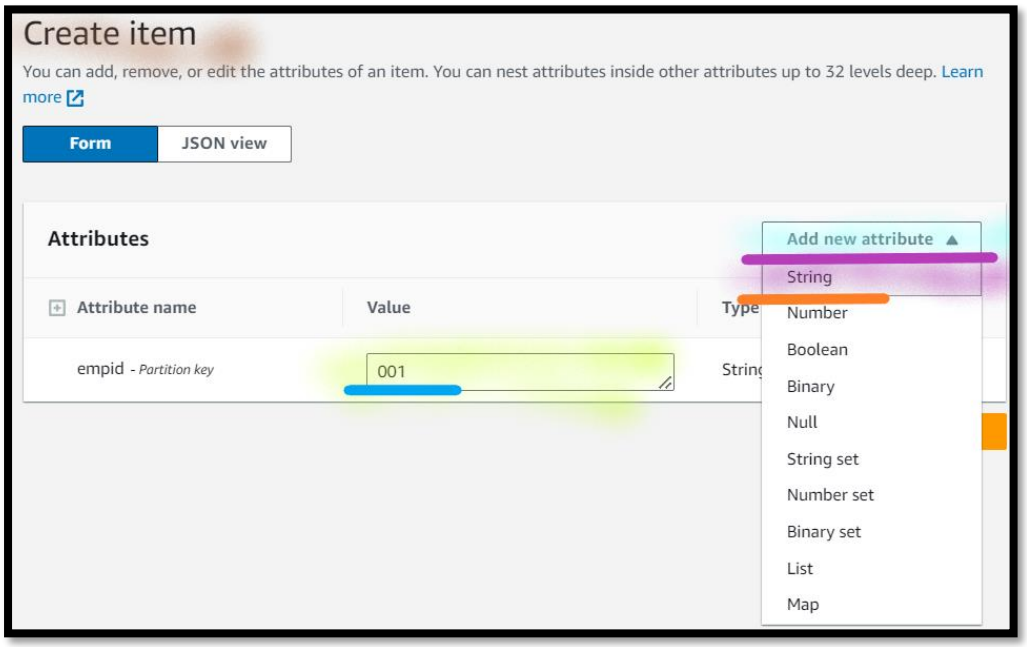
a) In the **Create item** page:

1) **empid**: Write **001** (***in value field***).

I. Select **Add new attribute**.

A. Select **String**.



2) **Attribute name**: Write **empfirstname**.

I. **Value**: Write **Ajay**.

A. Select **Add new attribute**.

B. Select **String**.

3) **Attribute name**: Write **emplastname**.

I. **Value**: Write **Kaushik**.

A. Select **Add new attribute**.

B. Select **String**.

4) **Attribute name**: Write **empage**.

I. **Value**: Write **32**.

Note: **Write** the **empfirstname**, **emplastname** and **empage** in the **lower case** only.

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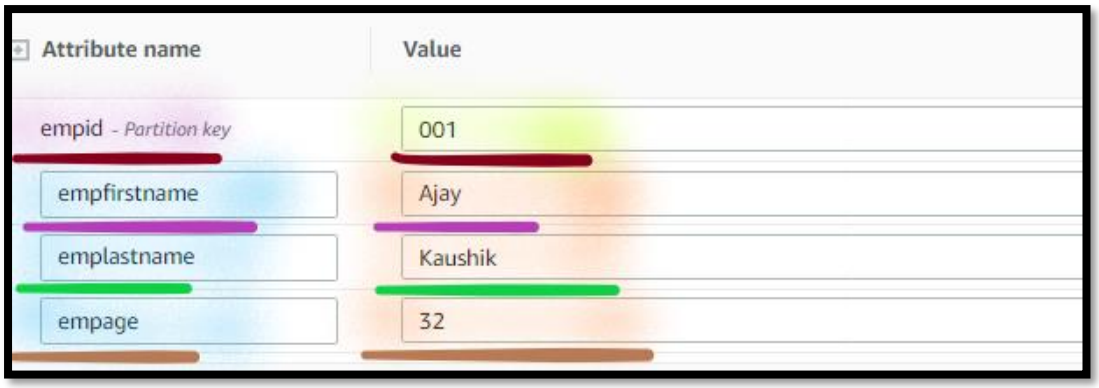
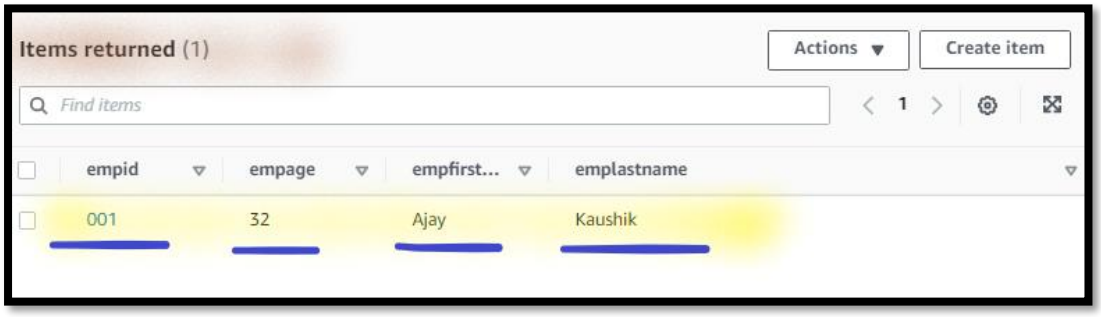


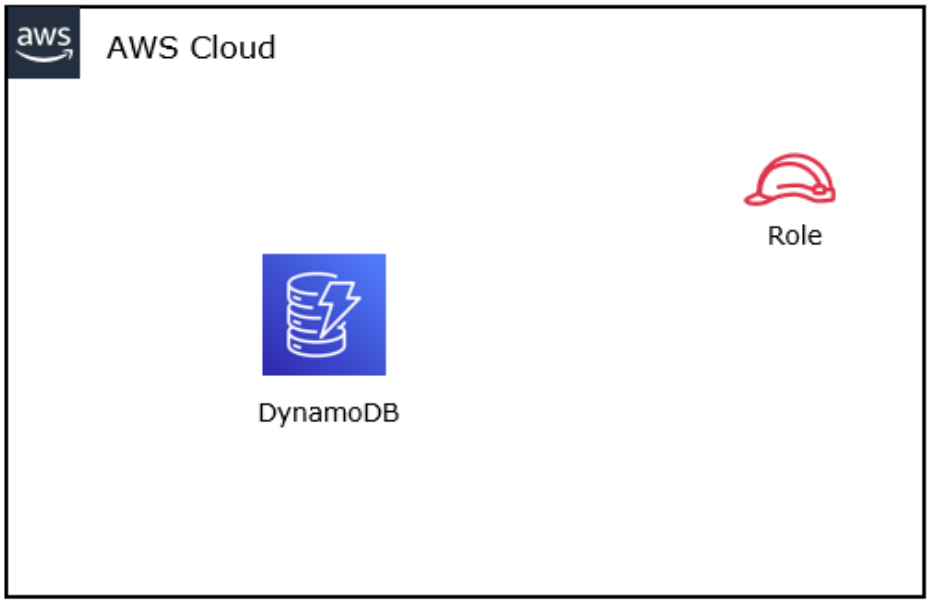
5) Select **Create item**.

Note: You can see the item details under Items.



Task 2: Create IAM Role

In this task, you will create the IAM role for Lambda.



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Step 1: Create IAM Roles for AWS Lambda

6. In the **AWS Management Console**, on the **Services** menu, search and select **IAM**.
7. Select **Roles**.
    a. Click on **Create role**.
        i. In the **Select trusted entity** section.
            a) **Trusted entity type**: Select **AWS service**.
            b) **Use cases**: Select **Lambda**.
            c) Select **Next**.
        ii. In the **Add permissions** section.
            a) In the **Search box**, write **AmazonDynamoDBFullAccess** and select **Enter Key**.
                1) Select **AmazonDynamoDBFullAccess**.
                2) Select **Clear search query**.
            b) In the **Search box**, write **AWSLambdaBasicExecutionRole** and select **Enter Key**.
                1) **Filter by type**: Dropdown and select **AWS managed**.
                2) Select the **AWSLambdaBasicExecutionRole**.
            c) Select **Next**.
        iii. In the **Name, review, and create** section.
            a) **Role name**: Write **Lambda-DynamoDB-Role-YOUR-ID**.

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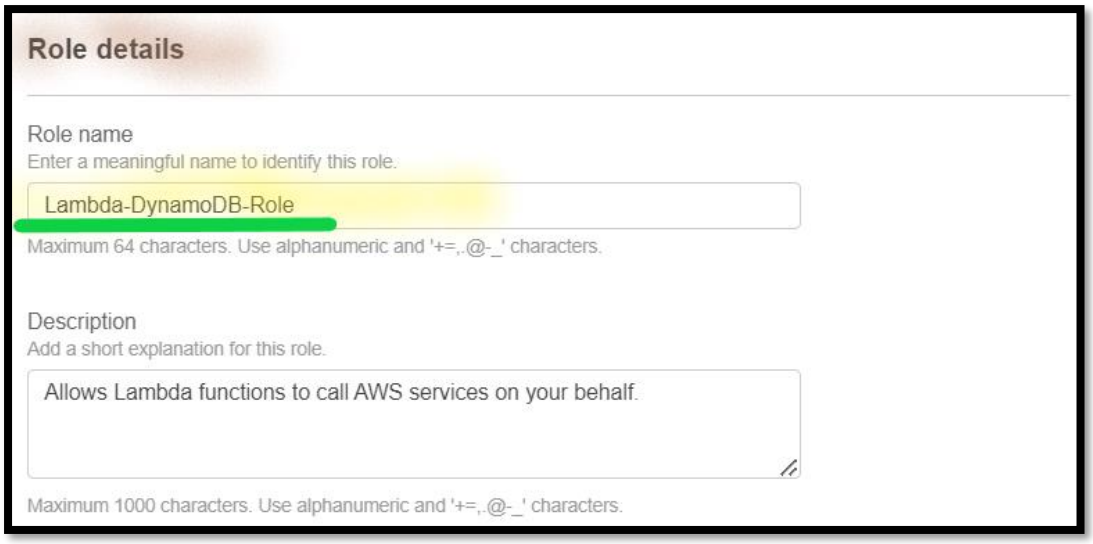
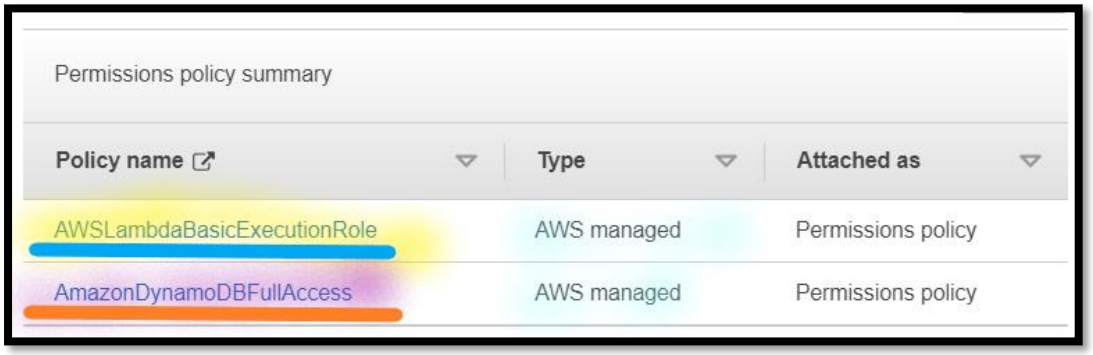


Note: You can see the **AmazonDynamoDBFullAccess** and **AWSLambdaBasicExecutionRole** policy under the **Add permissions** section.



b) Click **Create role**.

Note: **Wait**, till you can see the **message** "**Role Lambda-DynamoDB-Role created**".

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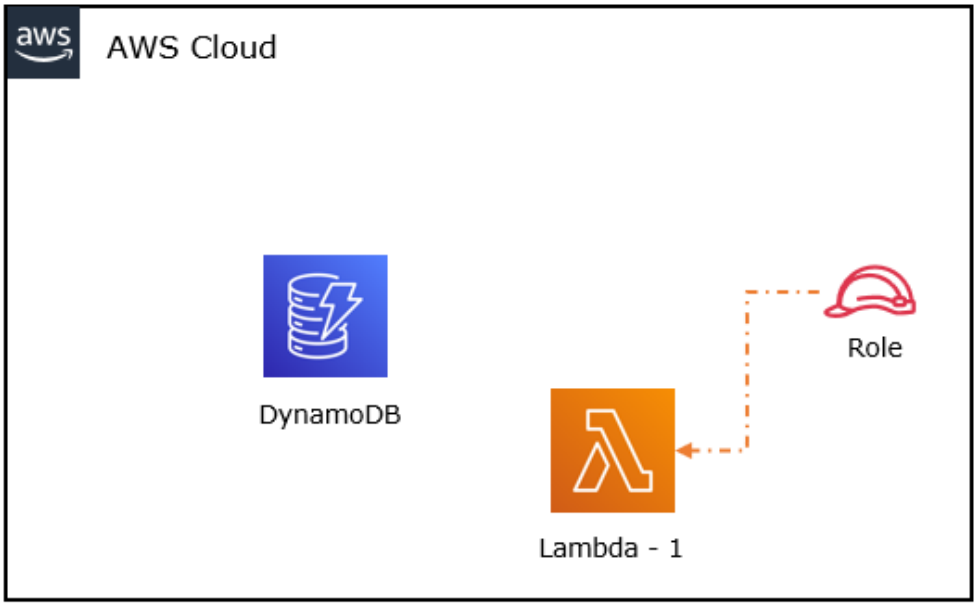
Task 3: Create Lambda Function to Read the Items

In this task, you will create the Lambda function to read the items from the DynamoDB.



Step 1: Create Lambda Function to Read the Items

8. In the **AWS Management Console**, on the **Services** menu, search and select **Lambda**.

9. Choose the **YOUR ALLOCATED REGION** list to the right of your account information on the navigation bar.

10. Select **Create a function**.

11. Select **Author from scratch**.

    a. In the **Basic information** section:

       i. **Name**: Write **ReadItems**.

       ii. **Runtime**: Dropdown and Select **Node.js 20.x**.

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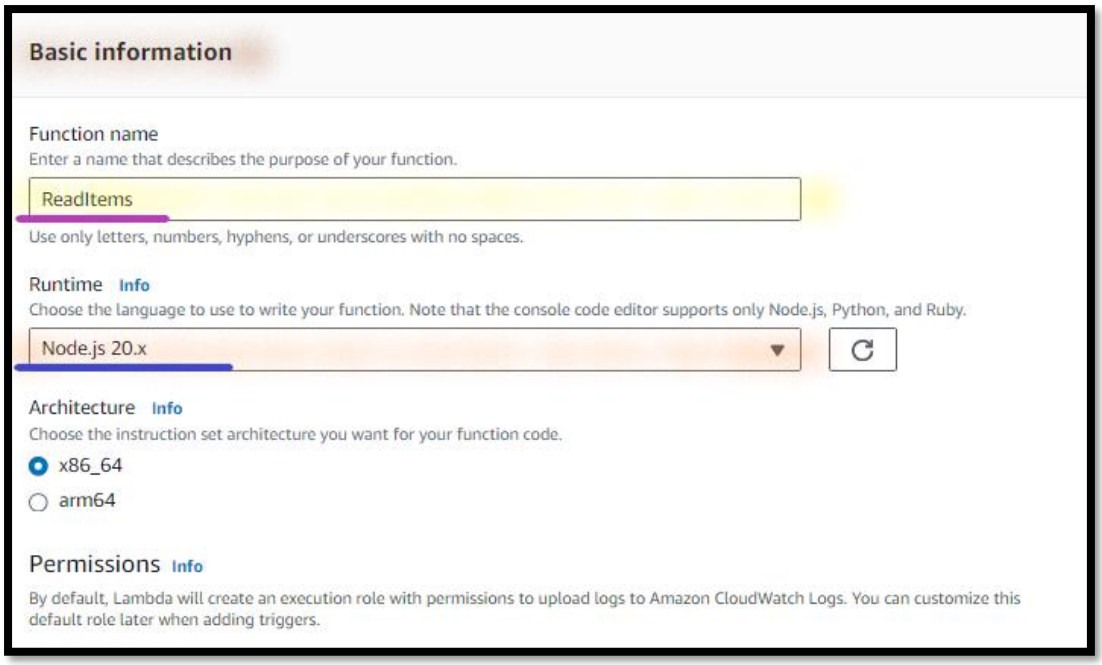
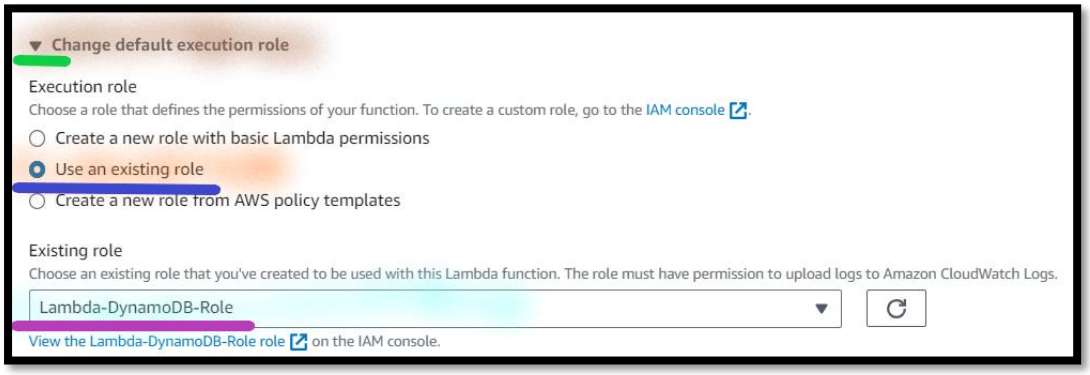


iii. **Expand** **Change default execution role**.

a) **Role**: Select **Use an existing role**.

1) **Existing role**: Dropdown and Select **Lambda-DynamoDB-Role**.



iv. Select **Create function**.

Note: **Wait**, till you can see the **message** "**Successfully created the function ReadItems**".

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b. From the **ReadItems** Lambda function:

i. Select the **Code** section:

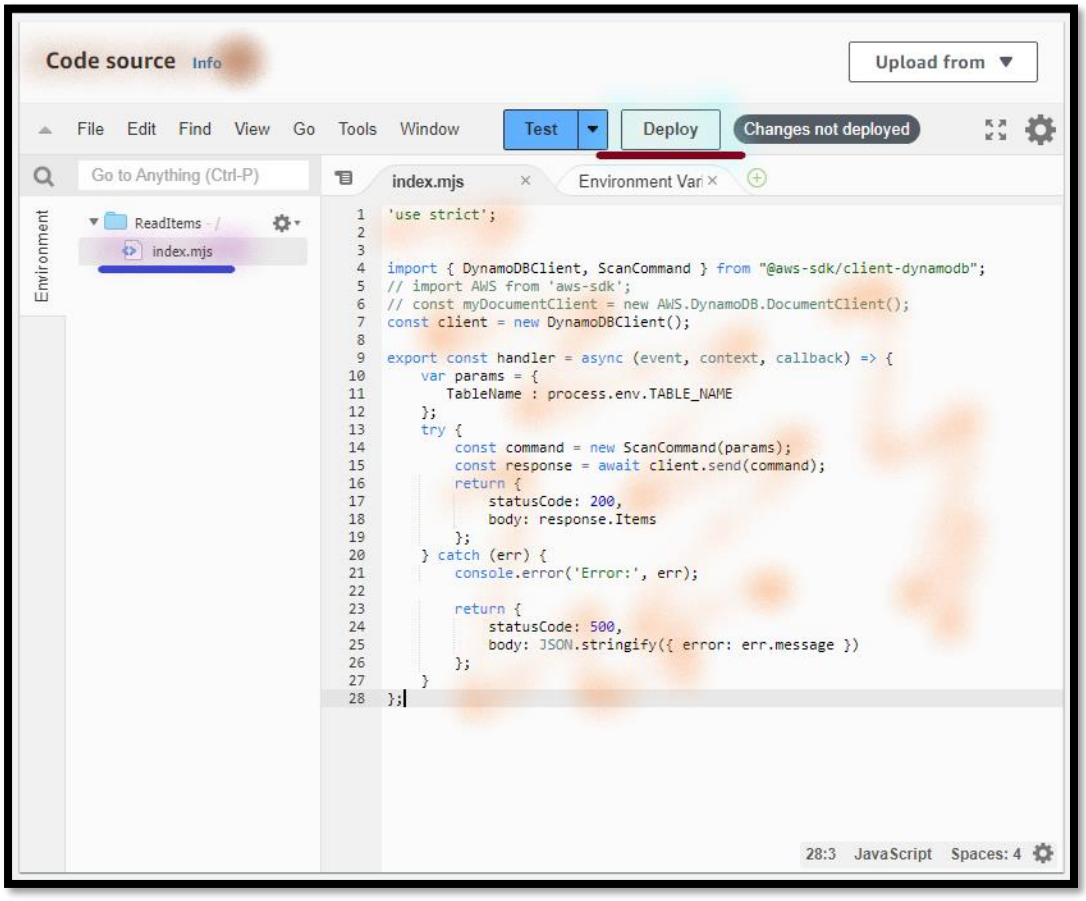
a) Click on **index.mjs**.

1) **Replace** the **existing code**.

2) **Copy** the **Code** from **read-function-code** file.

Note: **read-function-code.txt** is available with the **Lab manual**.

3) Select **Deploy**.



b) Select the **Configuration** section:

1) Select **Environment variables**.

I. Select **Edit**.

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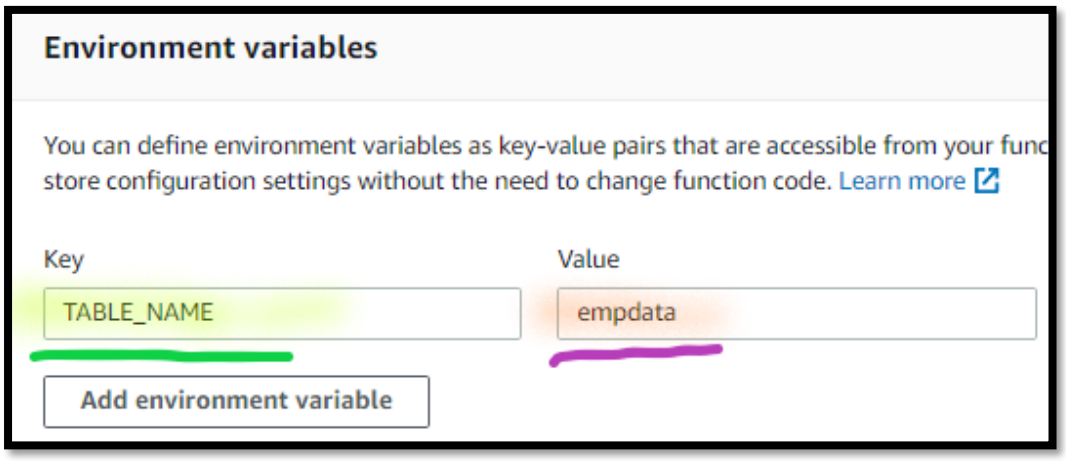
II. Select **Add environment variables**.

A. **Key**: Write **TABLE_NAME**.

B. **Value**: Write **empdata** (*DynamoDB table name*).



C. Select **Save**.

Step 2: Validate Your Implementation

12. From the **ReadItems** Lambda function:

a. Select the **Test** section:

i. In the **Test event** section:

a) **Event Name**: Write **TestReadItems**.

b) **Event JSON**:

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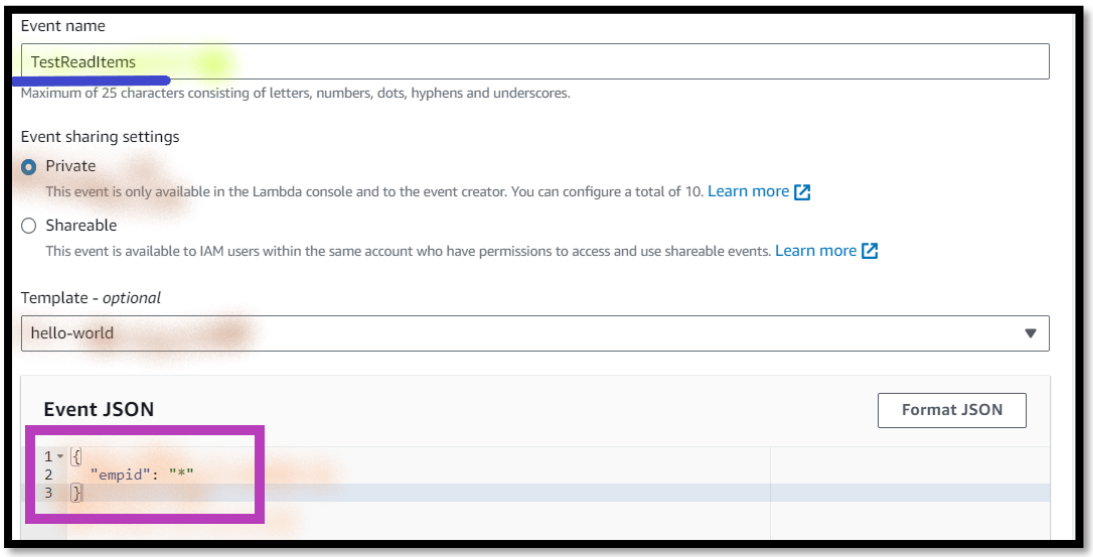
1) **Remove** the **existing event**.

I. **Copy** the **below event**.

```
{
  "empid": "*"
}
```



Note: Leave the other details as default.

c) Select **Test**.

Note: If Test executed succesfully, you can see the **Execution result** as **succeeded**.

ii. **Expand** the **Details** section of the ***execution result*** section.

Note: You can see the **Items**, which you have **added** in the **DynamoDB** in the Previous step.

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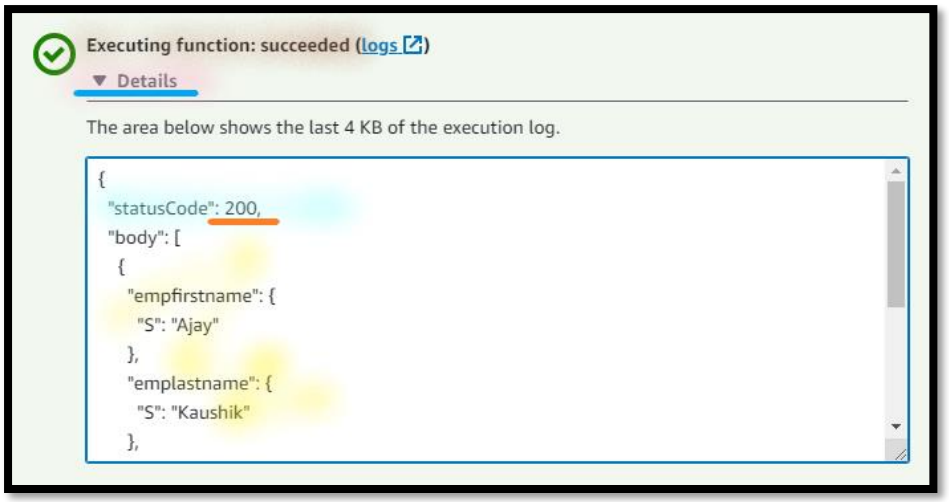
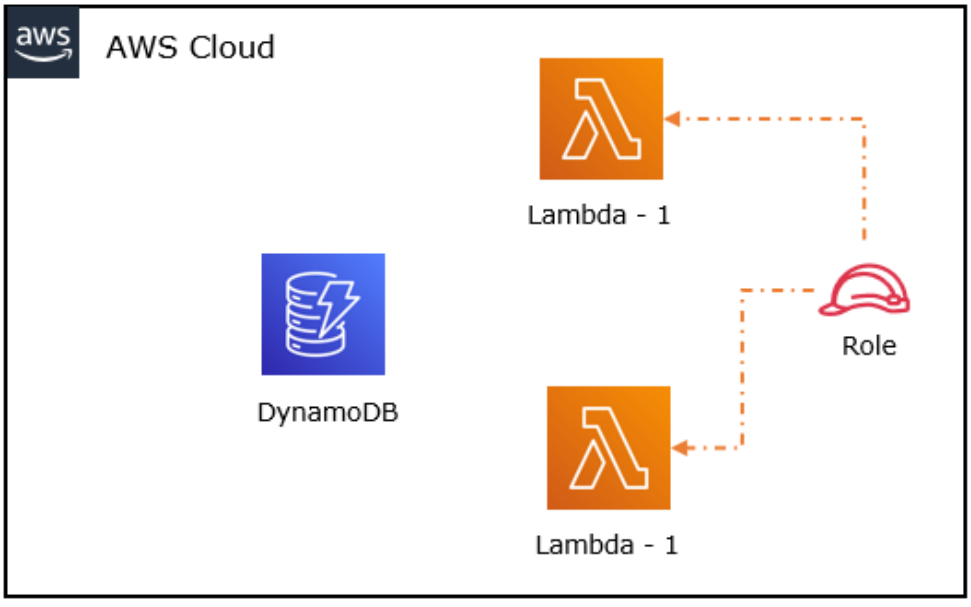


Task 4: Create Lambda Function to Write the Items

In this task, you will create the Lambda function to write the items to the DynamoDB.



Step 1: Create Lambda Function to Write the Items

13. From the **Lambda** Function console.
14. Select **Function**.
15. Select **Create a function**.
16. Select **Author from scratch**.

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a. In the **Basic information** section:

i. **Name**: Write **WriteItems**.

ii. **Runtime**: Dropdown and Select **Node.js 20.x**.

iii. **Expand** **Change default execution role**.

a) **Role**: Select **Use an existing role**.

1) **Existing role**: Dropdown and select **Lambda-DynamoDB-Role**.

iv. Select **Create function**.

Note: **Wait**, till you can see the **message** "**Successfully created the function WriteItems**".

b. From the **WriteItems** Lambda function:

i. Select the **Code** section.

a) Click on **index.js**.

1) **Replace** the **existing code**.

2) **Copy** the **Code** from **write-function-code** file.

Note: **write-function-code.txt** is available with the **Lab manual**.

b) Select **Deploy**.

ii. Select the **Configuration** section:

a) Select **Environment variables**.

1) Select **Edit**.

2) Select **Add environment variables**.

I. **Key**: Write **TABLE_NAME**.

II. **Value**: Write **empdata** (*DynamoDB table name*).

III. Select **Save**.

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Step 2: Validate Your Implementation

17. From the **WriteItems** Lambda function:

    a. Select the **Test**.

        i. In the **Test event** section:

            a) **Event Name**: Write **TestWriteItems**.

            b) **Event JSON**:

                1) **Remove** the **existing events**.

                2) **Copy** the **below event**.

```
{
  "empid": "002",
  "empfirstname": "Sana",
  "emplastname": "Yusuf",
  "empage": "21"
}
```

Note: Leave the other details as default.

        ii. Select **Test**.

Note: If Test executed succesfully, you can see the **execution result** as **succeeded**.

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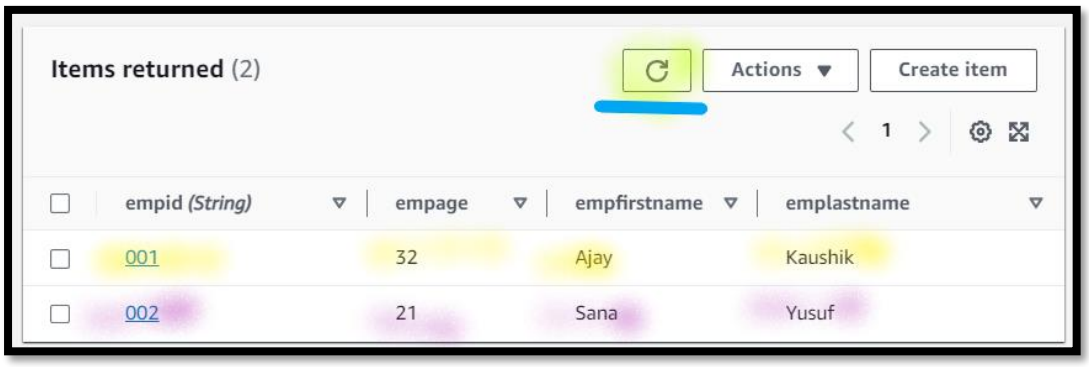
Step 3: View the DynamoDB Data

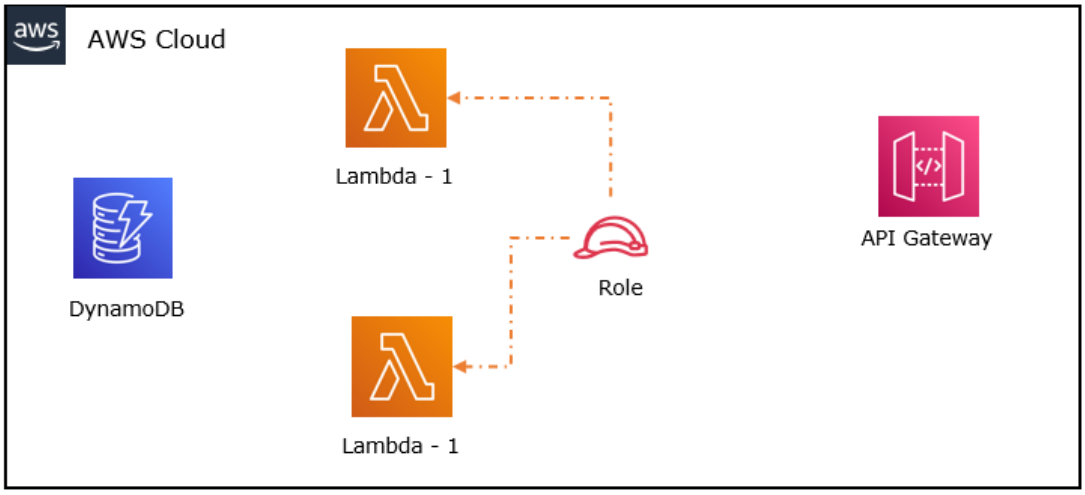
18. In the **AWS Management Console**, on the **Services** menu, search and select **DynamoDB**.
19. Select **Explore items**.
    a. Select **empdata**.
        i. Select **Refresh**.

Note: You can see the **Added Items**, which you have added in the DynamoDB via the **Lambda function** and **Console**.



Task 5: Create a RESTful API

In this task, you will create the API gateway.



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Step 1: Create REST API

20. In the **AWS Management Console**, on the **Services** menu, search and select **API Gateway**.

21. Choose the **YOUR ALLOCATED REGION** list to the right of your account information on the navigation bar.

22. Select **Rest API** (***Don't select Rest API private***).

    a. Select **Build**.

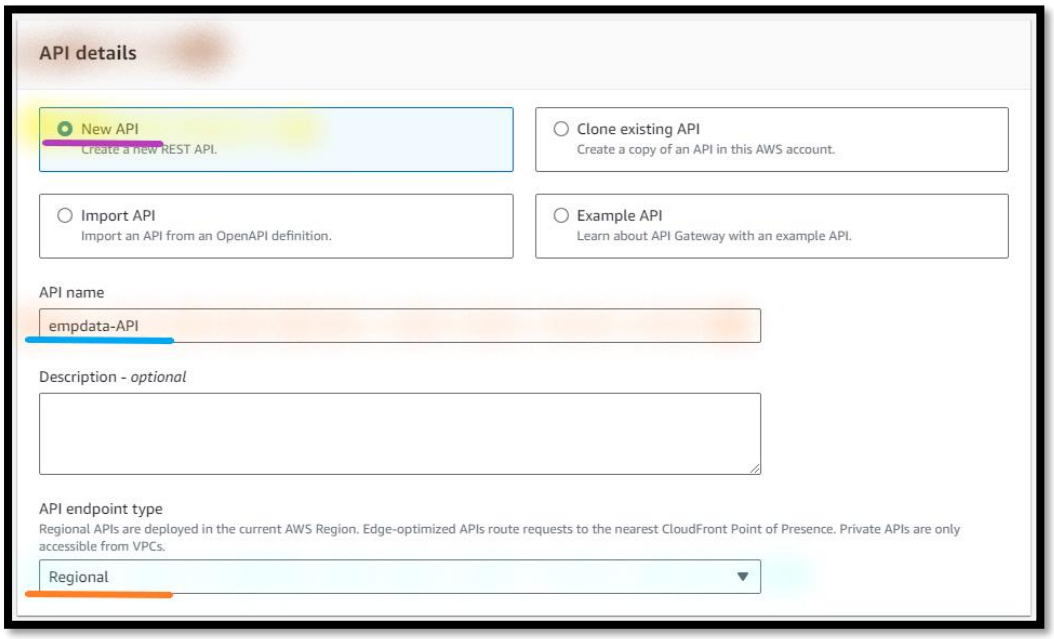
i. From the **Create REST API** page:

a) In the **API details** section:

1) Select **New API**.

2) **API name**: Write **empdata-API**.

3) **API Endpoint type**: Dropdown and select **Regional**.



ii. Select **Create API**.

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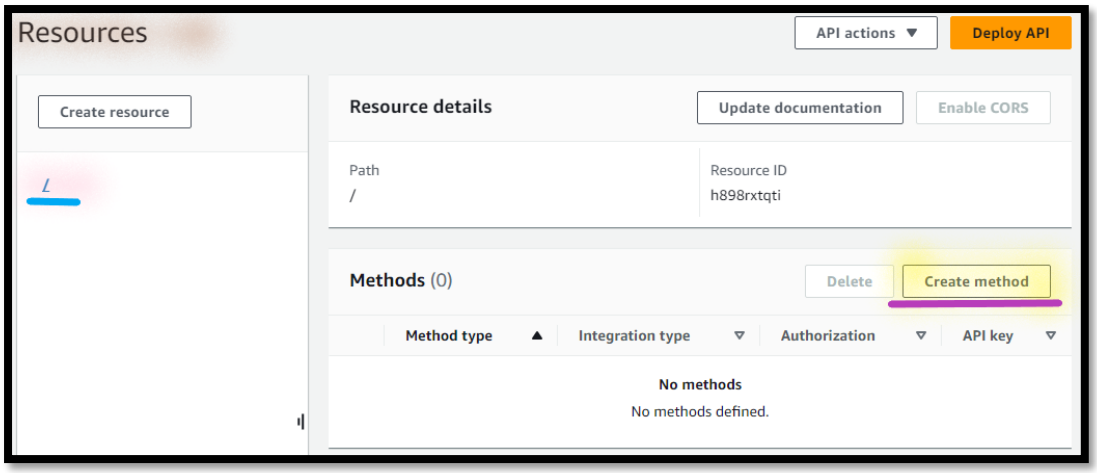
Task 6: Create API Method to Read and Write the Data

In this task, you will configure the API gateway to fetch the items from the DynamoDB using the Lambda function.

Step 1: Create Method to Read the Items

23. **From** the **empdata-API** gateway:
24. Select **Resources**.
    a. Select **/** (*resource path*).
        i. Select **Create method**.



a) From the **Create method** page:

1) In the **Method details** section:

I. **Method type**: Dropdown and select **Get**.

II. **Integration type**: Select **Lambda function**.

III. **Lambda function**:

A. **Region**: Dropdown and select the **YOUR ALLOCATED REGION-ID**.

Note: **Replace** the **region-identifier**.
Refer the **link** to know your **respective region region identifier**
https://docs.aws.amazon.com/AWSEC2/latest/UserGuide/using-regions-availability-zones.html

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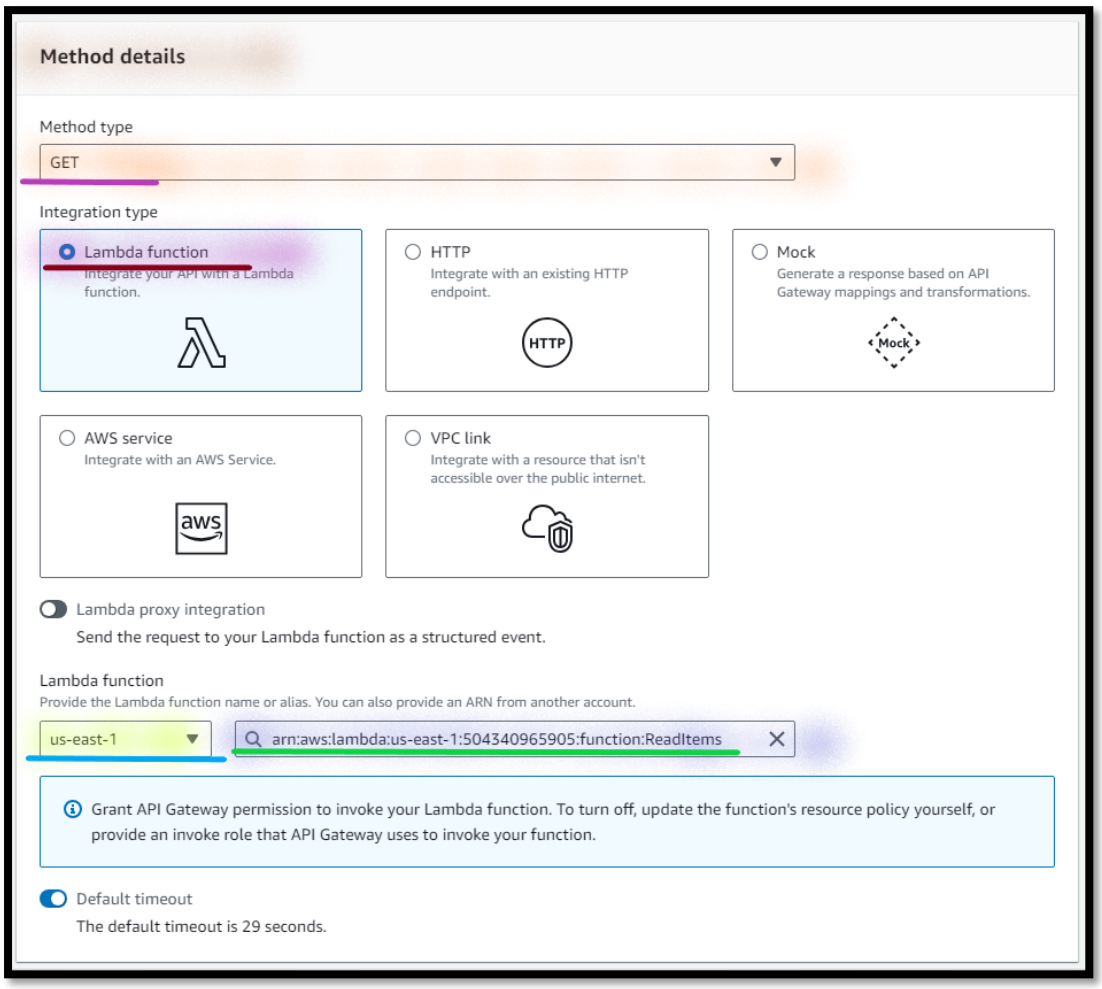
B. **Choose a lambda function**: In the **Search** section, click and select **ReadItems** (*lambda function you created in the previous step*).



Note: Leave the other details as default.

2) Select **Create method**.

Note: **Wait**, till the **Get - Method execution** gets created.

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Step 2: Test the API Gateway to Read the Items

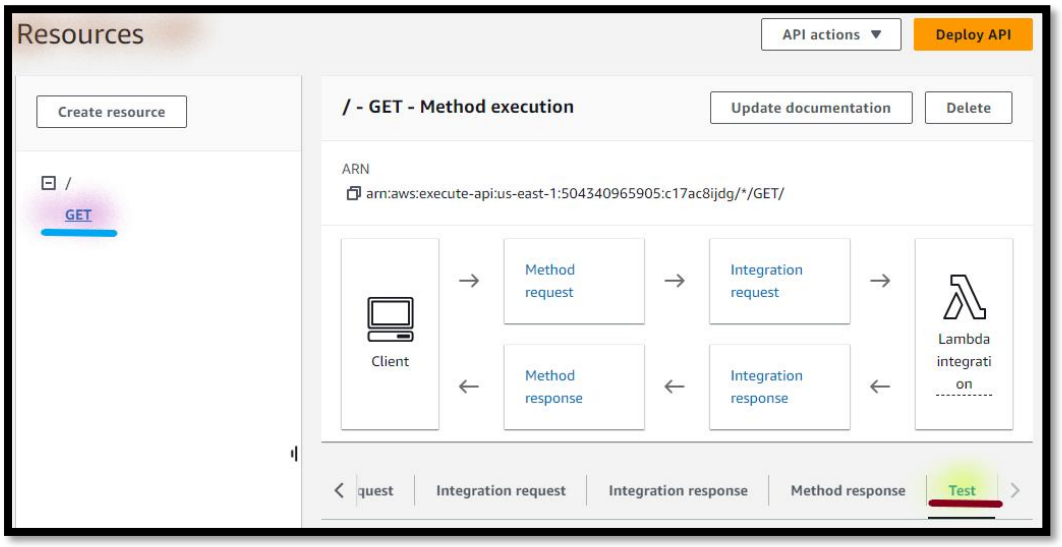
25. **From** the **empdata-API** gateway:

    a. Select **Resources**.

        i. Select **/** (*resource path*).

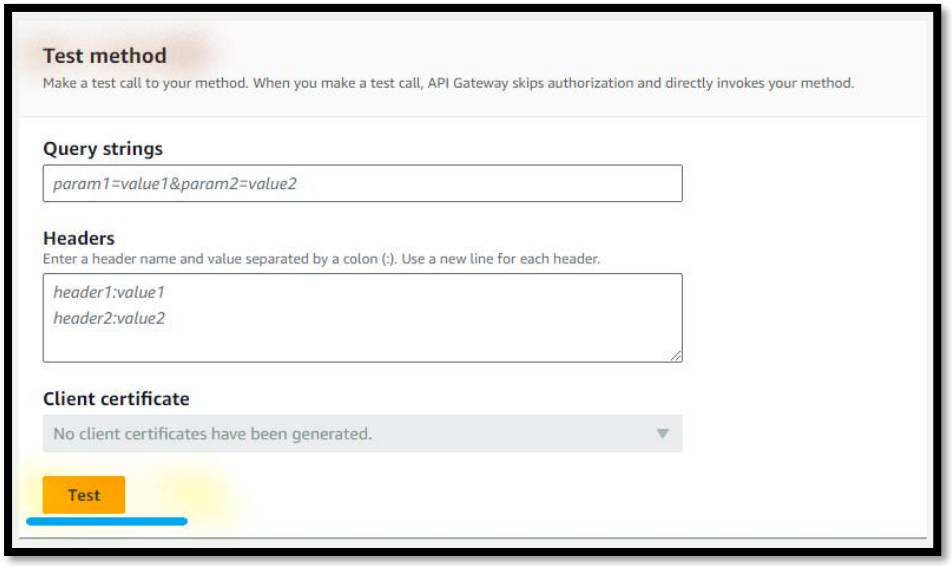
            a) Select **Get**.

                1) Select **Test**.



Note: Leave all the details as default.

I. Select **Test**.



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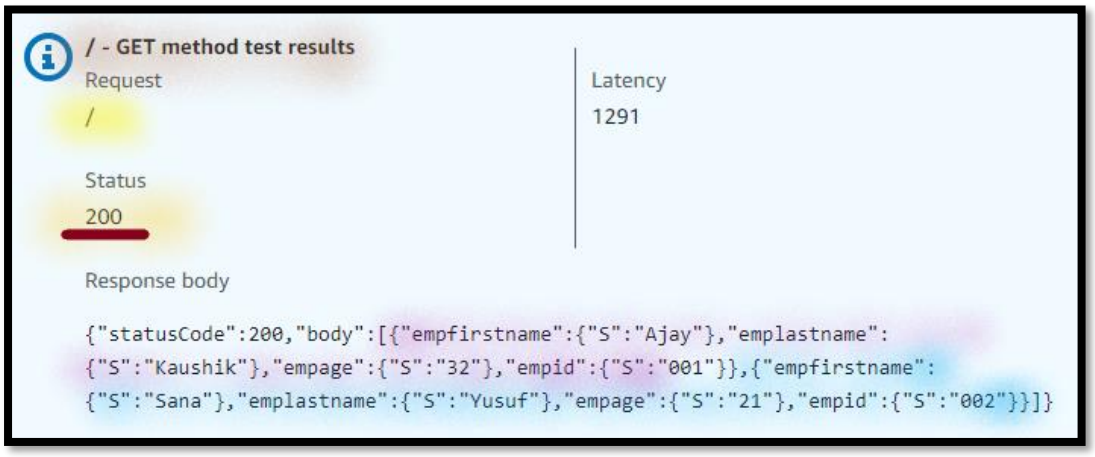
Note: If request **executed succesfully**, you can see the request **Status** as **200**.

Note: In the **Response body**, you can see the **Items**, which you have added in the DynamoDB in the previous steps.



Step 3: Create Method to Write the Items

26. **From** the **empdata-API** gateway:
27. Select **Resources**.
    a. Select **/** (*resource path*).
        i. Select **Create method**.
            a) From the **Create method** page:
                1) In the **Method details** section:
                    I. **Method type**: Dropdown and select **Post**.
                    II. **Integration type**: Select **Lambda function**.

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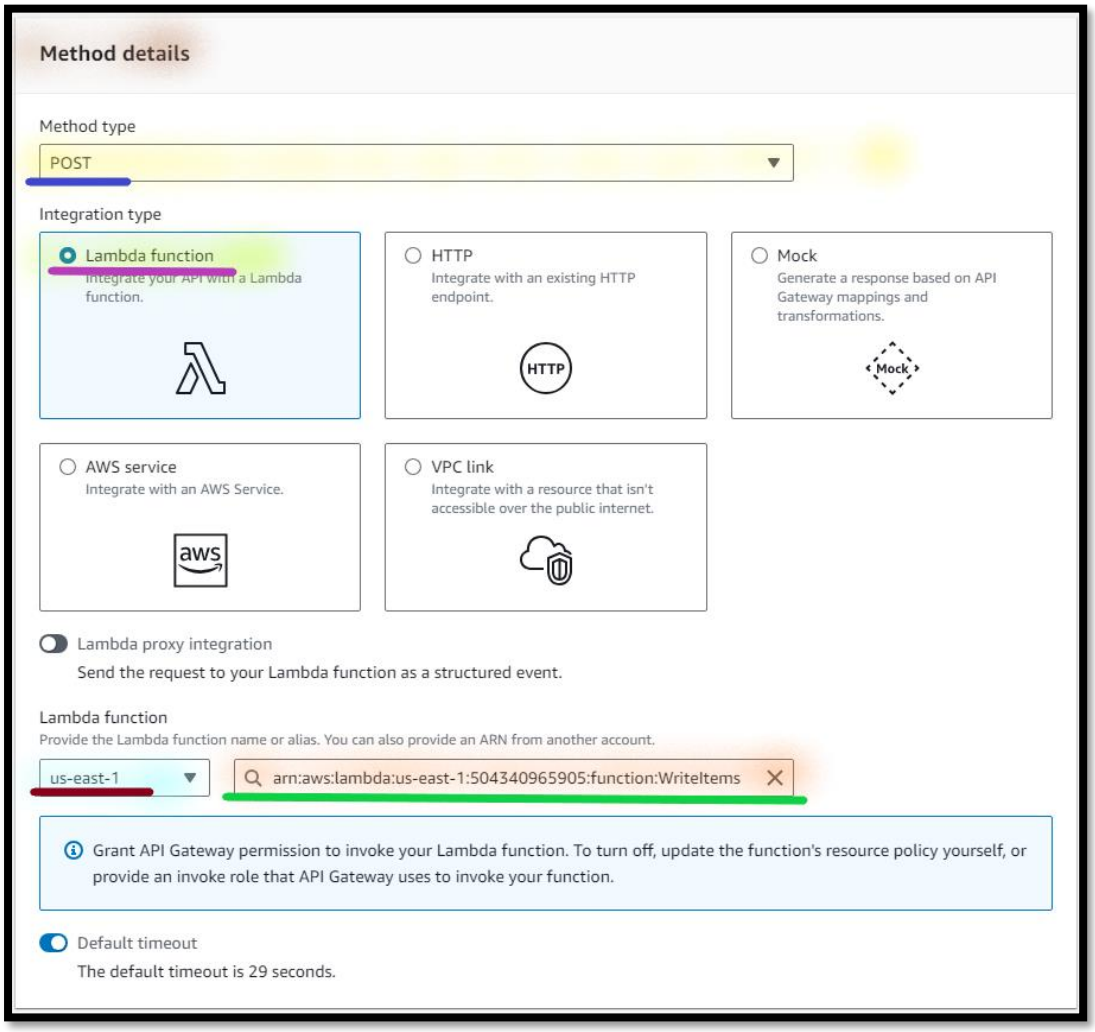
III. **Lambda function**:

A. **Region**: Dropdown and select the **YOUR ALLOCATED REGION-ID**.

Note: **Replace** the **region-identifier**.
Refer the **link** to know your **respective region region identifier**
https://docs.aws.amazon.com/AWSEC2/latest/UserGuide/using-regions-availability-zones.html

B. **Choose a lambda function**: In the **Search** section, click and select **WriteItems** (*lambda function you created in the previous step*).

Note: Leave other details as default.



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2) Select **Create method**.

Note: **Wait**, till the **Post - Method execution** gets created.

Step 4: Test the API Gateway to Write the Items

28. **From** the **empdata-API** gateway:

a. Select **Resources**.

i. Select **/** (*resource path*).

a) Select **POST**.

1) Select **Test**.

I. **Request body**: Write the **below event**:

```
{
  "empid": "003",
  "empfirstname": "Mukesh",
  "emplastname": "Walia",
  "empage": "38"
}
```

Note: Leave all the details as default.

Note: You can now **add** the **new items** via **API Gateway**.

A. Select **Test**.

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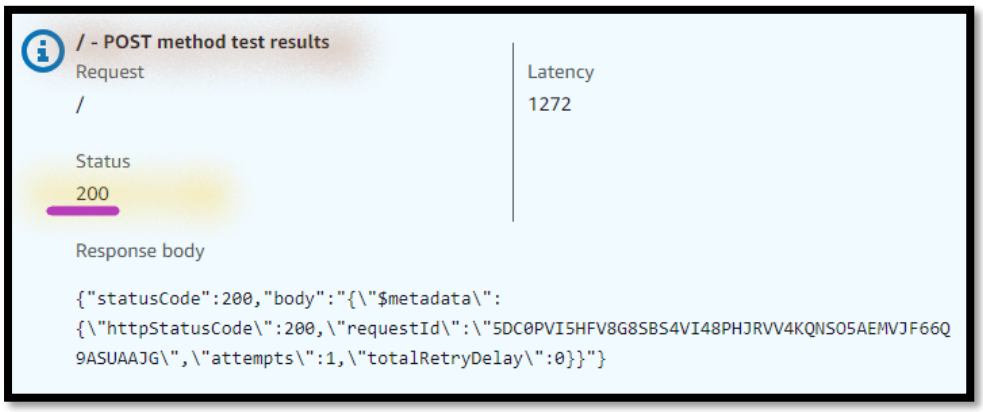
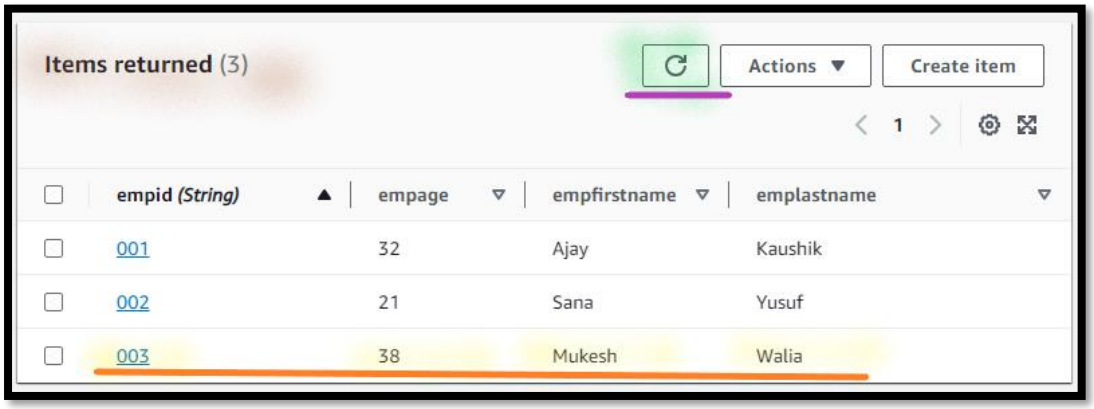
Note: If request **executed succesfully**, you can see the request **Status** as **200**.



Step 5: View the DynamoDB Data

29. In the **AWS Management Console**, on the **Services** menu, search and select **DynamoDB**.
30. Select **Explore items**.
    a. Select **empdata**.
        i. Select **Refresh**.

Note: You can view the **Added Items**, which you have **added in the DynamoDB** via the **API gateway**.



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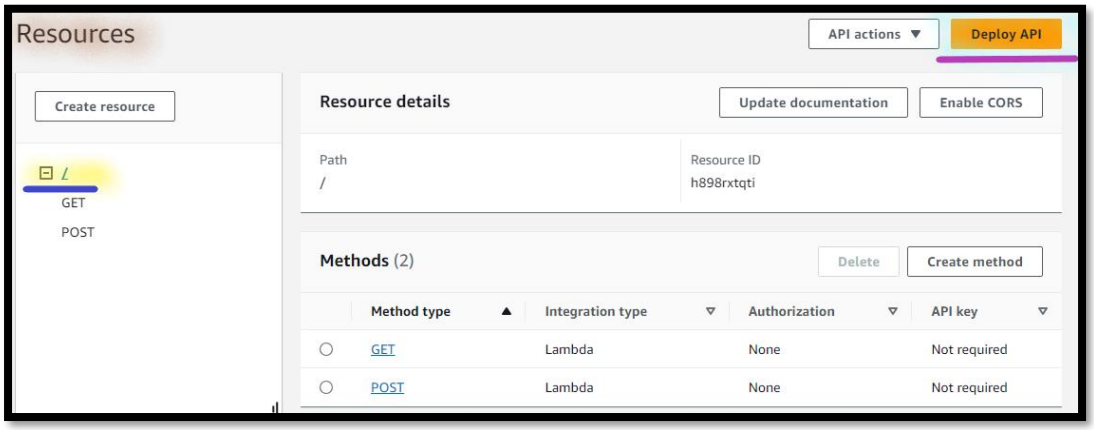
Task 7: Deploy API

In this task, you will publish the API to access via tools.

Step 1: Deploy API

31. In the **AWS Management Console**, on the **Services** menu, search and select **API Gateway**.
32. Choose the **YOUR ALLOCATED REGION** list to the right of your account information on the navigation bar.
33. Open the **empdata-API** API.
    a. Select **Resources**.
        i. Select **/** (*resource path*).
            a) Select **Deploy API**.



1) **Stage**: Dropdown and select ***New Stage***.
2) **Stage name**: Write **ReadWrite-API**.

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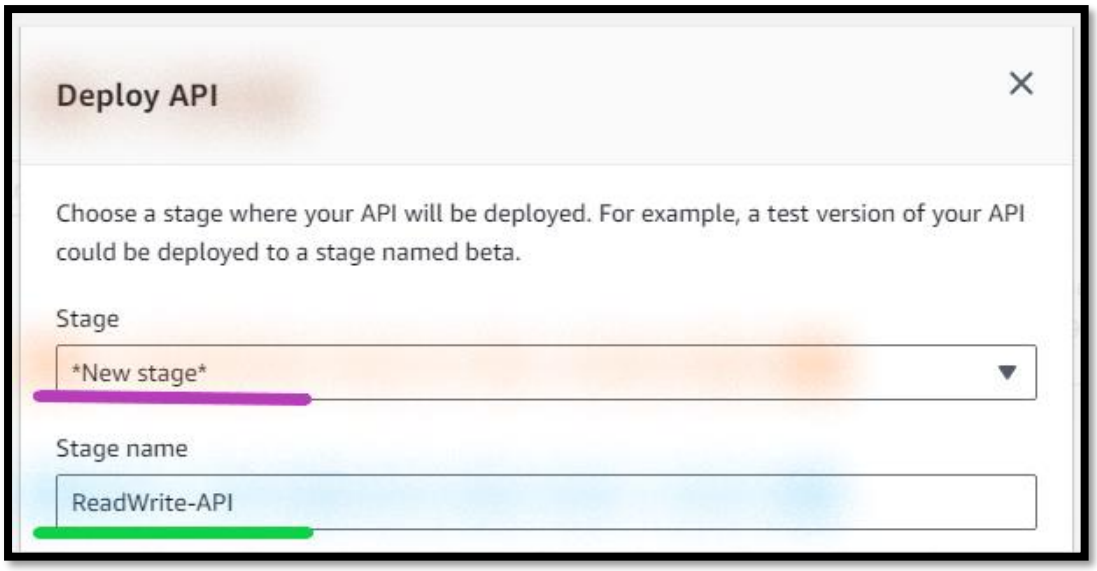

Note: Leave other details as default.

b) Select **Deploy**.

1) **Copy** the **Invoke URL** in the **Notepad**.

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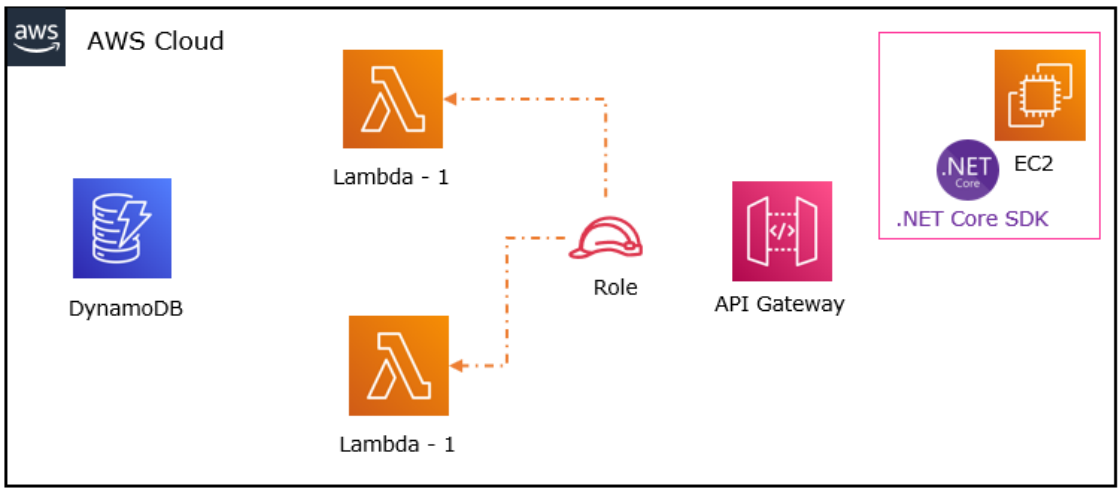
Task 8: Build the Environment

In this task, you will build the environment to test the API using the tool.



Step 1: Create EC2 Instance

34. In the **AWS Management Console**, on the **Services** menu, search and select **EC2**.

35. Choose the **YOUR ALLOCATED REGION** list to the right of your account information on the navigation bar.

36. Select **Instances**.

37. Select **Launch Instances**.

    a. In the **Name and tags** section:

        i. **Name**: Write **Dev-API-Server**.

    b. In the In the **Application and OS Images** section:

        i. In the **Search box**:

            a) Type **Microsoft Windows Server 2022 Base**.

            b) Press **Enter** ***key***.

Note: You can see the **Choose an Amazon Machine Image** page.

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c) **From** the **Choose an Amazon Machine Image** page:

1) Select **Microsoft Windows Server 2022 Base**.

Note: You can see the **Launch an Instance** page.

c. In the **Instance Type** section:

i. **Instance type**: Dropdown and in the **Search box**:

a) Type and select **t2.micro**.

d. In the **Key pair (login)** section:

i. **Key pair name**: Dropdown and select **Proceed without a key pair**.

e. In the **Network setting** section:

Note: You can see "**Allow RDP traffic**" is already **enabled** from "**Anywhere**".

Note: Leave the other details as default.

f. In the **Advance details** section:

i. **User data**: **Copy** the **script** from **script-api-server**.

Note: **script-api-server**.txt script is provided with the **Lab manual**.

Note: User Data **script** performing the **following** tasks:

1. Set the **Administrator's Password**.

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g. In the **Summary** section:

i. Select **Launch Instances**.

Note: **Wait**, till you can see the **message** "**Successfully initiated launch of instance**".

h. Select **View all instances**.

Note: **Wait**, till you can see the **Dev API Server** Instance **State** is **Running**.

Note: **Wait**, till you can see the **Dev API Server** Instance **Status check** is **2/2 check passed**.

Note: **Refresh** your **screen** unless you can see the **2/2 check passed**.

Step 2: Copy the IP Address

38. **From** the **EC2** console.
39. Select the **Dev API Server**.
    a. Select the **Details**.

Note: **Copy** the **Public IP address** of **Dev API Server** in the **Notepad**.

Step 3: Connect to Instance

40. From the **Local Desktop/ Laptop** (*Windows desktop*), right click on **Start** & **Run**.
    a. In the **Open**, write **mstsc**.
    b. Select **Ok**.
        i. **From** the **Remote Desktop Connection**:
            a) **Computer**: Write the **Public IP Address** of the **Dev API Server**.
            b) Select **Connect**.

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Note: You can **get the prompt** to enter the **Username** and **Password**.

1) **Username:** Write **Administrator**.
2) **Password**: Write the **lab-password@123**.
3) Select **Ok**.

Step 4: Install the Dot Net Core SDK

41. **From** the **Dev API Server**.
    a. **Download** and **install** the **.Net Core SDK** for **Windows x64**.

Note: Use the below **URL** to download the **.Net Core SDK 7.0**.

https://download.visualstudio.microsoft.com/download/pr/e3f91c3f-dbcc-44cb-a319-9cb15c9b61b9/6c87d96b2294afed74ccf414e7747b5a/dotnet-sdk-7.0.400-win-x64.exe

Note: **Wait**, till **.NET Core SDK 7.0** install **succesfully**.

Step 5: Check the .NET Core SDK Version

42. **From** the **Dev API Server**, right click on **Start** & **Run**.
    a. In the **Open**, write **cmd**.
    b. Select **Ok**.
        i. From the **Command line interpreter**:
            a) **Execute** the ***below command*** to **Check** the **dotnet version**.

```
dotnet --version
```

Note: You can see the **Dotnet** installed **version**.

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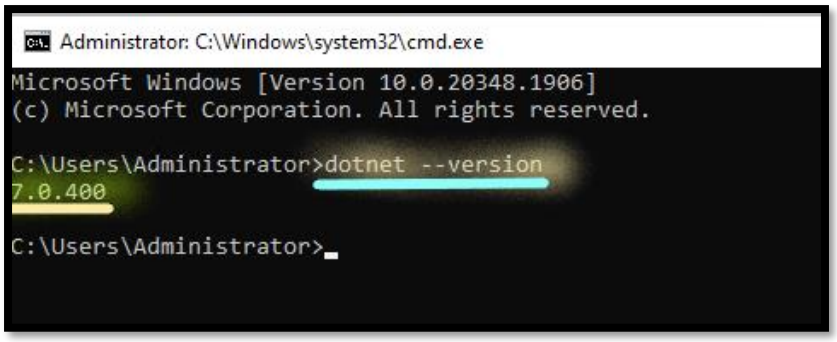
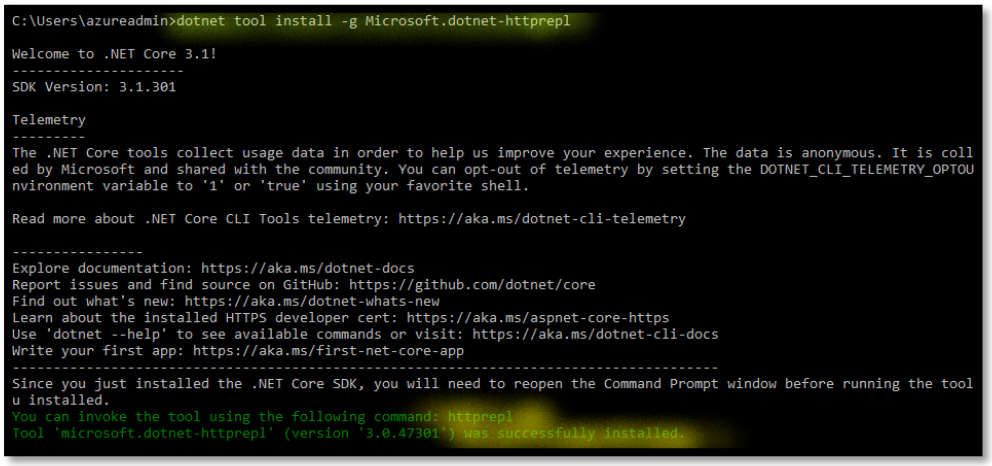


Step 6: Install the HTTPREPL

43. **From** the **Dev API Server**, right click on **Start** & **Run**.
    a. In the **Open**, write **cmd**.
    b. Select **Ok**.
        i. From the **Command line interpreter**:
            a) **Execute** the ***below command*** to **Install** the **HTTPREPL**.

```
dotnet tool install -g Microsoft.dotnet-httprepl
```

Note: **Wait**, till **httprepl** install **succesfully**.



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Info: The HTTP Read-Eval-Print Loop (REPL) is A lightweight, cross-platform command-line tool, used for making HTTP requests to test web APIs and view their results.

b) **Execute** the ***below command*** to **Close** the **Command line interpreter**.

```
exit
```

Step 7: Verify the HTTPREPL

44. From the **Dev API Server**, right click on **Start** & **Run**.

    a. In the **Open**, write **cmd**.

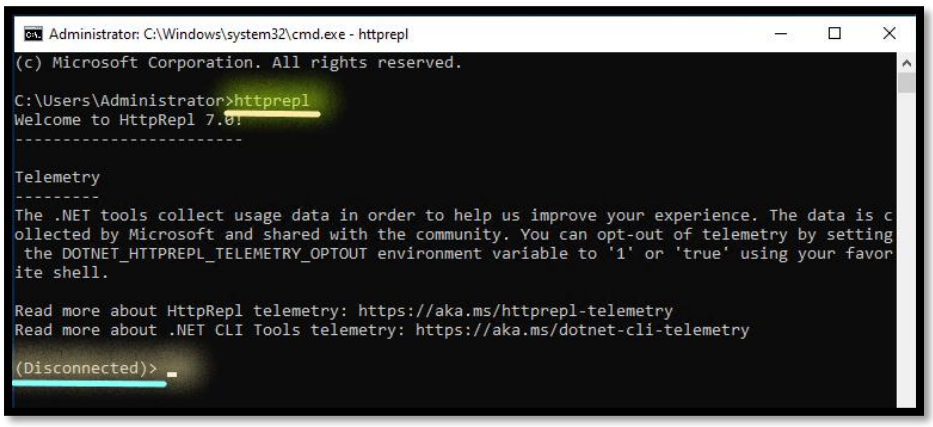
    b. Select **Ok**.

        i. From the **command line interpreter**:

            a) **Execute** the ***below command*** to **Initiate** the **HTTPREPL**.

```
httprepl
```

Note: You can see the **disconnected**.



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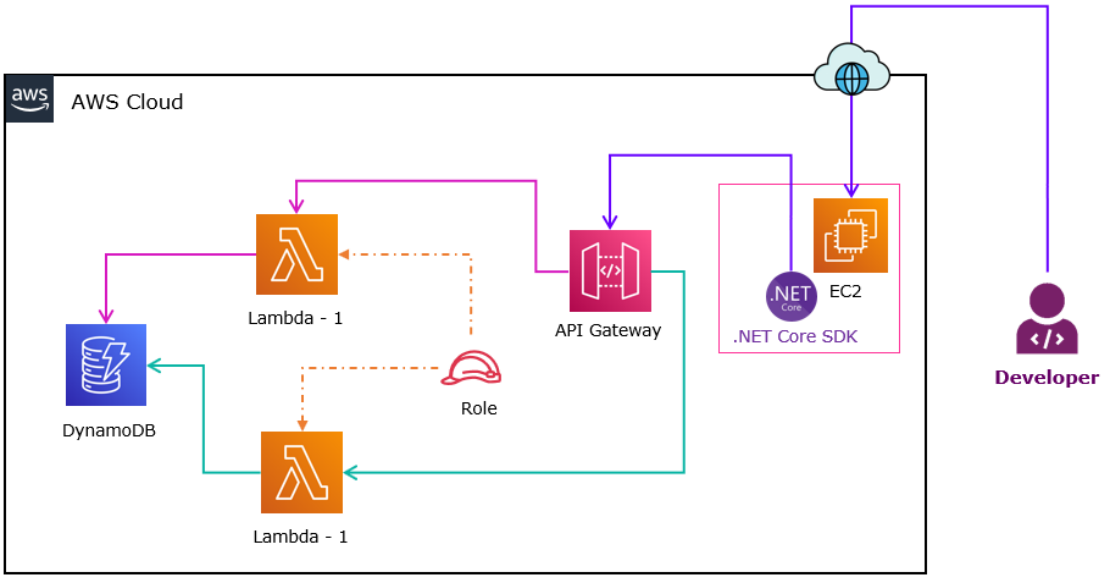
b) From the **httprepl**:

1) **Execute** the ***below command*** to **Close** the **httprepl**.

```
exit
```

Task 9: Validate the Solution using Httprepl

In this task, you will access the API using the tools.



Step 1: Test API by using Httprepl

45. From the **Dev API Server**, right click on **Start** & **Run**.

a. In the **Open**, write **cmd**.

b. Select **Ok**.

i. From the **Command line interpreter**:

Note: **Set** the base **Uniform Resource Identifier** (URI) to the value of the Request URL for the API operation.

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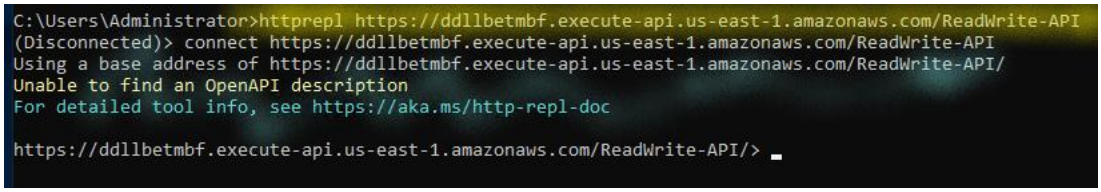
a) **Execute** the ***below command*** to **Invoke** the **API**.

```
httprepl API-INVOKE-URL
```

Note: **Replace** the **API-INVOKE-URL**, with the **empdata-API API Invoke URL** which you have copied in the previous step.



b) From the **httprepl**:

1) **Execute** the ***below command*** to **Get** the **Items**.

```
get
```

Note: **Observe** the **JSON response** content.

Note: In the **Response body**, you can see the **Items**, which you have added in the DynamoDB table.

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2) **Execute** the ***below command*** to **Set** the **Default text editor**.

```
pref set editor.command.default C:\Windows\system32\notepad.exe
```

Info: By default, the HttpRepl has no text editor configured for use.

To test web API methods requiring an HTTP request body, a default text editor must be set.

The HttpRepl tool launches the configured text editor for the sole purpose of composing the request body.

3) **Execute** the ***below command*** to **Set** the **Media type (JSON)**.

```
post -h Content-Type=application/json
```

Info: In the preceding command, the HTTP request header is set to indicate a request body media type of JSON. The default text editor opens a *.tmp* file.

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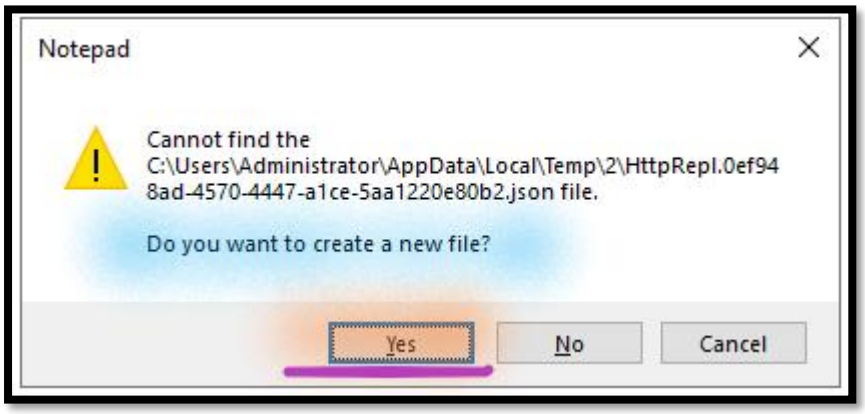
I. Select **Yes**, when you ***get prompt*** to **Create new file**.



II. In the **Body**, **Copy** the ***below details***:

```
{
  "empid": "004",
  "empfirstname": "Aisha",
  "emplastname": "Khan",
  "empage": "45"
}
```

A. **From** the **Notepad**:

a. Select **File** and select **Save**.

b. Select **File** and select **Exit**.

Note: You can see the **200 OK** message.

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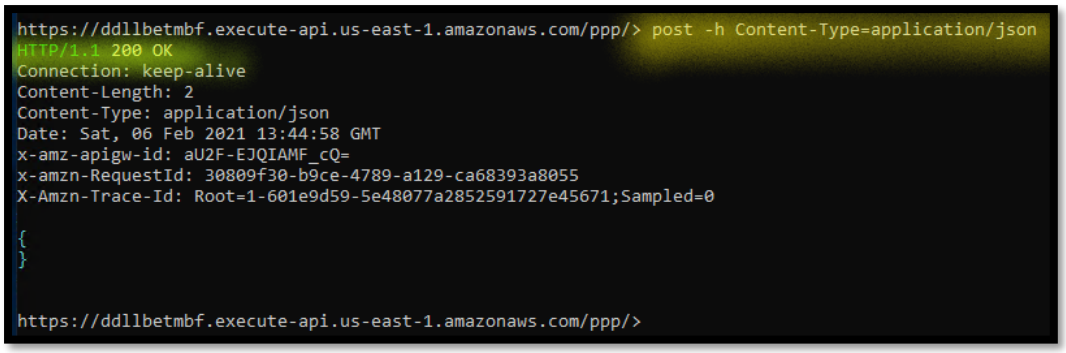

4) **Execute** the ***below command*** to **Get** the **Items**.

```
get
```

Note: **Observe** the **JSON response** content.

Note: In the **Response body**, you can see the **New Item**, which you have added in the Previous step.

5) **Execute** the ***below command*** to **Exit** the **httprepl**.

```
exit
```

Step 2: View the DynamoDB Data

46. In the **AWS Management Console**, on the **Services** menu, search and select **DynamoDB**.
47. Choose the **YOUR ALLOCATED REGION** list to the right of your account information on the navigation bar.
48. Select **Explore items**.
    a. Select **empdata**.
        i. Select **Refresh**.

Note: You can view the **Added Items**, which you have added in the **DynamoDB** via the **Invoke URL**.

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Task 10: Delete the Environment

Step 1: Delete the DynamoDB Table

49. In the **AWS Management Console**, on the **Services** menu, search and select **DynamoDB**.

50. Choose the **YOUR ALLOCATED REGION** list to the right of your account information on the navigation bar.

51. Select the **Tables**.

    a. Select the **emdpdata**.

        i. Select **Delete**.

            a) When you ***get prompt***, write **confirm**.

            b) Select **Delete**.

Step 2: Delete Lambda Function

52. In the **AWS Management Console**, on the **Services** menu, search and select **Lambda**.

53. Choose the **YOUR ALLOCATED REGION** list to the right of your account information on the navigation bar.

54. Select **Functions**.

    a. Select **ReadItems**.

    b. Select **WriteItems**.

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i. Select **Actions**.

a) Select **Delete**.

1) When you ***get prompt***, write **delete**.

2) Select **Delete**.

b) Select **Close**.

Step 3: Delete the API Gateway

55. In the **AWS Management Console**, on the **Services** menu, search and select **API Gateway**.
56. Choose the **YOUR ALLOCATED REGION** list to the right of your account information on the navigation bar.
57. Select the **APIs**.
58. Select the **empdata-API**.

a. Select **Delete**

i. When you ***get prompt***, write **confirm**.

ii. Select **Delete**.

Step 4: Terminate EC2 Instances

59. In the **AWS Management Console**, on the **Services** menu, search and select **EC2**.
60. Choose the **YOUR ALLOCATED REGION** list to the right of your account information on the navigation bar.
61. Select **Instances**.

a. Select **Dev API Server**.

i. Select **Instance state**.

a) Select **Terminate instance**.

1) Select **Terminate**.

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