# AWS Serverless Architecture

Step-by-Step Guide

Made by: - Manav Khandurie

Source Code: -

 $\underline{https://github.com/Manav-Khandurie/Attendence\_Managment\_System\_AWS-}$ 

Serverless.git

# System Design

**Project:** Attendance Management System

#### **Tech Stack:**

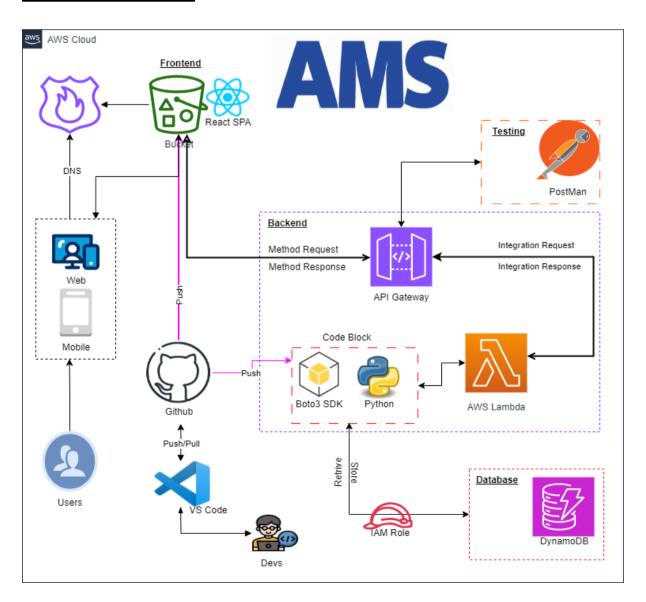
Frontend : React, HTML, CSS, JavaScript

**Backend**: Python, Boto3

**Databases**: AWS DynamoDB [NoSQL]

DevOps Tools : Git/GitHubIDE/Code editor : VS CodeTesting Tools : PostmanCloud : AWS

#### **Proposed Architecture**



## **Explanation**

- **Frontend:** The frontend of the AMS app is a React single-page application (SPA) or HTML CSS JS. This means that the entire user interface is loaded in a single web page, which makes the app feel more like a native desktop application.
- **Backend:** The backend of the AMS app is serverless, which means that it is made up of small, independent functions that are run on demand. This makes the app more scalable and cost-effective.
- **API Gateway:** The API Gateway is the entry point for all requests to the AMS app. It routes requests to the appropriate backend function.
- Integration Requests and Responses: When a user interacts with the AMS app, their request is first sent to the API Gateway. The API Gateway then routes the request to the appropriate backend function. The backend function processes the request and sends a response back to the API Gateway. The API Gateway then sends the response back to the user.
- **Mobile:** The AMS app can also be accessed from mobile devices. The mobile app uses the same API Gateway as the web app.
- **Push Notifications:** The AMS app can send push notifications to users' devices. This is useful for things like keeping users up-to-date on the latest activity in their apps.
- **Version Control:** The AMS app uses Git for version control. This means that developers can track changes to the code and revert to previous versions if necessary.
- **Databases:** The AMS app uses DynamoDB for its database. DynamoDB is a NoSQL database that is highly scalable and fault-tolerant.
- **Security:** The AMS app uses a number of security features, including IAM roles, API keys, and encryption. These features help to protect the app and its data from unauthorized access.

#### **Procedure**

#### Part 1 [Creation of DynamoDb Table]

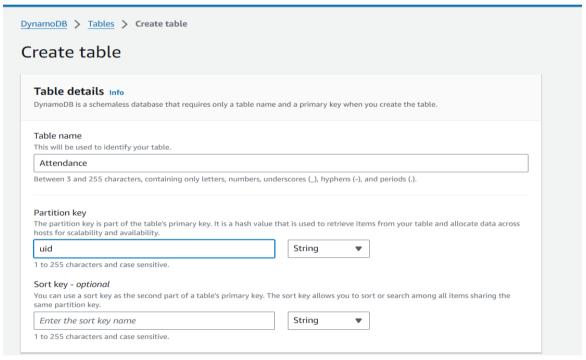
Step 1: Install GitBash, VSCode, Nodejs on your local system

If you haven't installed them yet follow this guide

GitBash: <a href="https://youtu.be/naL0cZNQh1g?si=wPIbKcRTaayIakZK">https://youtu.be/naL0cZNQh1g?si=wPIbKcRTaayIakZK</a>
VSCode: <a href="https://youtu.be/AdzKzlp66sQ?si=besF5b3SW2CoEau">https://youtu.be/AdzKzlp66sQ?si=besF5b3SW2CoEau</a>
NodeJs: <a href="https://youtu.be/JINE4D0Syqw?si=vtjgfgJ99Jh945Hc">https://youtu.be/JINE4D0Syqw?si=vtjgfgJ99Jh945Hc</a>

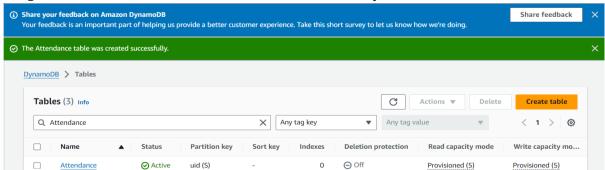
Step 2: Login to AWS Console and go to DynamoDB

Create a new table called Attendance and set partition key as 'uid'

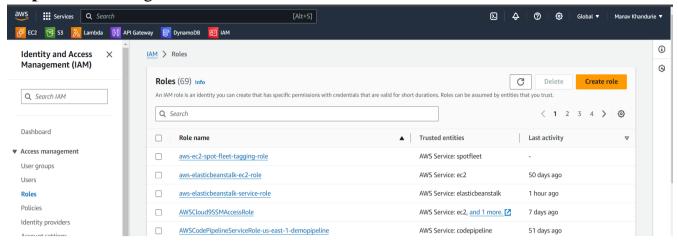


And finally create the table

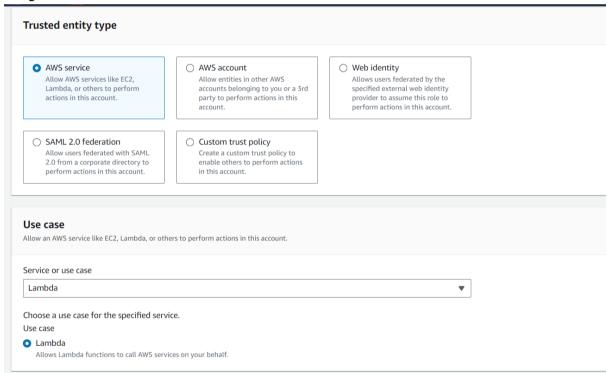
**Step 3:** Select the table and add some dummy data to it



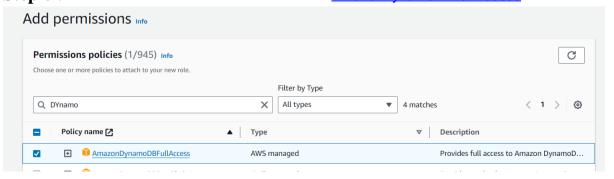
**Step 4:** Now go to IAM service and then to IAM Role  $\rightarrow$  then create role



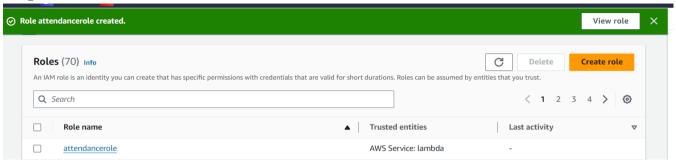
**Step 5:** Now create a new role called "attendancerole" & usecase as Lambda



**Step 6:** Under "Add Permission" add "AmazonDynamoDBFullAccess"



**Step 7:** Give a role name and create role



## Part 2 [Creation of Lambda Function]

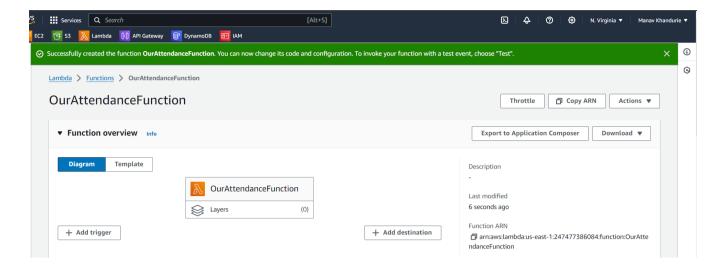
**Step 8:** Now go to AWS Lambda , and create a new function called "OurAttendanceFunction" in the environment Python 3.12 and architecture as  $x86\_64$ 

Create function Info Choose one of the following options to create your function.		
Author from scratch     Start with a simple Hello World example.	Use a blueprint  Build a Lambda application from sample code and configuration presets for common use cases.	Container image     Select a container image to deploy for your function.
Basic information		
Function name  Enter a name that describes the purpose of your function.		
OurAttendanceFunction		
Use only letters, numbers, hyphens, or underscores with no spaces.		
Runtime Info Choose the language to use to write your function. Note that the console code	editor supports only Node.js, Python, and Ruby.	
Python 3.12		▼ C
Architecture Info Choose the instruction set architecture you want for your function code.  x86 64		
arm64		

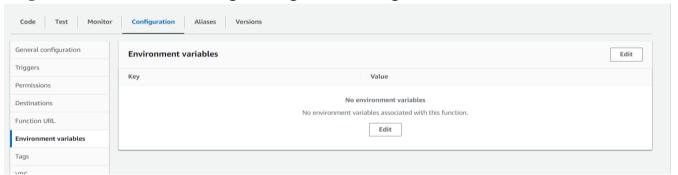
**Step 9:** Under the default execution role, we select "Use an existing role" And we select the role "attendancerole" that we created in step 7

▼ Change default execution role	
Execution role	
Choose a role that defines the permissions of your function. To create a custom role, go to the IAM console 🔀	
Create a new role with basic Lambda permissions	
• Use an existing role	
○ Create a new role from AWS policy templates	
Existing role	
Choose an existing role that you've created to be used with this Lambda function. The role must have permission to upload logs to Amazon CloudWatch Logs.	
attendancerole	▼ C
View the attendancerole role 🛂 on the IAM console.	

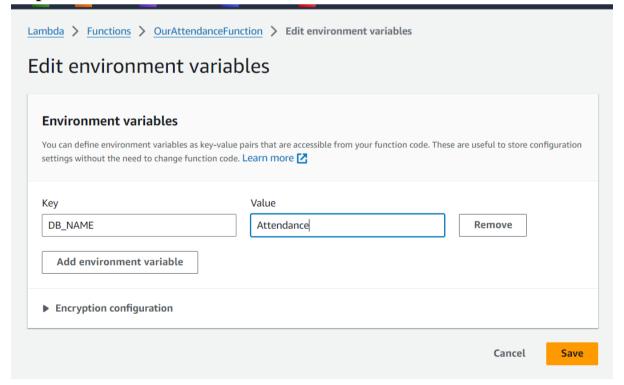
**Step 10:** Finally we click on create the function



Step 11: Under the heading "configuration" we goto environment variables



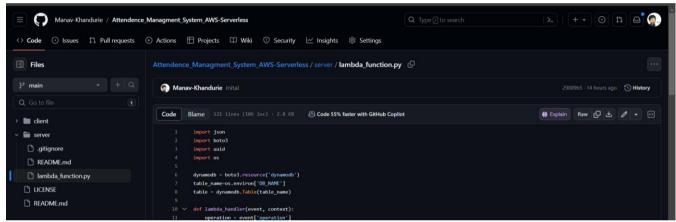
**Step 12:** Here we click on edit and add a new variable named DB\_NAME



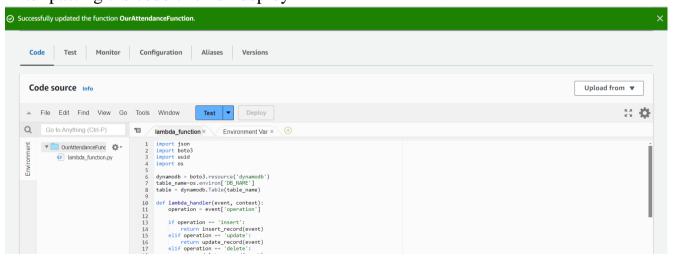
**Step 13:** Click on save to store the env variable



Step 14: In the section Code → lambda\_function.py
We add the code that's provided in the source code present at
Server/lambda\_function.py , simply copy and paste the code in the
browser editor

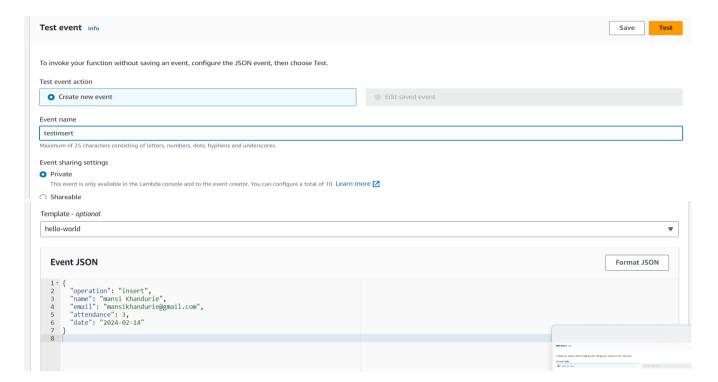


After pasting the code click on deploy

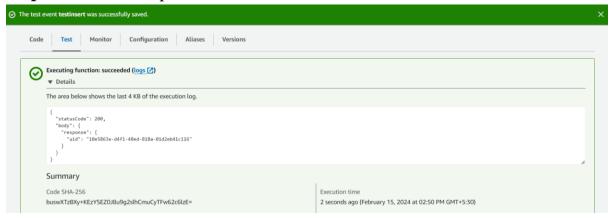


**Step 15:** Now we start by testing the lambda function, so we goto test, we assign a eventname called "inserttest" and add a requestbody as given below, finally click save & test

```
"operation": "insert",
  "name": "manav Khandurie",
  "email": "manavkhandurie@gmail.com",
  "attendance": 3,
  "date": "2024-02-14"
}
```

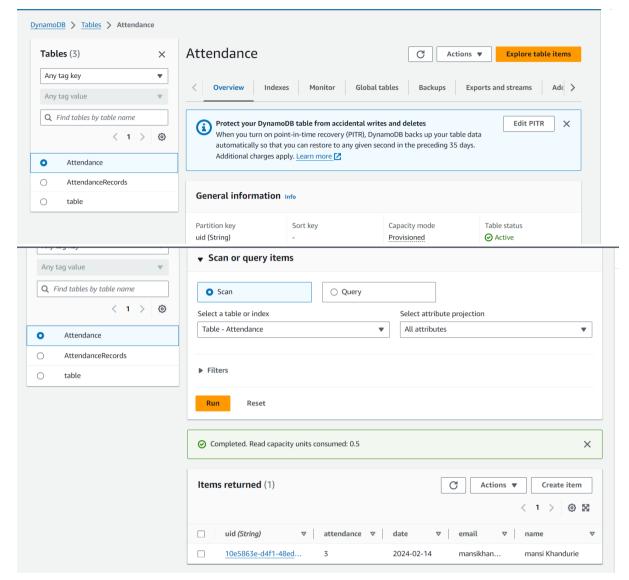


**Step 16:** The output should be a statuscode 200 as below



Note:- If there is an error go through steps 1-16 again and check

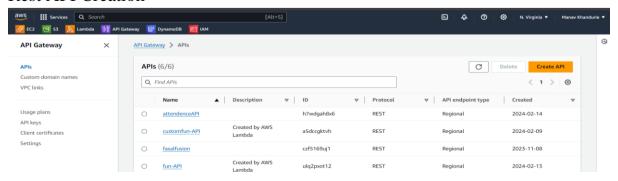
Also tally at the dynomoDb Table Select your table and click explore table items

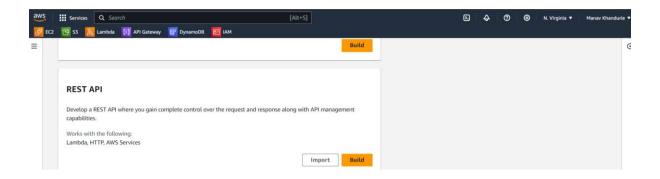


As we can see a record has being inserted so our table, i.ee lambda function works as expected.

# Part 3 [Creation of API GATEWAY]

**Step 17:** After creation of Lambda , we goto API Gateway  $\rightarrow$  Create  $\rightarrow$  Rest API Creation

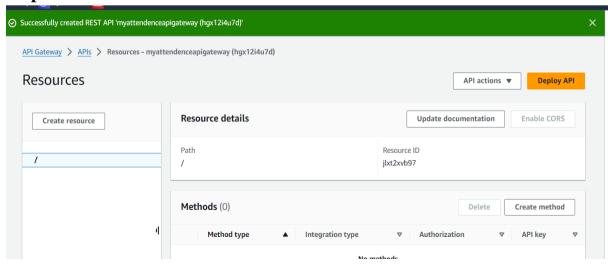




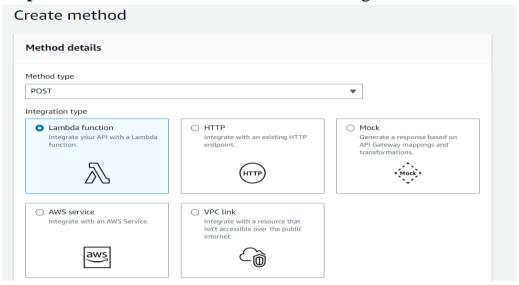
**Step 18:** We assign a name to the gateway

API details	
New API  Create a new REST API.	Clone existing API Create a copy of an API in this AWS account.
O Import API Import an API from an OpenAPI definition.	Example API  Learn about API Gateway with an example API.
API name	
myattendenceapigateway	
Description - optional	
API endpoint type Regional APIs are deployed in the current AWS Region. Edge-optimize Private APIs are only accessible from VPCs.	d APIs route requests to the nearest CloudFront Point of Presence.
Regional	▼
	Cancel Create API

Step 19: Under the '/' Path we create a new method



**Step 20:** We select the method POST & integration as lambda

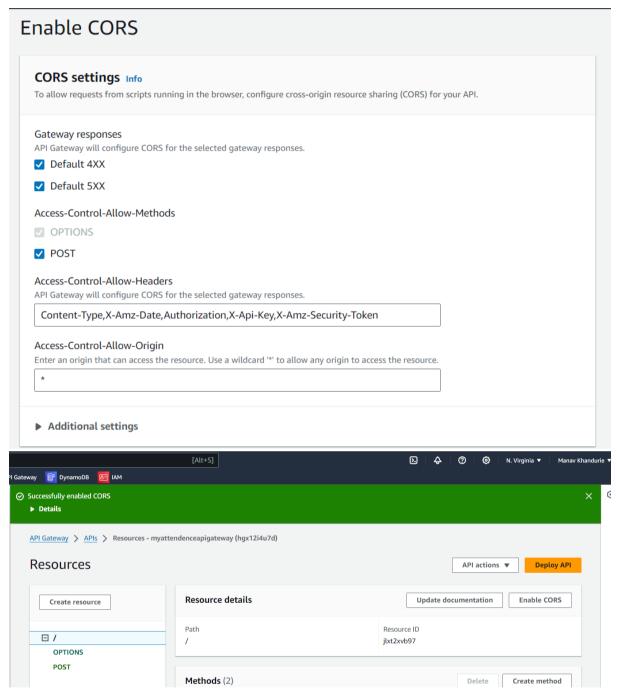


**Step 21:** We also select lambda function we created earlier & click create

Lambda proxy i	ntegration
	t to your Lambda function as a structured event.
Send the reque	t to your Lambua function as a structured event.
ambda function	
rovide the Lambda fun	tion name or alias. You can also provide an ARN from another account.
us-east-1 ▼	Q arn:aws:lambda:us-east-1:247477386084:function:Our/
us cust 1	arriaws.tambda.ds-east-1.247477500004.tunction.odi7
•	eway permission to invoke your Lambda function. To turn off, update the function's resource f, or provide an invoke role that API Gateway uses to invoke your function.
•	f, or provide an invoke role that API Gateway uses to invoke your function.
policy yoursel	f, or provide an invoke role that API Gateway uses to invoke your function.

**Step 22:** We would also enable CROS by selecting '/' Path & select POST

API Gateway > APIs > Resources - myatte	endenceapigateway (hgx12i4u7d)	
Resources		API actions ▼ Deploy API
Create resource	Resource details	Update documentation Enable CORS
□ / POST	Path /	Resource ID jlxt2xvb97
	Methods (1)	Delete Create method

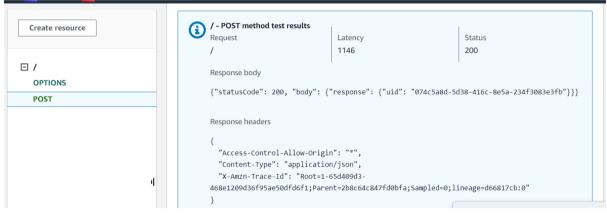


**Step 23:** Now to test the API Select POST Method under '/' Path and goto Test and use the following testcase

```
"operation": "insert",
  "name": "manav Khandurie",
  "email": "manavkhandurie@gmail.com",
  "attendance": 3,
  "date": "2024-02-14"
}
```

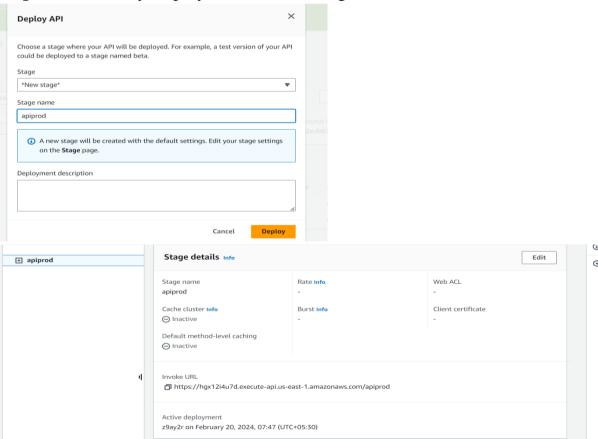


**Step 24:** Finally we click Test, and see the response



Note:  $\rightarrow$  If you face error at these steps it is probably because of the configuration of post method under the resource '/' go to steps 19 to 25 and retry the Part

**Step 25:** Finally Deploy API in a new Stage [Where we find invoke Url]

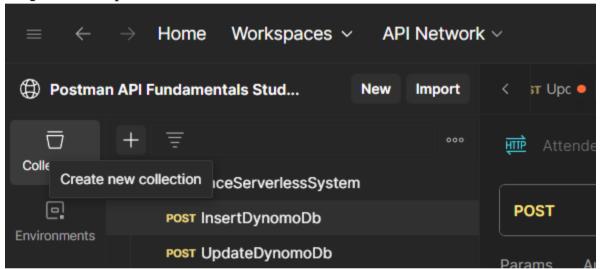


#### **Part 4 [Testing with POSTMAN]**

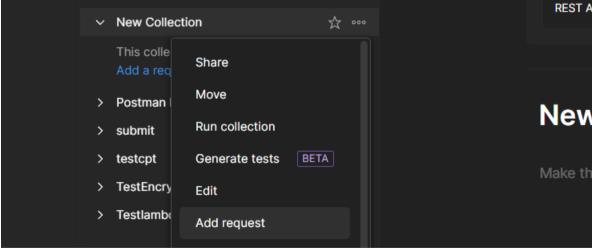
Note: Now this part is optional because you have already tested our API in the previous part however it is one of the best practises to test our API with Postman before deployment so if you wish to skip this part feel free to jump to part 5

**Perquisites:** - Install Postman from https://www.postman.com/downloads/

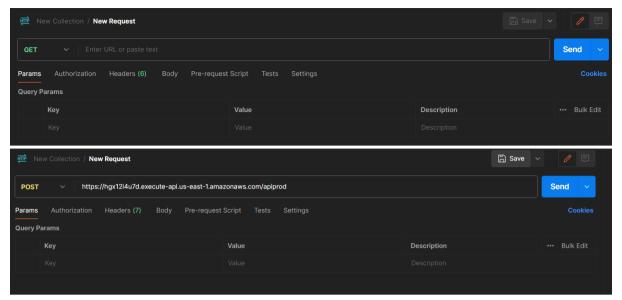
**Step 26:** Open PostMan → Create Collection



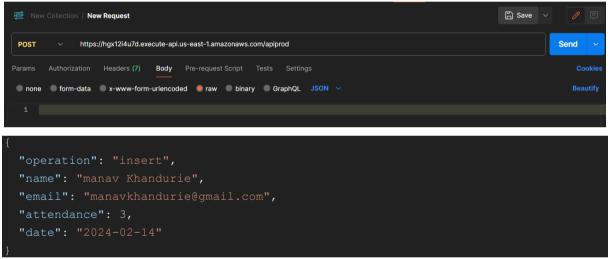
**Step 27:** Create a new Blank Collection and goto New Request



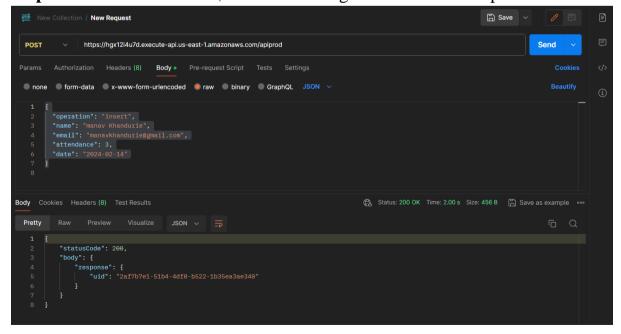
**Step 28:** In the new Request , select the POST option paste the invoke URL of API Gateway



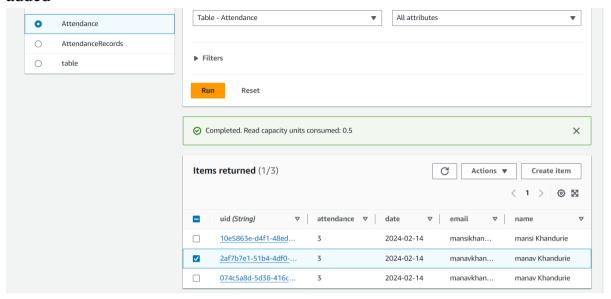
**Step 29:** Goto Body and pate the following body, under RAW, using JSON



Step 30: Click on Send, and we should get a 200 Status Response



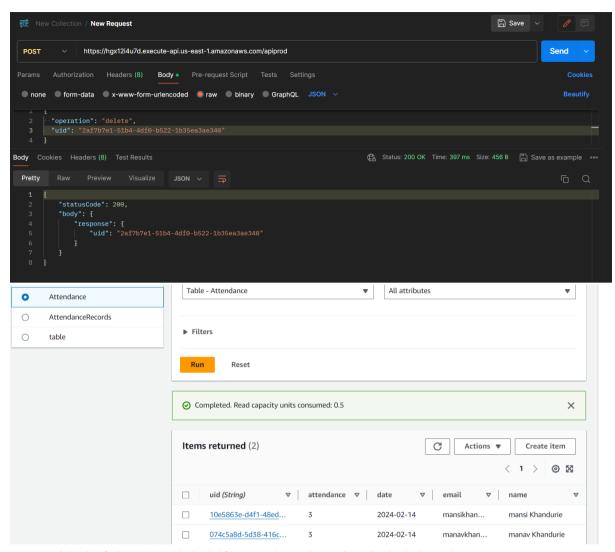
Also we will check at the db side, We can see that item under 2af7b7e1-51b4-4df0-b522-1b35ea3ae340 uid is added



Step 31: Subsequently we also check fetch & delete [ Use your UID in del ]

```
{
  "operation" : "fetch"
}
```

```
{
  "operation": "delete",
  "uid": "e29815aa-6688-41b6-8ce6-4ea614c22e10"
}
```



[ ID with 2af7b7e1-51b4-4df0-b522-1b35ea3ae340 deleted ]

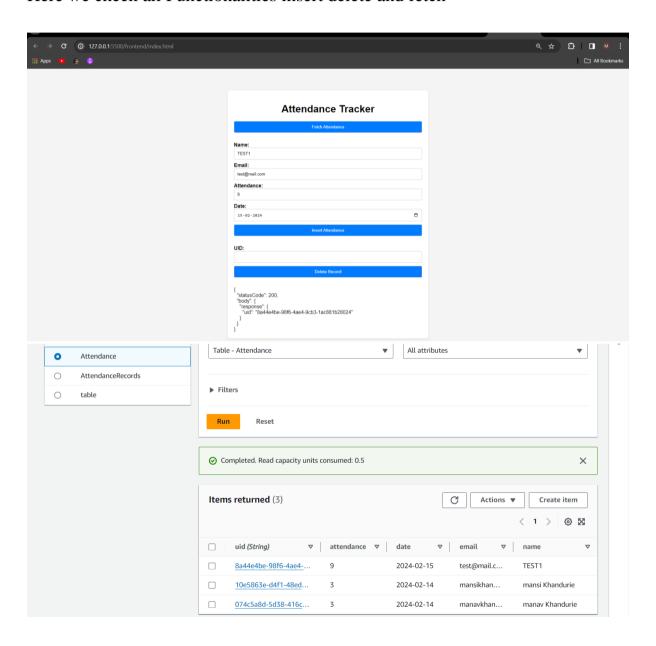
# Part 5 [Frontend Deployment]

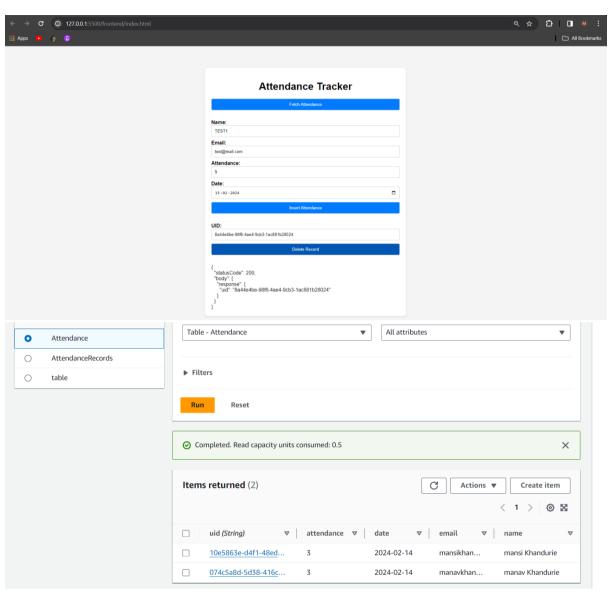
**Step 32:** We fetch the frontend from Source Code → Frontend & view using VS Code

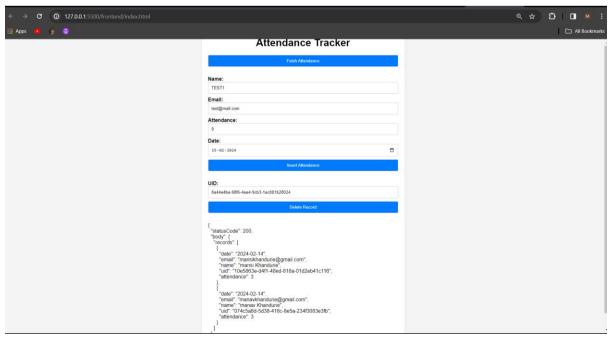
# **Step 33:** In the source code change the URL variable to your API

**Step 34:** Test the site locally, use live server or simply open the html page using chrome

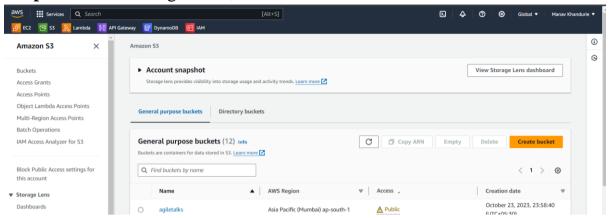
Here we check all Functionalities insert delete and fetch



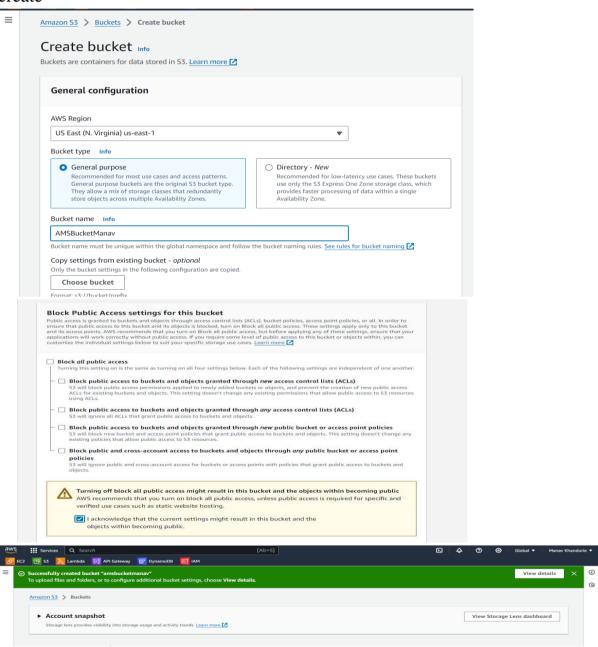




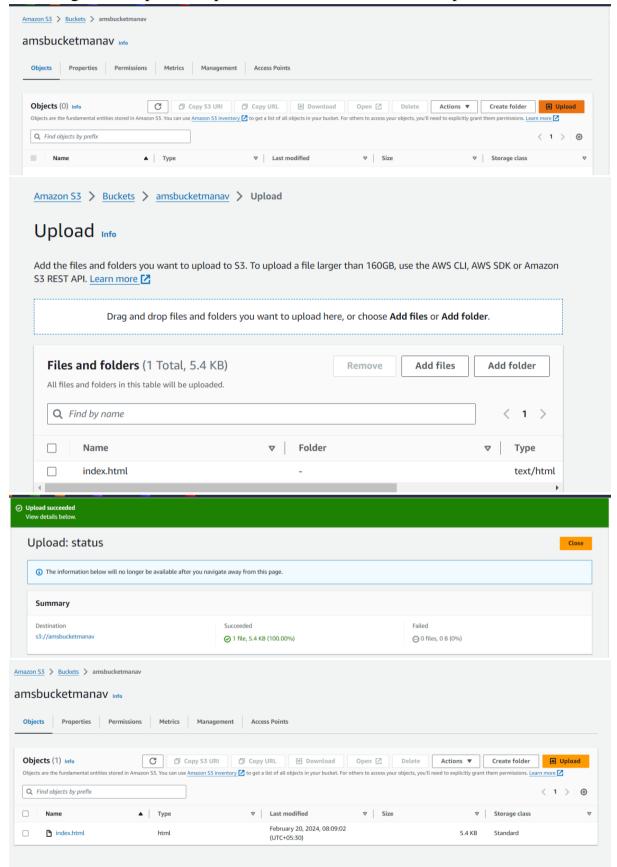
**Step 35:** Now we goto S3, and create a bucket



**Step 36:** We give a unique name to the bucket, unblock the public acess & create



**Step 37:** We goto the bucket we created and add the HTML page we created before, goto → Upload, Upload file, select the File and Upload



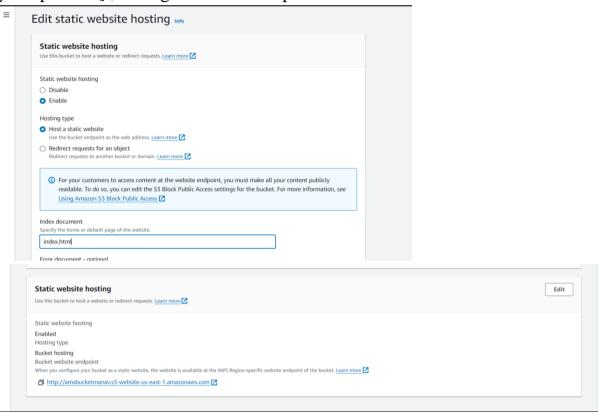
**Step 38:** Goto Permission → Bucket Policy → Edit and use the following Policy & save. Note do change the Resouce to your Bucket ARN shown

```
"<Your-resource-arn>/*"
   "Version": "2012-10-17",
   "Statement": [
             "Effect": "Allow",
             "Principal": "*",
             "Action": "s3:GetObject",
             "Resource": "arn:aws:s3:::agiletalks/*"
 Bucket policy
                                                                                                                                            Edit Delete
 The bucket policy, written in JSON, provides access to the objects stored in the bucket. Bucket policies don't apply to objects owned by other accounts. Learn more
  No policy to display.
                                                                                                                                                     🗇 Сору
Edit bucket policy Info
  Bucket policy
                                                                                                                  Policy examples 🖾 Policy generator 🖸
  The bucket policy, written in JSON, provides access to the objects stored in the bucket. Bucket policies don't apply to objects owned by other accounts. Learn more 🔀
  arn:aws:s3:::amsbucketmanav
  Policy
                                                                                                                       Edit statement
            "Version": "2012-10-17",
             {
    "Effect": "Allow",
                 "Principal": "*",

"Action": "s3:GetObject",

"Resource": "arn:aws:s3:::amsbucketman
                                                                                                                        Select an existing statement in the policy or
                                                                                                                                add a new statement
  11
                                                                                                                              + Add new statement
O Successfully edited bucket policy.
   Amazon S3 > Buckets > amsbucketmanav
   amsbucketmanav Info
     Objects Properties Permissions Metrics Management Access Points
     Permissions overview
     Objects can be public
```

**Step 39:** Now goto Staic Site hosting under Properties and enable it, also set the index document as index.html [P.S. This is your html file's name that you uploaded], we ll get a bucket endpoint url



**Step 40:** Open the URL in the incognito mode, well see the application test it out as you wish

