

# **Project:-**

## **Architect and Build an End-to-End AWS Web Application from Scratch**

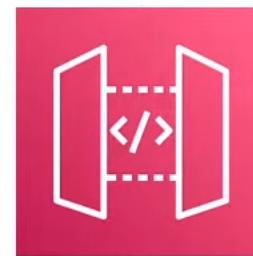
# Services We'll be Using



AWS  
Amplify



AWS  
Lambda



Amazon  
API Gateway



Amazon  
DynamoDB



AWS  
Identity & Access  
Management (IAM)

# What Do We Need?



- ? A way to create/host a webpage
- ? A way to invoke the math functionality
- ? A way to do some math
- ? Somewhere to store/return the math result
- ? A way to handle permissions

# What Do YOU Need?

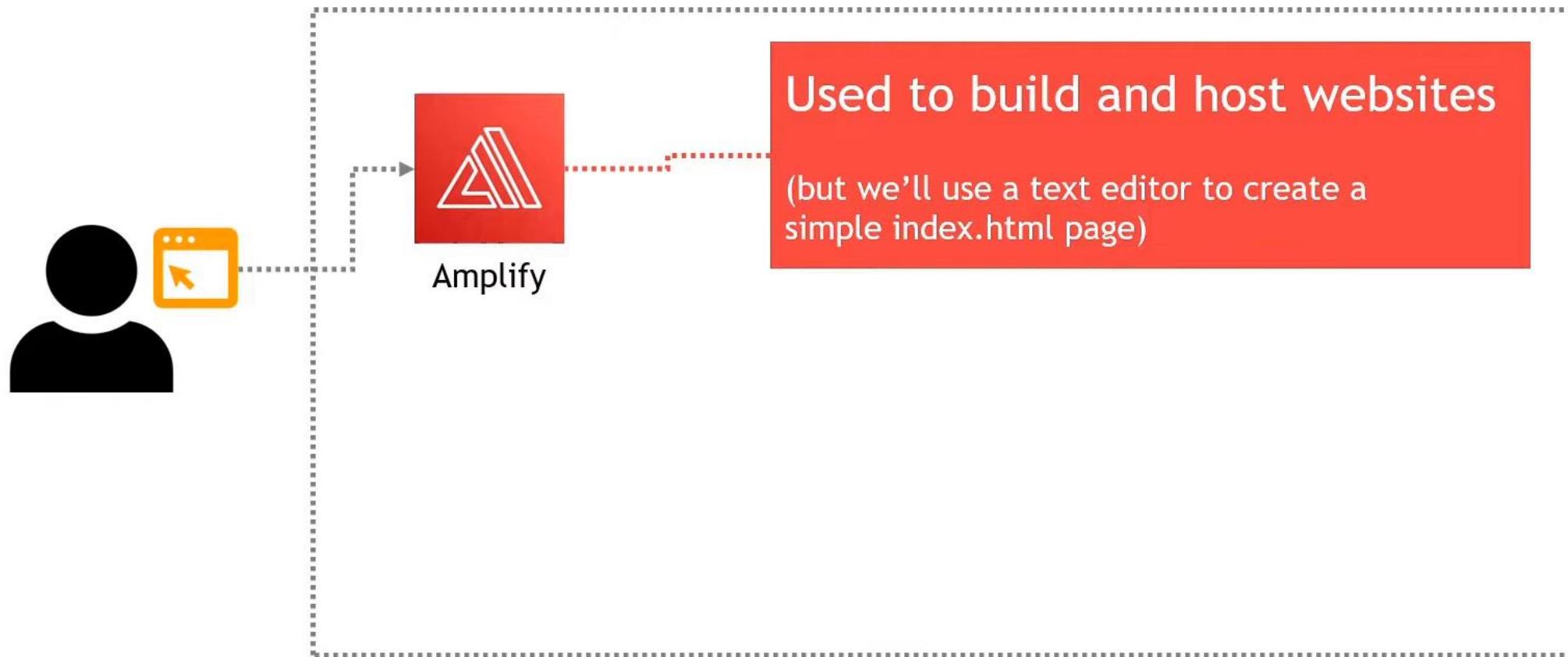
- ? A text editor (e.g., Notepad++, Notepad, etc.)
- ? An AWS account and access to the Console
- ? Basic knowledge of AWS

# What Do We Need?



-  A way to create/host a webpage
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# The Application Architecture



C:\Users\user\OneDrive\Desktop\AWS Project\index-ORIGINAL.html - Notepad++

File Edit Search View Encoding Language Settings Tools Macro Run Plugins Window ?

index.html index-ORIGINALhtml

```
1 <!DOCTYPE html>
2 <html>
3   <head>
4     <meta charset="UTF-8">
5     <title>To the Power of Math!</title>
6   </head>
7 
8   <body>
9     To the Power of Math!
10    </body>
11  </html>
12
```

Creating an index.html page from scratch in a text editor

length : 167 lines : 12 Ln : 1 Col : 1 Pos : 1 Windows (CR LF) UTF-8 INS

# Deploying and hosting a web page with AWS Amplify

us-east-1.console.aws.amazon.com/amplify/home?region=us-east-1#/

## Get started

### Amplify Studio



### Build an app

Build an app backend with auth, data, and storage, and create custom UI components. Then integrate them in your app with just a few steps.

JS  

[Get started](#)

### Amplify Hosting



### Host your web app

Connect your Git repository to continuously deploy your frontend and backend. Host it on a globally available CDN.

[Get started](#)

Already have existing Cognito, S3, or other AWS resources? Connect to them from your app with the Amplify Libraries. [Go to docs](#)

# Get started with Amplify Hosting

Amplify Hosting is a fully managed hosting service for web apps. Connect your repository to build, deploy, and host your web app.

## From your existing code

Connect your source code from a Git repository or upload files to host a web app in minutes.

 GitHub Bitbucket GitLab AWS CodeCommit Deploy without Git providerContinue

# Uploading the zip file

us-east-1.console.aws.amazon.com/amplify/home?region=us-east-1#/create/manual

Gmail YouTube Maps Amazon ECS WhatsApp Google Translate

aws Services Search [Alt+S] N. Virginia Mayur@303

## Start a manual deployment

**App name**  
Give this app a name or we will generate a default for you

**Environment name**  
Give this resource a meaningful environment name, like dev, test, or prod, or we will generate a default for you

**Method**

Drag and drop 

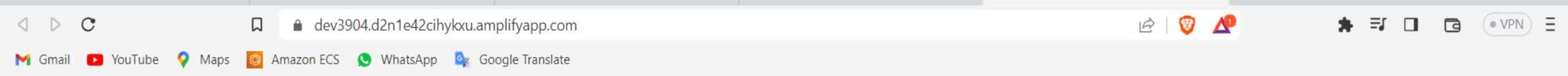
Amazon S3 

Any URL 

 **index-ORIGINAL.zip**

**Cancel** **Previous** **Save and deploy**





To the Power of Math!

# The Current Architecture

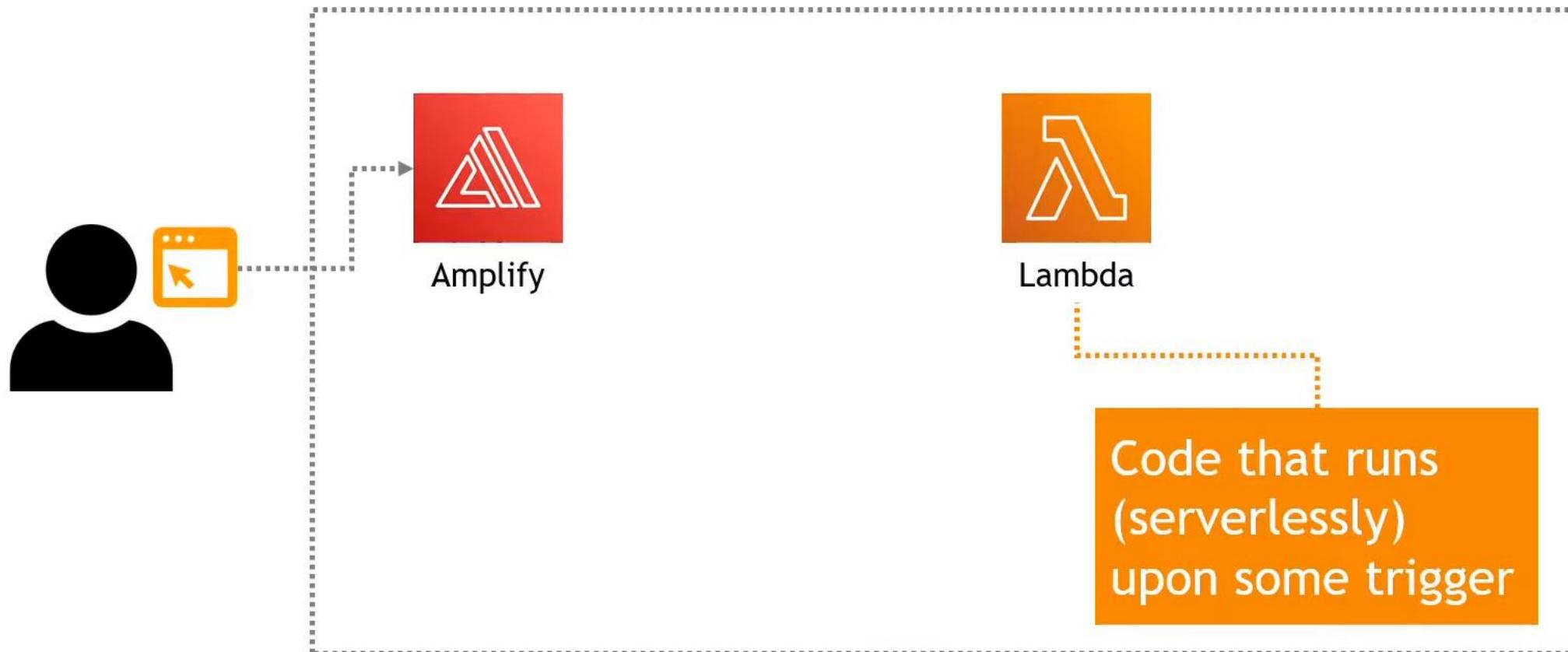


# What Do We Need?



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# The Application Architecture



## Basic information

### Function name

Enter a name that describes the purpose of your function.

Use only letters, numbers, hyphens, or underscores with no spaces.

### Runtime

Choose the language to use to write your function. Note that the console code editor supports only Node.js, Python, and Ruby.



### Architecture

Choose the instruction set architecture you want for your function code.

 x86\_64 arm64

### Permissions

By default, Lambda will create an execution role with permissions to upload logs to Amazon CloudWatch Logs. You can customize this default role later when adding triggers.

▶ Change default execution role

▶ Advanced settings

Cancel

Create function

Code source [Info](#)

Upload from ▾

File Edit Find View Go Tools Window

Test

Deploy

Changes not deployed



Go to Anything (Ctrl-P)

lambda\_function x

Environment

powerofmathfunc lambda\_function.py

```
1 # import the JSON utility package
2 import json
3 # import the Python math library
4 import math
5
6 # define the handler function that the Lambda service will use as an entry point
7 def lambda_handler(event, context):
8
9     # extract the two numbers from the Lambda service's event object
10    mathResult = math.pow(int(event['base']), int(event['exponent']))
11
12    # return a properly formatted JSON object
13    return {
14        'statusCode': 200,
15        'body': json.dumps('Your result is ' + str(mathResult))
16    }
17
```

Successfully updated the function powerof

Code source Info

File Edit Find View Go Tools

Go to Anything (Ctrl-P)

powerofmathfunc lambda\_function.py

Environment

hello-world

## Event JSON

Format JSON

```
1 {  
2   "base": 2,  
3   "exponent": 4  
4 }  
5  
10  
11  
12  
13  
14  
15  
16  
17
```

Upload from



Cancel Invoke Save

# Successfully Test the Lambda function

Screenshot of the AWS Lambda console showing a successful test event for a Python function.

The Lambda function code source is `lambda\_function.py`:

```
def calculate_power(event, context):
    result = event['number'] ** event['power']
    return {"statusCode": 200, "body": f"Your result is {result}"}
```

The test event `powerofmathevent` was successfully saved.

Execution results:

- Status: Succeeded
- Max memory used: 36 MB
- Time: 4.03 ms

Test Event Name: powerofmathevent

Response:

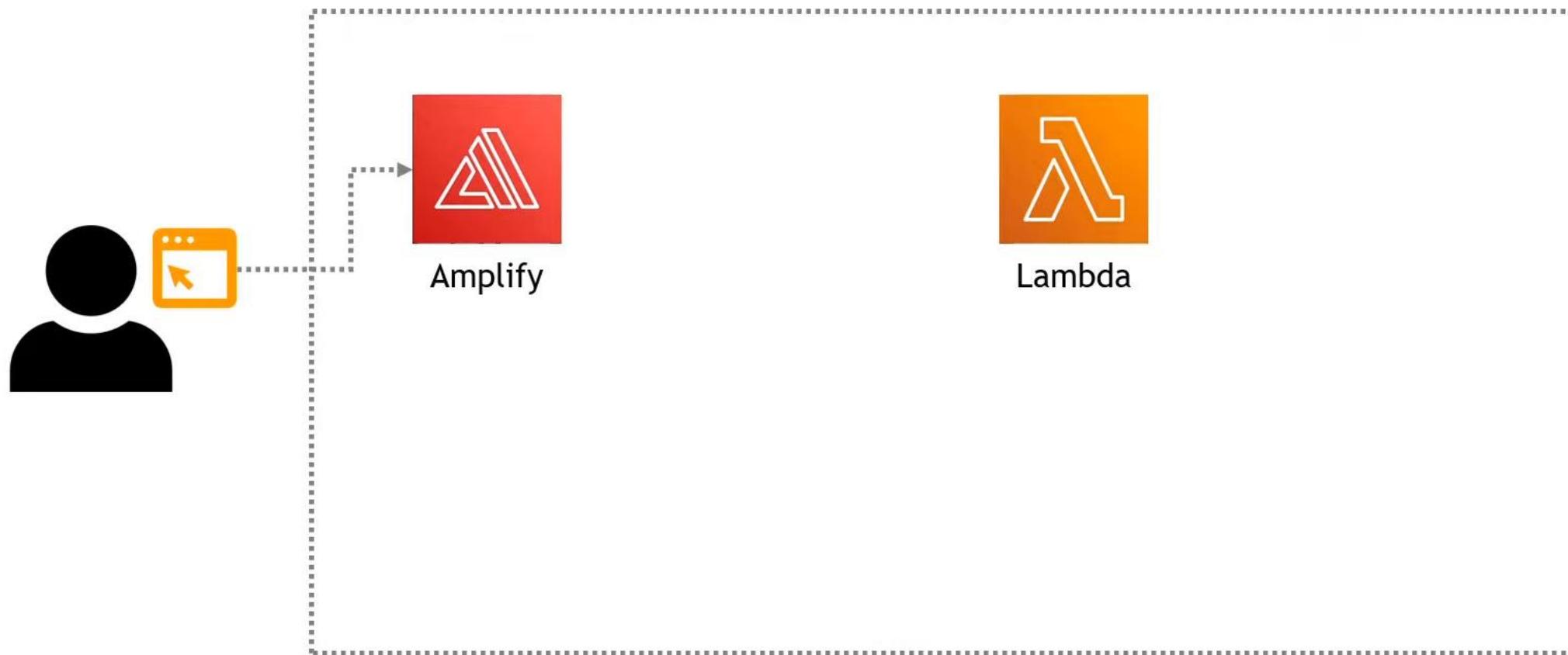
```
{"statusCode": 200, "body": "\"Your result is 16.0\""}  
Function Logs:  
START RequestId: 66957358-22c3-462d-83ca-a09e8b3538ee Version: $LATEST  
END RequestId: 66957358-22c3-462d-83ca-a09e8b3538ee  
REPORT RequestId: 66957358-22c3-462d-83ca-a09e8b3538ee Duration: 4.03 ms Billed Duration: 5 ms Memory Size: 128 MB Max Memory Used: 36 MB Init Duration: 101.70 ms
```

Request ID: 66957358-22c3-462d-83ca-a09e8b3538ee

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27°C ENG IN 18-08-2023

# The Current Architecture

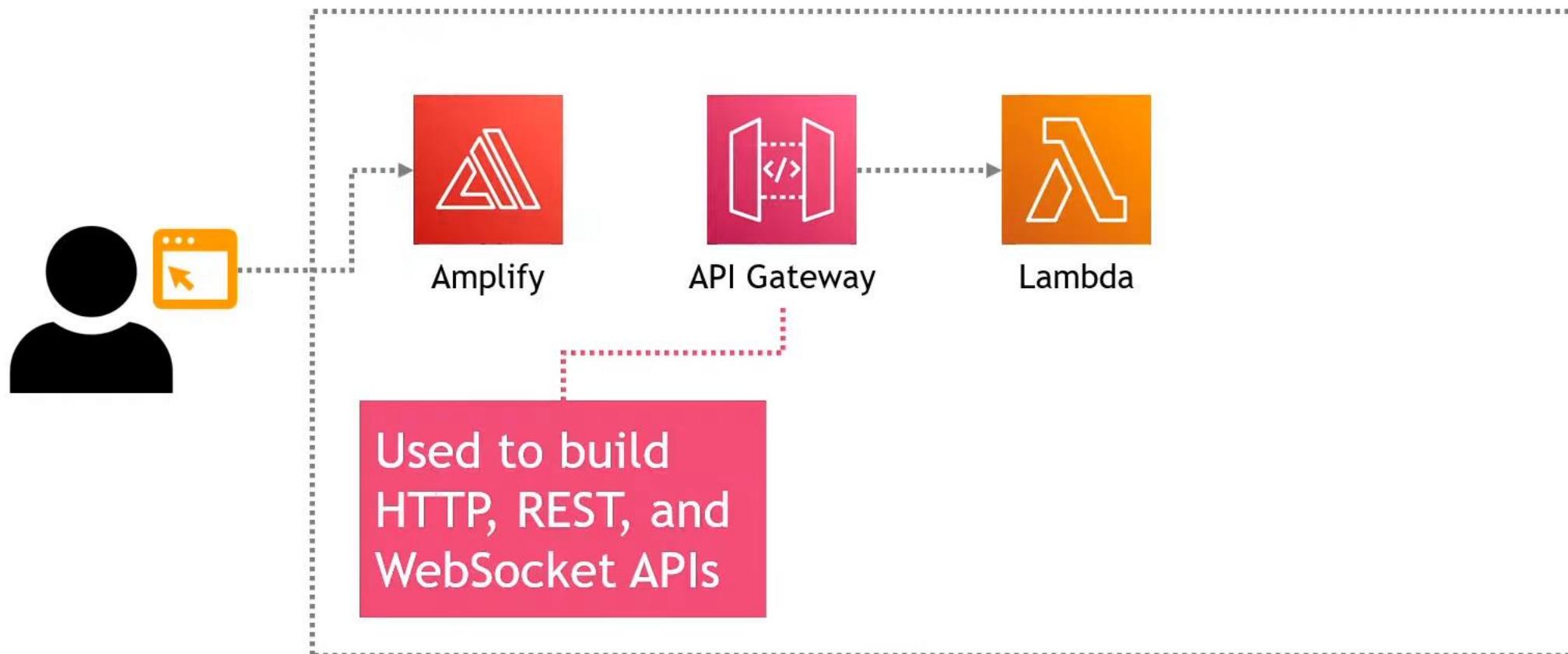


# What Do We Need?



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# The Application Architecture



us-east-1.console.aws.amazon.com/apigateway/home?region=us-east-1#/apis/mx4vec6a54/resources/rhyjuh7s0f

Gmail YouTube Maps Amazon ECS WhatsApp Google Translate

aws Services Search [Alt+S]

Amazon API Gateway APIs > powerofmathAPI (mx4vec6a54) > Resources > / (rhyjuh7s0f)

N. Virginia Mayur@303 Hide hints ?

APIs Resources Actions / Methods

No methods defined for the resource.

Custom Domain Names /

VPC Links

**API: powerofmathAPI**

**Resources**

- Stages
- Authorizers
- Gateway Responses
- Models
- Resource Policy
- Documentation
- Dashboard
- Settings

Usage Plans

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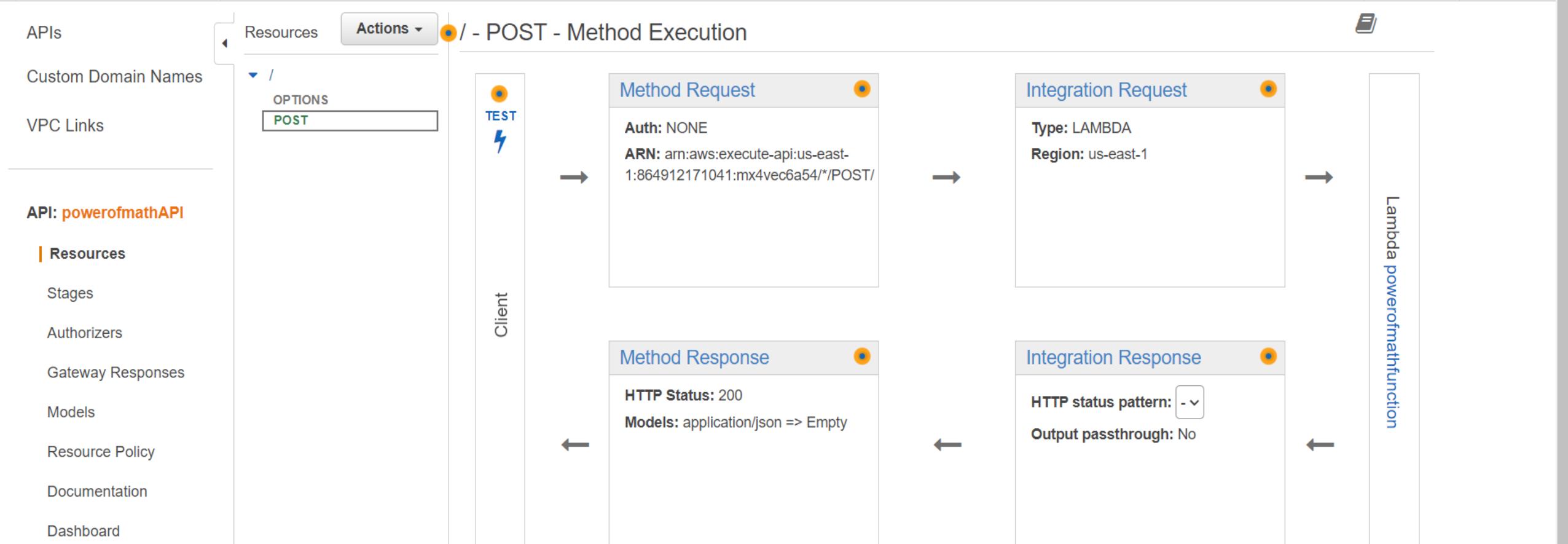
GBP/INR -0.26% ENG IN 13:30 18-08-2023

us-east-1.console.aws.amazon.com/apigateway/home?region=us-east-1#/apis/mx4vec6a54/resources/rhyjuh7s0f/methods/P...

Gmail YouTube Maps Amazon ECS WhatsApp Google Translate

aws Services Search [Alt+S] N. Virginia Mayur@303 Hide hints ?

Amazon API Gateway APIs > powerofmathAPI (mx4vec6a54) > Resources > / (rhyjuh7s0f) > POST



The screenshot shows the AWS API Gateway Method Execution Test interface. The top navigation bar includes the AWS logo, Services (with a dropdown menu), a Search bar, and account information for N. Virginia and Mayur@303. The left sidebar lists APIs, Custom Domain Names, VPC Links, and various API-related options under the heading "API: powerofmathAPI". The main content area displays the "Method Execution" test for the POST method of the root resource. The path is / (rhyjuh7s0f). The test results show a successful request with status 200, latency of 302 ms, and a response body of {"statusCode": 200, "body": "\"Your result is 8.0\""}.

APIs      Actions ▾

Custom Domain Names

VPC Links

API: powerofmathAPI

Resources

Stages

Authorizers

Gateway Responses

Models

Resource Policy

Documentation

Dashboard

Settings

Usage Plans

Amazon API Gateway    APIs > powerofmathAPI (mx4vec6a54) > Resources > / (rhyjuh7s0f) > POST    Hide hints ?

← Method Execution / - POST - Method Test

Make a test call to your method. When you make a test call, API Gateway skips authorization and directly invokes your method

Path

No path parameters exist for this resource. You can define path parameters by using the syntax `{myPathParam}` in a resource path.

Request: /

Status: 200

Latency: 302 ms

Query Strings

No query string parameters exist for this method. You can add them via Method Request.

Response Body

```
{"statusCode": 200, "body": "\"Your result is 8.0\""}
```

Headers

No header parameters exist for this method. You can add them via Method Request.

Response Headers

```
{"Access-Control-Allow-Origin": ["*"], "Content-Type": ["application/json"], "X-Amzn-Trace-Id": ["Root=1-64df26b0-baf2beb03db438a727d94b53;Sampled=0;lineage=e2740019:0"]}
```

Stage Variables

No stage variables exist for this method.

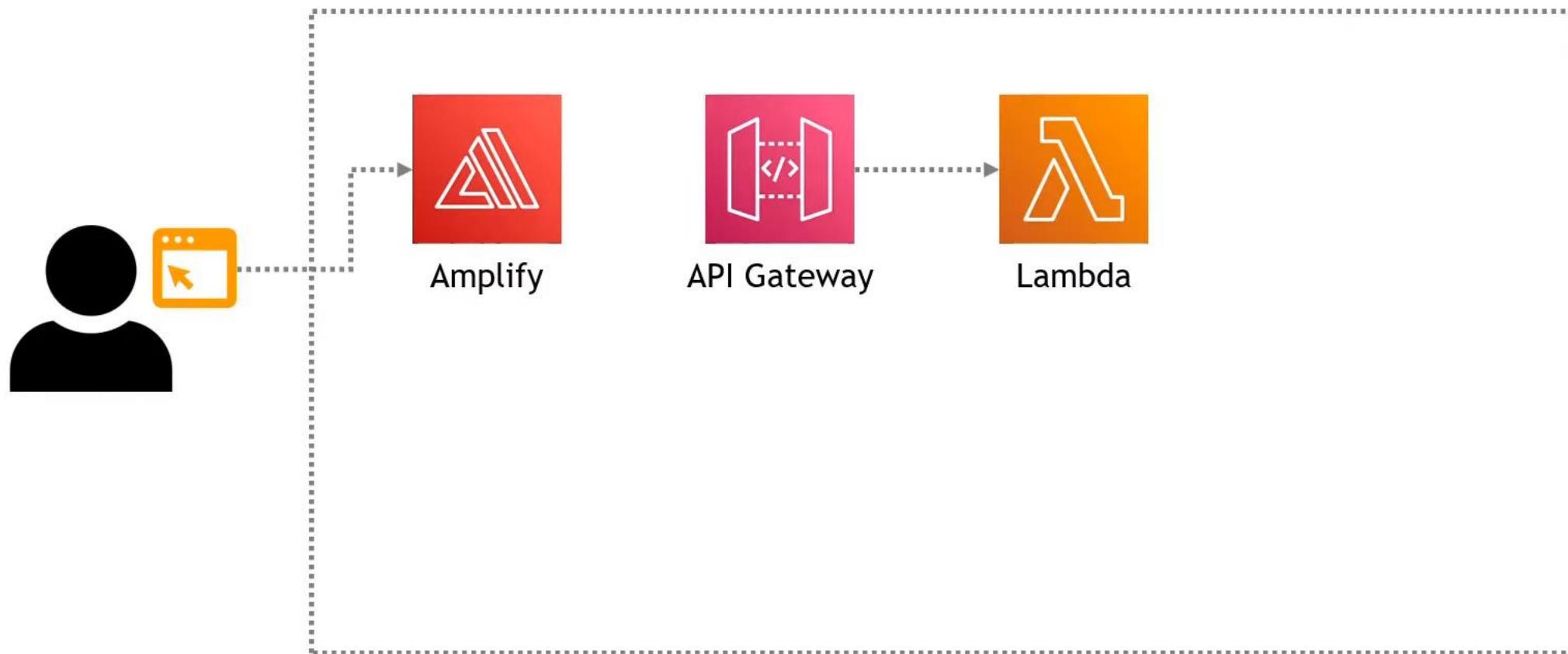
Logs

```
Execution log for request e8cba1d7-a4fc-4a5b-8a19-b9a166168f0
2
Fri Aug 18 08:07:12 UTC 2023 : Starting execution for request: e8cba1d7-a4fc-4a5b-8a19-b9a166168f0
Fri Aug 18 08:07:12 UTC 2023 : HTTP Method: POST, Resource Path: /
Fri Aug 18 08:07:12 UTC 2023 : Method request path: {}
```

Request Body

```
1 {
2     "base": 2,
```

# The Current Architecture

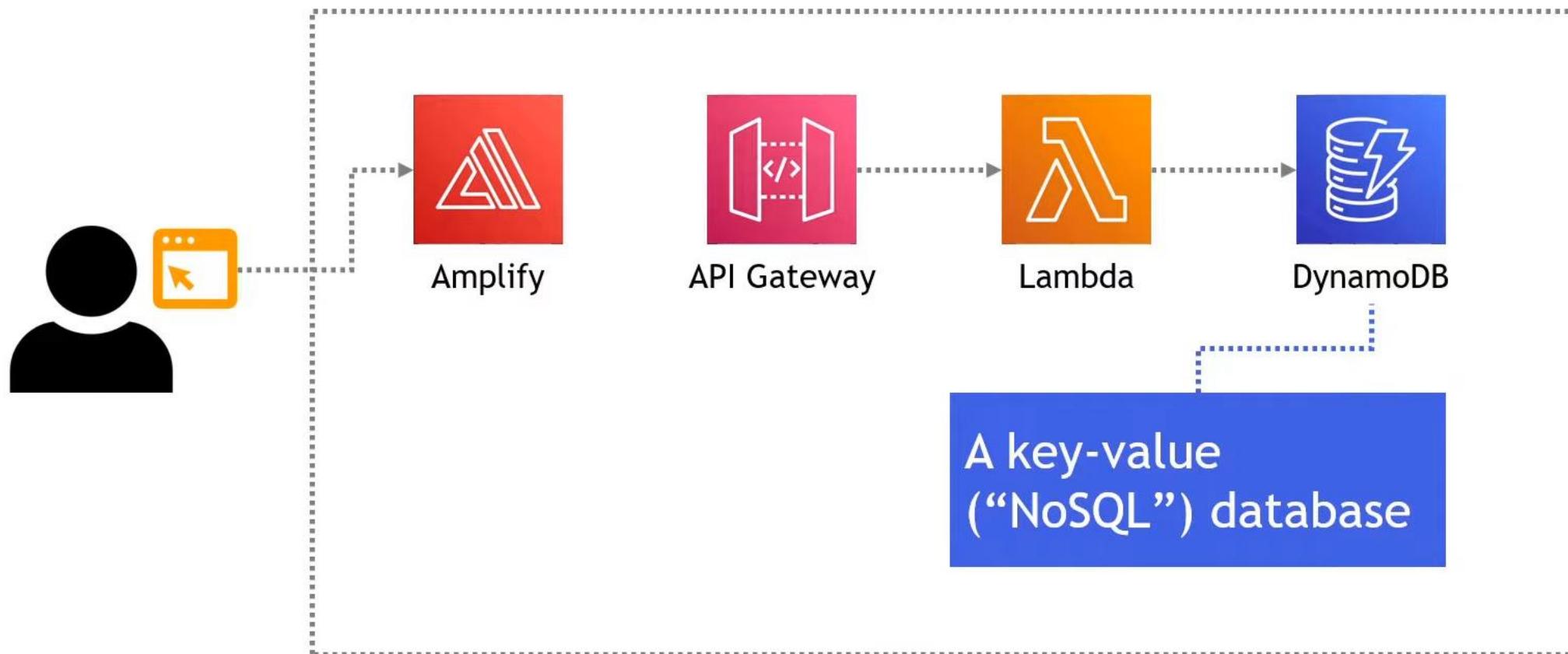


# What Do We Need?



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# The Application Architecture



### DynamoDB

The powerofmathdatabase table was created successfully.

[DynamoDB](#) > [Tables](#)

**Tables (2) [Info](#)**

<input type="checkbox"/>	Name	Status	Partition key	Sort key	Indexes	Deletion protection	Read capacity mode	Write
<input type="checkbox"/>	<a href="#">newtable</a>	<span>Active</span>	unique (S)	-	0	<span>Off</span>	Provisioned with auto scaling (1)	Provis
<input type="checkbox"/>	<a href="#">powerofmathdatabase</a>	<span>Active</span>	ID (S)	-	0	<span>Off</span>	Provisioned with auto scaling (5)	Provis

[Create table](#)

[Find tables by table name](#)

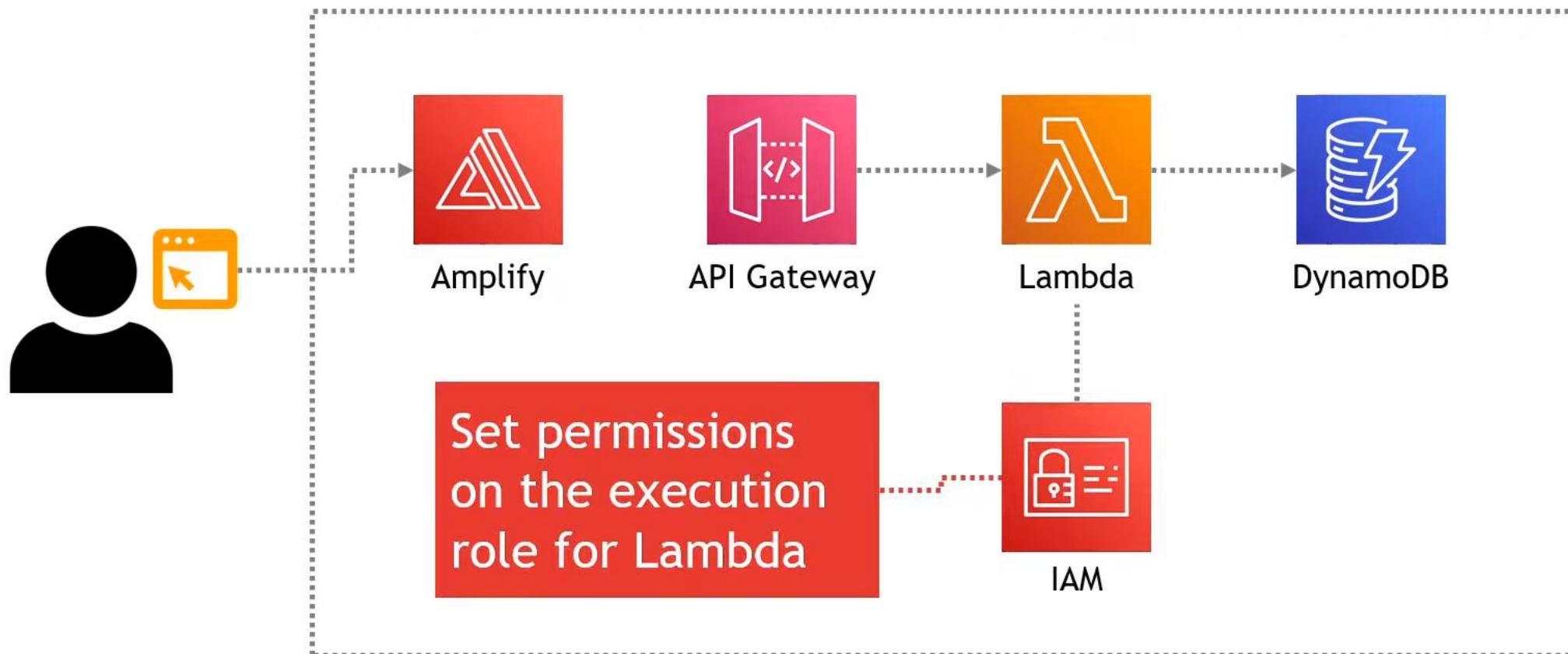
Any tag key ▾ Any tag value ▾

◀ 1 ▶ ⚙

**DAX**

- Clusters
- Subnet groups
- Parameter groups
- Events

# The Application Architecture



Step 1  
Specify permissionsSpecify permissions Info

Add permissions by selecting services, actions, resources, and conditions. Build permission statements using the JSON editor.

Step 2  
Review and create

## Policy editor

[Visual](#) [JSON](#) [Actions ▾](#)

```
1 {  
2   "Version": "2012-10-17",  
3   "Statement": [  
4     {  
5       "Sid": "VisualEditor0",  
6       "Effect": "Allow",  
7       "Action": [  
8         "dynamodb:PutItem",  
9         "dynamodb>DeleteItem",  
10        "dynamodb:GetItem",  
11        "dynamodb:Scan",  
12        "dynamodb:Query",  
13        "dynamodb:UpdateItem"  
14      ],  
15      "Resource": "arn:aws:dynamodb:us-east-1:864912171041:table/powerofmathdatabase"  
16    }  
17  ]  
18}
```

Edit statement  
**VisualEditor0** [Remove](#)

## Add actions

Choose a service

 Filter servicesIncluded  
DynamoDBAvailable  
AMP  
API Gateway  
API Gateway V2  
ASC  
Access Analyzer  
Account  
Activate  
Alexa for Business

us-east-1.console.aws.amazon.com/lambda/home?region=us-east-1#/functions/powerofmathfunction?tab=code

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AWS Services Search [Alt+S] Test Deploy Changes not deployed

AWS Lambda

Dashboard Applications Functions powerofmathfunction Additional resources Code signing configurations Layers Replicas Related AWS resources Step Functions state machines

Go to Anything (Ctrl-P) lambda\_function

```
# import the AWS SDK (for Python the package name is boto3)
import boto3
# import two packages to help us with dates and date formatting
from time import gmtime, strftime
# create a DynamoDB object using the AWS SDK
dynamodb = boto3.resource('dynamodb')
# use the DynamoDB object to select our table
table = dynamodb.Table('PowerOfMathDatabase')
# store the current time in a human readable format in a variable
now = strftime("%a, %d %b %Y %H:%M:%S +0000", gmtime())
# define the handler function that the Lambda service will use as an entry point
def lambda_handler(event, context):
    # extract the two numbers from the Lambda service's event object
    mathResult = math.pow(int(event['base']), int(event['exponent']))
    # write result and time to the DynamoDB table using the object we instantiated and save response in a variable
    response = table.put_item(
        Item={
            'ID': str(mathResult),
            'LatestGreetingTime':now
        })
    # return a properly formatted JSON object
    return {
        'statusCode': 200,
        'body': json.dumps('Your result is ' + str(mathResult))
    }
```

35:6 Python Spaces: 4

us-east-1.console.aws.amazon.com/lambda/home?region=us-east-1#/functions/powerofmathfunction?tab=code

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AWS Services Search [Alt+S] N. Virginia Mayur@303

## AWS Lambda

Dashboard Applications Functions powerofmathfunction Additional resources Code signing configurations Layers Replicas Related AWS resources Step Functions state machines

File Edit Find View Go Tools Window Test Deploy

Go to Anything (Ctrl-P) lambda\_function.x Execution result:

powerofmathfunction Environment lambda\_function.py

Execution results Status: Succeeded Max memory used: 70 MB Time: 250.80 ms

Test Event Name powerofmathevent

Response

```
[{"statusCode": 200, "body": "\Your result is 8.0\""}]
```

Function Logs

```
START RequestId: 9c1f5d25-2288-4186-b3d1-aeada4e312e6 Version: $LATEST
END RequestId: 9c1f5d25-2288-4186-b3d1-aeada4e312e6
REPORT RequestId: 9c1f5d25-2288-4186-b3d1-aeada4e312e6 Duration: 250.80 ms Billed Duration: 251 ms Memory Size: 128 MB Max Memory Used: 70 MB
```

Request ID

9c1f5d25-2288-4186-b3d1-aeada4e312e6

Any tag value

Find tables by table name

< 1 >

newtable

powerofmathdatabase

Scan or query items

Scan

Query

Select a table or index

Table - powerofmathdatabase

Select attribute projection

All attributes

▶ Filters

Run Reset

 Completed. Read capacity units consumed: 0.5

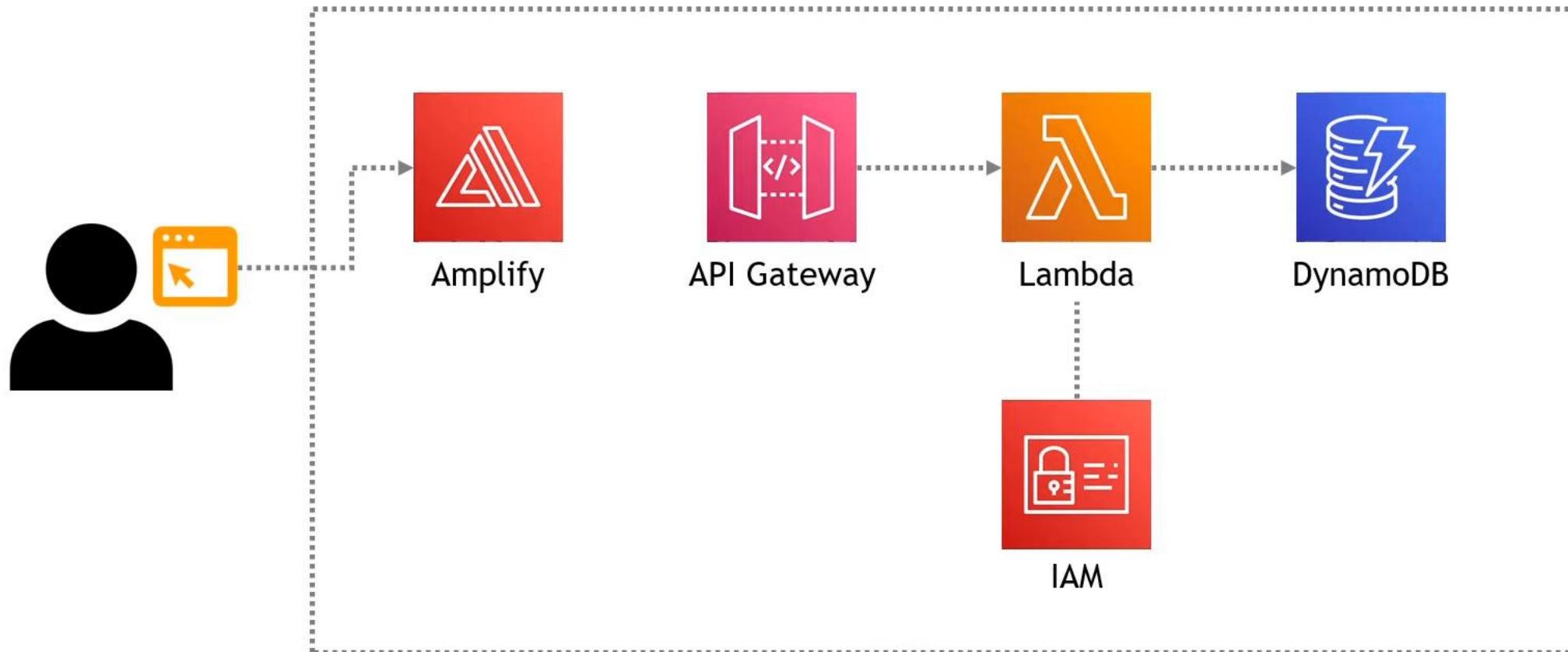
## Items returned (1)



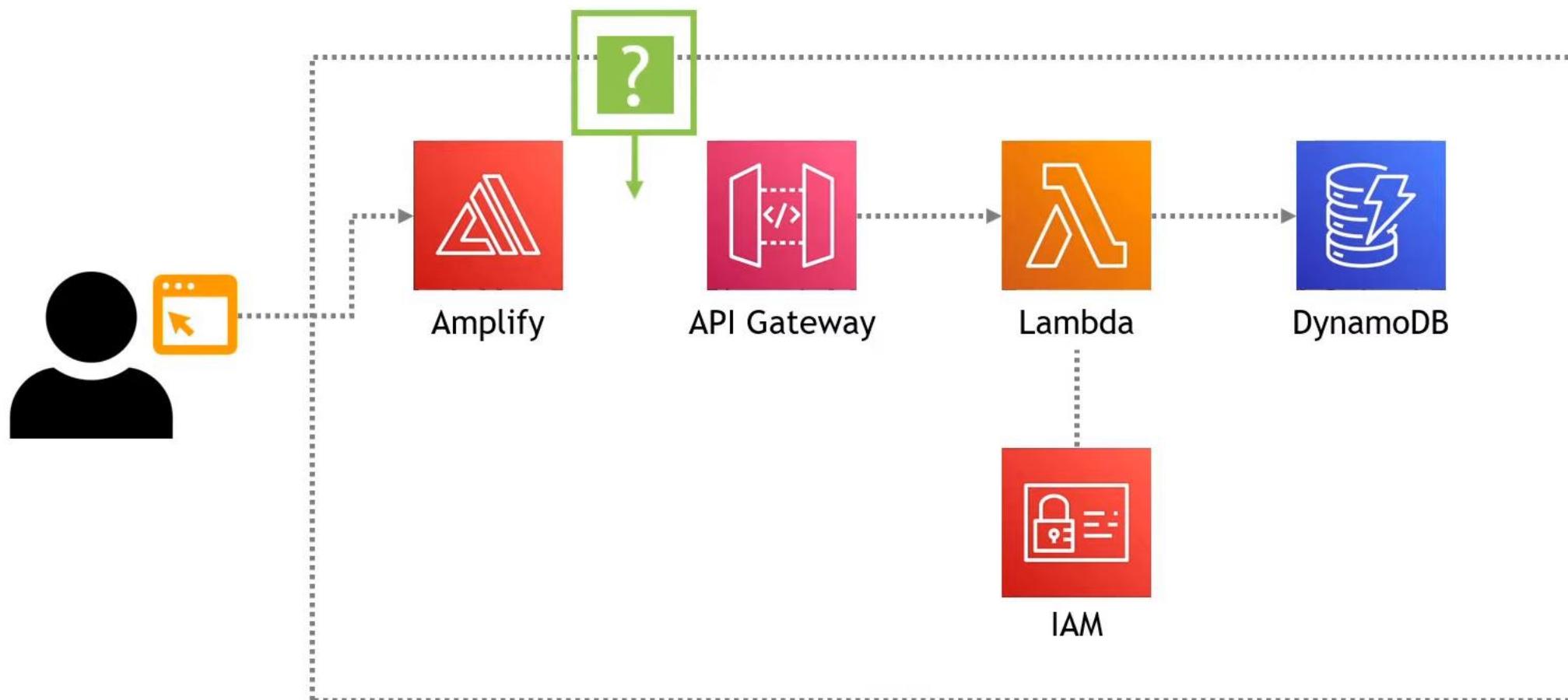
**ID (String)** ▾ **LatestGreetingTime**

Fri, 18 Aug 2023 08:22:18 +0000

# The Current Architecture



# The Current Architecture



\*C:\Users\user\OneDrive\Desktop\AWS Project\update index.html - Notepad++

File Edit Search View Encoding Language Settings Tools Macro Run Plugins Window ?

update index.html

```
36     font-family: system-ui;
37     font-size: 20px;
38     margin-left: 10px;
39     margin-top: 20px;
40     width: 100px;
41   }
42 
```

```
</style>
<script>
  // callAPI function that takes the base and exponent numbers as parameters
  var callAPI = (base,exponent)=>{
    // instantiate a headers object
    var myHeaders = new Headers();
    // add content type header to object
    myHeaders.append("Content-Type", "application/json");
    // using built in JSON utility package turn object to string and store in a variable
    var raw = JSON.stringify({ "base":base, "exponent":exponent });
    // create a JSON object with parameters for API call and store in a variable
    var requestOptions = {
      method: 'POST',
      headers: myHeaders,
      body: raw,
      redirect: 'follow'
    };
    // make API call with parameters and use promises to get response
    fetch("https://mx4vec6a54.execute-api.us-east-1.amazonaws.com/dev", requestOptions)
      .then(response => response.text())
      .then(result => alert(JSON.parse(result).body))
      .catch(error => console.log('error', error));
  }
</script>
</head>
<body>
  <h1>TO THE POWER OF MATH!</h1>
  <form>
    <label>Base number:</label>
    <input type="text" id="base">
    <label>...to the power of:</label>
    <input type="text" id="exponent">
    <!-- set button onClick method to call function we defined passing input values as parameters -->
    <button type="button" onclick="callAPI(document.getElementById('base').value,document.getElementById('exponent').value)">CALCULATE</button>
  </form>
</body>
</html>
```

Hyper Text Markup Language file length : 2,584 lines : 78 Ln : 60 Col : 20 Sel : 58 | 1 Windows (CR LF) UTF-8 INS

SENSEX Market Brief

Search

13:59 18-08-2023



## AWS Amplify

All apps

powerofmath

### App settings

General

Amplify Studio settings

Domain management

Notifications

Access control

Monitoring

Rewrites and redirects

Custom headers

Documentation

Support

This tab lists all connected branches, select a branch to view build details.

Add environment

dev3904



Deployment successfully completed.

100%

Domain

<https://dev3904.d2n1e42cihykxu.amplifyapp.com>

Last deployment

8/18/2023, 2:00:50 PM



Drag and drop your project's build output directory or zip file here to update your app, or, [choose another method](#).

Choose files



# TO THE POWER OF MATH!

Base number:

...to the power of:

**CALCULATE**





Gmail



YouTube



Maps



Amazon ECS



WhatsApp



Google Translate



14:14

18-08-2023

# TO THE POWER OF MATH!

Base number: ...to the power of: **CALCULATE**

dev3904.d2n1e42cihykxu.amplifyapp.com says

'Your result is 16.0"

OK