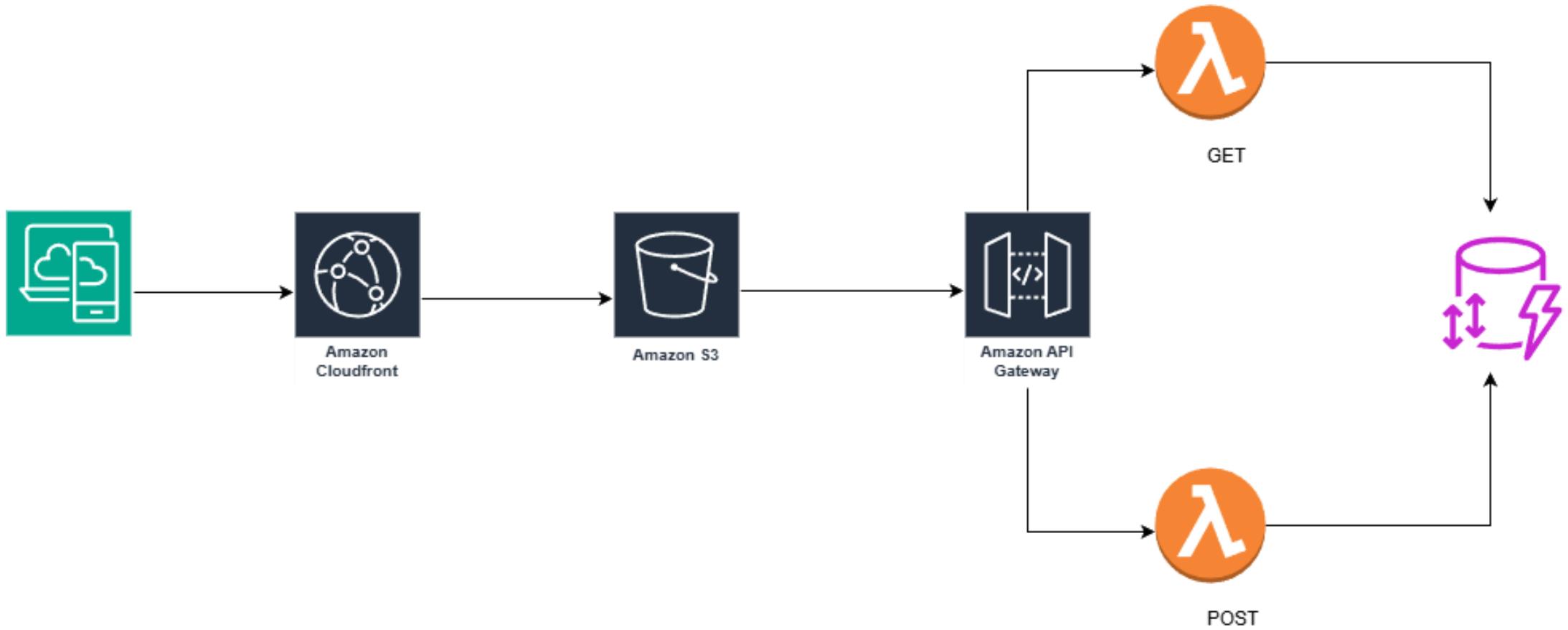


Deploying a Serverless Web Application on AWS Using S3, CloudFront, API Gateway, Lambda, DynamoDB, and Custom Domain Integration



AGENDA

- Deploy Lambda Functions for GET and POST
- Set Up DynamoDB Table
- Configure API Gateway
- Host Frontend on S3
- Set Up CloudFront CDN
- Troubleshooting & Common Issues



Set Up DynamoDB Table

- Open AWS Console → search “DynamoDB”
- Click “Create table”
- Enter Table Name
- Set Partition Key (e.g., EmployeeID – String)
- Leave Sort Key OFF (optional)
- In Table settings, keep Default settings
- Keep Table class as “DynamoDB Standard”
- Click “Create table”

Set Up DynamoDB Table

Create table

Table details Info

DynamoDB is a schemaless database that requires only a table name and a primary key when you create the table.

Table name

This will be used to identify your table.

Between 3 and 255 characters, containing only letters, numbers, underscores (_), hyphens (-), and periods (.)

Partition key

The partition key is part of the table's primary key. It is a hash value that is used to retrieve items from your table and allocate data across hosts for scalability and availability.



1 to 255 characters and case sensitive.

Sort key - optional

You can use a sort key as the second part of a table's primary key. The sort key allows you to sort or search among all items sharing the same partition key.



1 to 255 characters and case sensitive.

Set Up DynamoDB Table

Table settings

Default settings

The fastest way to create your table. You can modify most of these settings after your table has been created. To modify these settings now, choose 'Customize settings'.

Customize settings

Use these advanced features to make DynamoDB work better for your needs.

Default table settings

These are the default settings for your new table. You can change some of these settings after creating the table.

Setting	Value	Editable after creation
Table class	DynamoDB Standard	Yes
Capacity mode	On-demand	Yes
Maximum read capacity units	-	Yes
Maximum write capacity units	-	Yes
Local secondary indexes	-	No
Global secondary indexes	-	Yes
Encryption key management	AWS owned key	Yes
Deletion protection	Off	Yes
Resource-based policy	Not active	Yes

Set Up DynamoDB Table

The screenshot shows the AWS DynamoDB console interface. On the left, a sidebar menu titled "DynamoDB" includes options like Dashboard, Tables (which is selected and highlighted in blue), Explore items, PartiQL editor, Backups, Exports to S3, Imports from S3, Integrations, Reserved capacity, and Settings. The main content area is titled "Tables (1) Info". A green success message at the top states: "The EmployeeData table was created successfully." Below this, the table list shows one entry: "EmployeeData" (Status: Active, Partition key: EmployeeID (\$)). The table has 0 items and 0 bytes of total size. The "Actions" button is highlighted in blue, indicating it's the current tab. The "Create table" button is also visible. The top right corner shows the last update time: "November 20, 2025, 16:50 (UTC+8:00)".

Name	Status	Partition key	Sort key	Indexes	Replication Regions	Deletion protection	Favorite	Read capacity mode	Write capacity mode	Total size	Table class
EmployeeData	Active	EmployeeID (\$)	-	0	0	Off	☆	On-demand	On-demand	0 bytes	Standard

Deploy Lambda Functions

- Go to AWS Console → Open Lambda
- Click Create function
- Select Author from scratch
- Enter function name
- Choose runtime (Python/Node.js, etc.)
- Select or create an execution role
- Click Create function
- Add code → Deploy → Test

Deploy Lambda Functions for GET and POST

Creating a Lambda Function – getEmployeeData

- **Function Name:** getEmployeeData
- **Runtime:** Python 3.9
- **Architecture:** x86_64
- **Execution Role:** Custom IAM Role
 - Create role in IAM console
 - Attach the role to Lamda
 - Ensure the role has permissions for CloudWatch logging and DynamoDB access
- **Click on Create Functions**

Deploy Lambda Functions for GET and POST

Basic information

Function name
Enter a name that describes the purpose of your function.
 Function name must be 1 to 64 characters, must be unique to the Region, and can't include spaces. Valid characters are a-z, A-Z, 0-9, hyphens (-), and underscores (_).

Runtime | [Info](#)
Choose the language to use to write your function. Note that the console code editor supports only Node.js, Python, and Ruby.
 

Architecture | [Info](#)
Choose the instruction set architecture you want for your function code.
 arm64
 x86_64

Permissions [Info](#)
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

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.
 
[View the LambdaDynamoDBRole role](#) on the IAM console.

Deploy Lambda Functions for GET and POST

Deploying Python Code on AWS Lamda (Serverless Deployment)

The screenshot shows the AWS Lambda console interface for a function named "getEmployeeData".

Function Overview:

- Name:** getEmployeeData
- Last modified:** 2 minutes ago
- Function ARN:** arn:aws:lambda:ap-southeast-1:529088293565:function:getEmployeeData
- Description:** -
- Code URL:** -

Code Source:

- File:** lambda_function.py
- Content:**

```
import json
import boto3

def lambda_handler(event, context):
    # Initialize a DynamoDB resource object for the specified
    dynamodb = boto3.resource('dynamodb', region_name='ap-southeast-1')

    # Select the DynamoDB table named 'EmployeeData'
    table = dynamodb.Table('EmployeeData')

    # Scan the table to retrieve all items
    response = table.scan()
    data = response['Items']

    # If there are more items to scan, continue scanning until
    while 'LastEvaluatedKey' in response:
        response = table.scan(ExclusiveStartKey=response['LastEvaluatedKey'])
        data.extend(response['Items'])

    return {
        'statusCode': 200,
        'body': json.dumps(data)
    }
```

Deploy Lambda Functions for GET and POST

Lamda Test Execution

The screenshot shows the AWS Lambda function editor in the AWS Toolkit for VS Code. A green notification bar at the top left says "Successfully updated the function getEmployeeData." The main area displays the code for `lambda_function.py`:

```
def lambda_handler(event, context):
    # Initialize a DynamoDB resource object for the specified region
    dynamodb = boto3.resource('dynamodb', region_name='ap-south-1')

    # Select the DynamoDB table named 'EmployeeData'
    table = dynamodb.Table('EmployeeData')

    # Scan the table to retrieve all items
    response = table.scan()
    data = response['Items']

    # If there are more items to scan, continue scanning until 'LastEvaluatedKey' is found
    while 'LastEvaluatedKey' in response:
        response = table.scan(ExclusiveStartKey=response['LastEvaluatedKey'])
        data.extend(response['Items'])

    # Return the retrieved data
    return data
```

The sidebar on the left shows the project structure under `EXPLORER`, with `GETEMPLOYEEDATA` expanded to show `lambda_function.py`. Below it, under `DEPLOY`, are buttons for `Deploy (Ctrl+Shift+U)` and `Test (Ctrl+Shift+I)`. The `TEST EVENTS` section shows a selected event named `test1`.

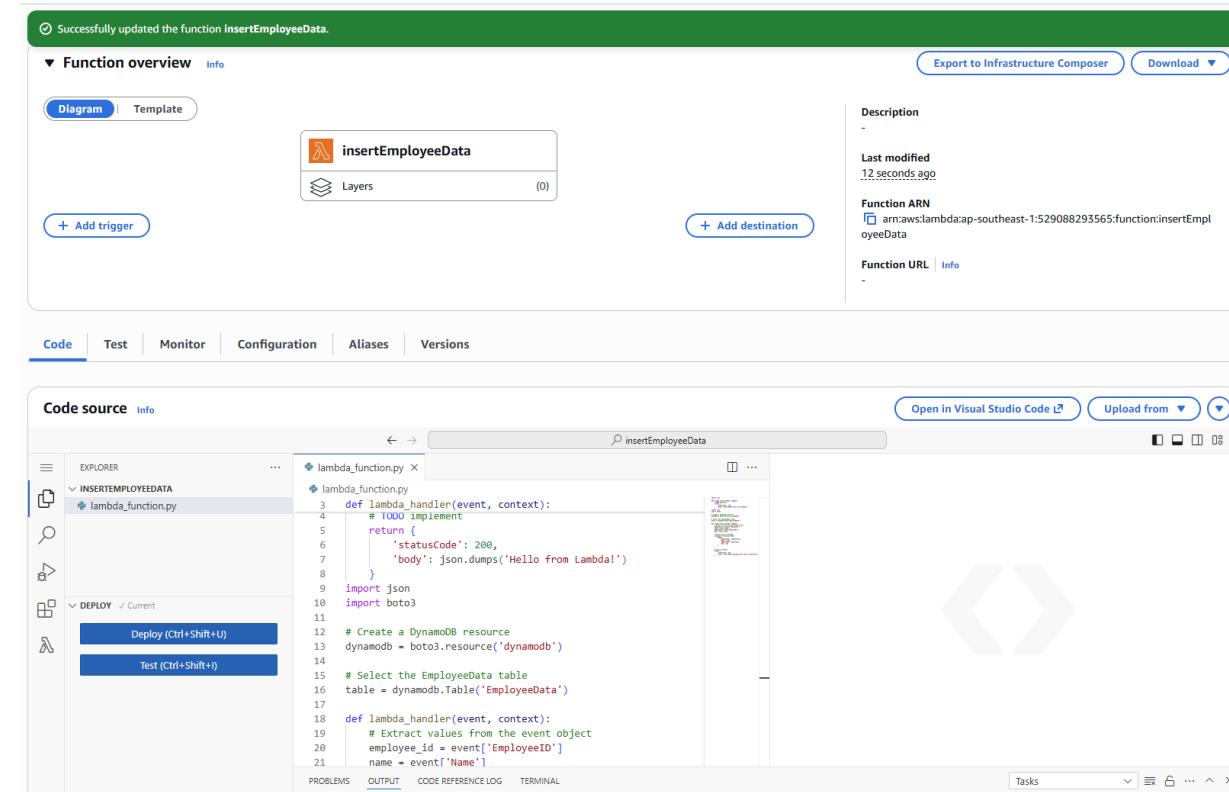
The bottom right corner of the code editor has another green notification bar saying "Successfully updated the function getEmployeeData."

At the bottom of the interface, there are status indicators: `Lambda Deployed`, `0 △ 0`, and `Amazon Q`. The footer includes standard VS Code navigation and file tabs.

Deploy Lambda Functions for GET and POST

Creating a Lambda Function – insertEmployeeData

Remark: Follow the steps on pages 8–11 to create the *insertEmployeeData* Lambda function



Configure API Gateway

- Open AWS Console → search “API Gateway”
- Click “Create API”
- Choose “REST API (Build)”
- Select “New API” → Give API Name
- Click “Create API”
- Create a Resource
- Create a Method (GET or POST)
- Choose Integration Type: Lambda Function
- Select your Lambda → Click “Save”
- Deploy API → Create a new Stage (e.g., prod)
- Copy the Invoke URL and test your REST API

Configure API Gateway

- Create an API and select REST API

Create REST API info

API details

New API
Create a new REST API.

Clone existing API
Create a copy of an API in this AWS account.

Import API
Import an API from an OpenAPI definition.

Example API
Learn about API Gateway with an example API.

API name

Description - optional

API endpoint type
Regional APIs are deployed in the current AWS Region. Edge-optimized APIs route requests to the nearest CloudFront Point of Presence. Private APIs are only accessible from VPCs.

IP address type | Info
Select the type of IP addresses that can invoke the default endpoint for your API.

IPv4
Supports only edge-optimized and Regional API endpoint types.

Dualstack
Supports all API endpoint types.

Cancel

Configure API Gateway

- Create a GET method

Create method

Method details

Method type
GET

Integration type

Lambda function
Integrate your API with a Lambda function.


HTTP
Integrate with an existing HTTP endpoint.


Mock
Generate a response based on API Gateway mappings and transformations.


AWS service
Integrate with an AWS Service.


VPC link
Integrate with a resource that isn't accessible over the public internet.


Lambda proxy integration
Send the request to your Lambda function as a structured event.

Response transfer mode | [Info](#)
 Buffered
Wait to receive the complete response before beginning transmission.
 Stream
Send portions of the response without waiting for the complete response.

Lambda function
Provide the Lambda function name or alias. You can also provide an ARN from another account.
 

 **Grant API Gateway permission to invoke your Lambda function**
When you save your changes, API Gateway updates your Lambda function's resource-based policy to allow this API to invoke it.

Integration timeout | [Info](#)
By default, you can enter an integration timeout of 50 - 29,000 milliseconds. You can use Service Quotas to raise the integration timeout to greater than 29,000 ms

Configure API Gateway

- Create a PUT method

Create method

Method details

Method type: PUT

Integration type

- Lambda function**
Integrate your API with a Lambda function.

- HTTP**
Integrate with an existing HTTP endpoint.

- Mock**
Generate a response based on API Gateway mappings and transformations.


- AWS service**
Integrate with an AWS Service.

- VPC link**
Integrate with a resource that isn't accessible over the public internet.


Lambda proxy integration
Send the request to your Lambda function as a structured event.

Response transfer mode | [Info](#)

- Buffered**
Wait to receive the complete response before beginning transmission.
- Stream**
Send portions of the response without waiting for the complete response.

Lambda function
Provide the Lambda function name or alias. You can also provide an ARN from another account.

ap-southeast-1

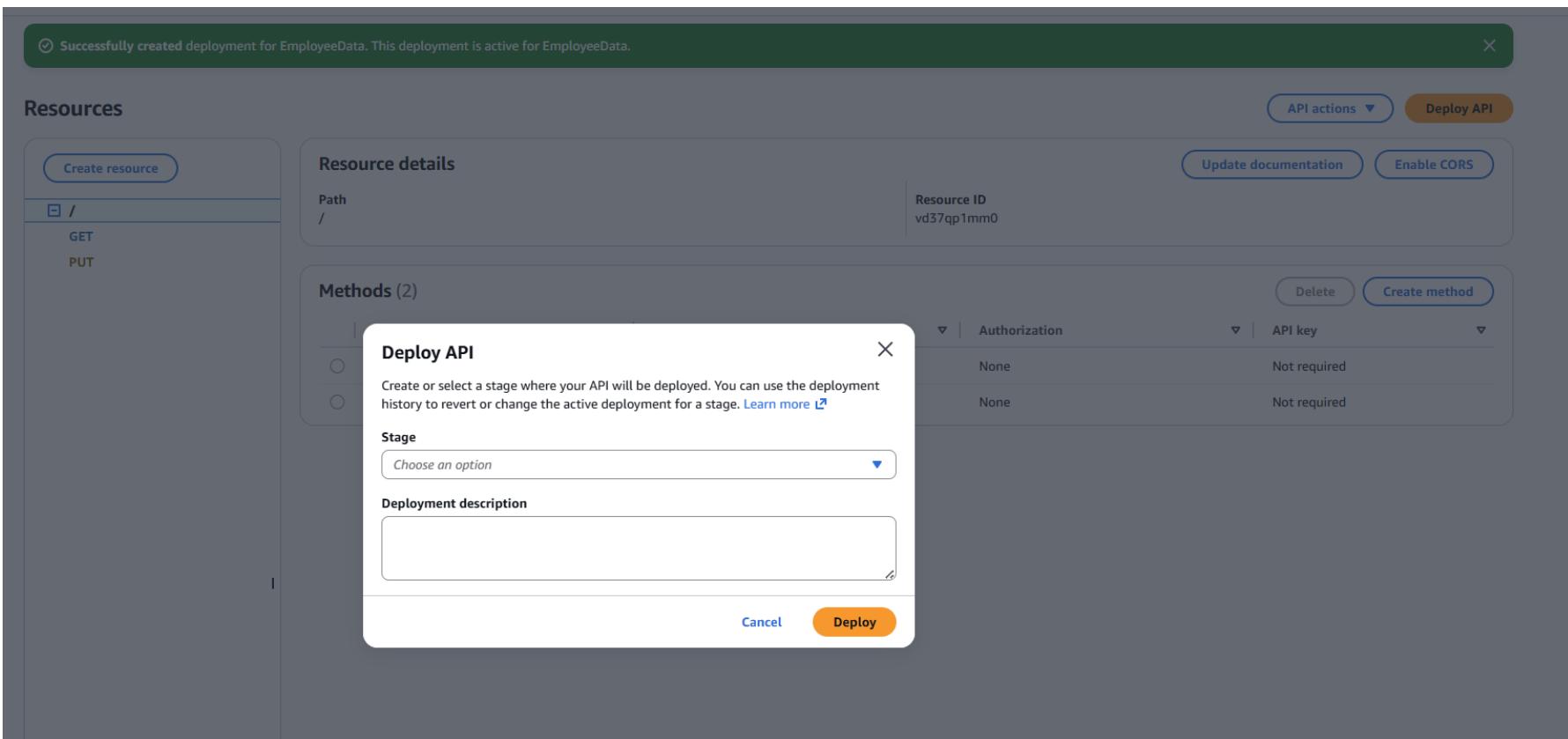
Grant API Gateway permission to invoke your Lambda function
When you save your changes, API Gateway updates your Lambda function's resource-based policy to allow this API to invoke it.

Integration timeout | [Info](#)
By default, you can enter an integration timeout of 50 - 29,000 milliseconds. You can use Service Quotas to raise the integration timeout to greater than 29,000 ms

29000

Configure API Gateway

- Deploy the API to a stage



Configure API Gateway

- API Deployed

The screenshot shows the 'Stage details' configuration page for the 'EmployeeData' stage. The stage name is 'EmployeeData'. Configuration includes:

- Rate Info**: 10000
- Burst Info**: 5000
- Web ACL**: -
- Client certificate**: -

The 'Invoke URL' is listed as <https://8rw6wh2h5k.execute-api.ap-southeast-1.amazonaws.com/EmployeeData>.

The 'Active deployment' is listed as 412nxg on November 20, 2025, 18:16 (UTC+08:00).

The 'Logs and tracing' section includes:

- CloudWatch logs**: Inactive
- Detailed metrics**: Inactive
- Data tracing**: Inactive

The 'Custom access logging' section is inactive.

At the bottom, there are tabs for **Stage variables**, **Deployment history**, **Documentation history**, **Canary**, and **Tags**. The **Stage variables** section shows 0/0 resources and no available variables.

Host Frontend on S3

- Open AWS Console → search “S3”
- Create bucket → Uncheck “Block all public access”
- Upload your build files (index.html, JS)
- Go to Permissions → Add Bucket Policy to allow public read
- Go to Properties → Enable “Static website hosting”
- Set Index document = index.html
- Save changes
- Copy the S3 Website Endpoint URL and access your site

Host Frontend on S3

- Create an S3 bucket

Create bucket Info

Buckets are containers for data stored in S3.

General configuration

AWS Region
Asia Pacific (Singapore) ap-southeast-1

Bucket type Info

General purpose
Recommended for most use cases and access patterns. General purpose buckets are the original S3 bucket type. They allow a mix of storage classes that redundantly store objects across multiple Availability Zones.

Directory
Recommended for specialized low-latency use cases supported by AWS Availability Zones or data residency use cases supported by AWS Local Zones.

Bucket name Info

employeeData-529088293565

Bucket names must be 3 to 63 characters and unique within the global namespace. Bucket names must also begin and end with a letter or number. Valid characters are a-z, 0-9, periods (.), and hyphens (-). [Learn more](#) ↗

Copy settings from existing bucket - optional
Only the bucket settings in the following configuration are copied.

[Choose bucket](#)

Format: s3://bucket/prefix

Object Ownership Info

Control ownership of objects written to this bucket from other AWS accounts and the use of access control lists (ACLs). Object ownership determines who can specify access to objects.

Object Ownership

ACLs disabled (recommended)
All objects in this bucket are owned by this account. Access to this bucket and its objects is specified using only policies.

ACLs enabled
Objects in this bucket can be owned by other AWS accounts. Access to this bucket and its objects can be specified using ACLs.

Object Ownership
Bucket owner enforced

Block Public Access settings for this bucket

Public access is granted to buckets and objects through access control lists (ACLs), bucket policies, access point policies, or all. In order to ensure that public access to this bucket and its objects is blocked, turn on Block all public access. These settings apply only to this bucket and its access points. AWS recommends that you turn on Block all public access, but before applying any of these settings, ensure that your applications will work correctly without public access. If you require some level of public access to this bucket or objects within, you can customize the individual settings below to suit your specific storage use cases. [Learn more](#) ↗

Block all public access
Turning this setting on is the same as turning on all four settings below. Each of the following settings are independent of one another.

Block public access to buckets and objects granted through new access control lists (ACLs)
S3 will block public access permissions applied to newly added buckets or objects, and prevent the creation of new public access ACLs for existing buckets and objects. This setting doesn't change any existing permissions that allow public access to S3 resources using ACLs.

Host Frontend on S3

- Upload the index.html and frontend JavaScript files to the S3 bucket

Upload: status Close

i After you navigate away from this page, the following information is no longer available.

Summary	
Destination s3://employeedata-529088293565	Succeeded ✓ 2 files, 5.3 KB (100.00%)
	Failed ✗ 0 files, 0 B (0%)

Files and folders Configuration

Files and folders (2 total, 5.3 KB)

Files and folders (2 total, 5.3 KB)						
Find by name		Type	Size	Status	Error	
Name	Folder					▼
scripts.js ↗	-	text/javascript	1.9 KB	✓ Succeeded	-	▼
index (1).html ↗	-	text/html	3.3 KB	✓ Succeeded	-	▼

Host Frontend on S3

- Enable Static website hosting

[Edit static website hosting](#) Info

Static website hosting
Use this bucket to host a website or redirect requests. [Learn more ↗](#)

Static website hosting
 Disable
 Enable

Hosting type
 Host a static website
Use the bucket endpoint as the web address. [Learn more ↗](#)
 Redirect requests for an object
Redirect requests to another bucket or domain. [Learn more ↗](#)

ⓘ For your customers to access content at the website endpoint, you must make all your content publicly readable. To do so, you can edit the S3 Block Public Access settings for the bucket. For more information, see [Using Amazon S3 Block Public Access](#) ↗

Index document
Specify the home or default page of the website.

Error document - optional
This is returned when an error occurs.

Redirection rules - optional
Redirection rules, written in JSON, automatically redirect webpage requests for specific content. [Learn more ↗](#)

1	

Host Frontend on S3

- Edit the bucket policy under Permissions

Successfully edited bucket policy.

Block public access (bucket settings)

Public access is granted to buckets and objects through access control lists (ACLs), bucket policies, access point policies, or all. In order to ensure that public access to all your S3 buckets and objects is blocked, turn on Block all public access. These settings apply only to this bucket and its access points. AWS recommends that you turn on Block all public access, but before applying any of these settings, ensure that your applications will work correctly without public access. If you require some level of public access to your buckets or objects within, you can customize the individual settings below to suit your specific storage use cases. [Learn more](#)

Block all public access

Off

► Individual Block Public Access settings for this bucket

Bucket policy

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](#)

```
{  
  "Version": "2012-10-17",  
  "Statement": [  
    {  
      "Sid": "Statement1",  
      "Effect": "Allow",  
      "Principal": "*"  
      "Action": "s3:GetObject",  
      "Resource": "arn:aws:s3:::employeedata-529088293565/*"  
    }  
  ]  
}
```

Copy

Set Up CloudFront CDN

- Go to CloudFront → Create Distribution
- Choose Distribution Type: Single Page Web Application (or Web)
- Select your S3 bucket as the Origin
- Set Origin Access = OAC to secure S3
- Click Create OAC → Copy policy → Paste into S3 bucket policy
- Set Default Root Object = index.html
- Leave other settings as default and Create Distribution
- Wait for deployment, then copy the CloudFront Domain Name

Set Up CloudFront CDN

- Create a CloudFront distribution.

CloudFront > Distributions > Create distribution

Step 1 Choose a plan
Step 2 Get started
Step 3 Specify origin
Step 4 Enable security
Step 5 Review and create

Get started
Connect your websites, apps, files, video streams, and other content to CloudFront. We optimize the performance, reliability, and security for your web traffic.

Distribution options Info

Distribution name
Name will be stored as a tag on the resource. You can change the name, or more tags, later.

Description - optional

Distribution type

Single website or app
Choose if each website or application will have a unique configuration.

Multi-tenant architecture - New
Choose when you have multiple domains that need to share configurations. This is a common architecture for SaaS providers.

Domain Info

Route 53 managed domain - optional
Enter a domain that's already registered with Route 53 in your AWS account. CloudFront will provision a TLS certificate for you. If you have a domain from a different DNS provider, skip this step and configure your domain later.

Tags - optional

Set Up CloudFront CDN

- Selected S3 bucket as the *origin* for CloudFront

Specify origin

Origin type
Your origin is where your content (such as a website or app) lives. CloudFront works with AWS-based origins and origins hosted on other cloud providers.

Origin type

Amazon S3
Deliver static assets like files and images, statically generated websites or single page applications (SPA).

Elastic Load Balancer
Deliver applications hosted behind ELB such as dynamic websites, web services, and APIs.

API Gateway
Deliver API endpoints for REST APIs hosted on API Gateway.

Elemental MediaPackage
Deliver end-to-end live events or video on demand (VOD).

VPC origin
Deliver applications and content hosted within private VPCs, such as EC2 instances and Application Load Balancers.

Other
Refer to any AWS or non-AWS origin through its publicly resolvable URL.

Origin

S3 origin
Choose an AWS origin, or enter your origin's domain name. [Learn more ↗](#)

employeedata-529088293565.s3.us-east-1.amazonaws.com [Browse S3](#)

⚠️ This S3 bucket has static web hosting enabled. If you plan to use this distribution as a website, we recommend using the S3 website endpoint rather than the bucket endpoint. [Use website endpoint](#)

Origin path - optional
The directory path within your origin where your content is stored. [Learn more ↗](#)

/path

Set Up CloudFront CDN

- Create a new CloudFront Origin Access Control (OAC) to allow CloudFront to securely access my S3 bucket.

This S3 bucket has static web hosting enabled. If you plan to use this distribution as a website, we recommend using the S3 website endpoint rather than the bucket endpoint. [Use website endpoint](#)

Origin path - optional
Enter a URL path to append to the origin domain name for origin requests.

Name
Enter a name for this origin.

Origin access | [Info](#)

Public
Bucket must allow public access.

Origin access control settings (recommended)
Bucket can restrict access to only CloudFront.

Legacy access identities
Use a CloudFront origin access identity (OAI) to access the S3 bucket.

Origin access control
Select an existing origin access control (recommended) or create a new control.
 [Create new OAC](#)

You must allow access to CloudFront using this policy statement. Learn more about [giving CloudFront permission to access the S3 bucket](#). [Copy policy](#)

[Go to S3 bucket permissions](#)

Add custom header - optional
CloudFront includes this header in all requests that it sends to your origin.
[Add header](#)

Set Up CloudFront CDN

- Copy the generated OAC bucket policy and paste it into the S3 bucket policy to allow CloudFront access

Bucket policy

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](#)

```
{  
    "Version": "2008-10-17",  
    "Id": "PolicyForCloudFrontPrivateContent",  
    "Statement": [  
        {  
            "Sid": "AllowCloudFrontServicePrincipal",  
            "Effect": "Allow",  
            "Principal": {  
                "Service": "cloudfront.amazonaws.com"  
            },  
            "Action": "s3:GetObject",  
            "Resource": "arn:aws:s3:::employeedata-529088293565/*",  
            "Condition": {  
                "StringEquals": {  
                    "AWS:SourceArn": "arn:aws:cloudfront::529088293565:distribution/E2T3VRRQ39QHMS"  
                }  
            }  
        }  
    ]  
}
```

[Edit](#) [Delete](#) [Copy](#)

Set Up CloudFront CDN

- Set Default Root Object = index.html

AWS WAF web ACL - optional
Choose the web ACL in AWS WAF to associate with this distribution.

CreatedByCloudFront-faad3351 ▾

Alternate domain name (CNAME) - optional
Add the custom domain names that you use in URLs for the files served by this distribution.

Add item

To add a list of items, use the [bulk editor](#).

Custom SSL certificate - optional
Associate a certificate from AWS Certificate Manager. The certificate must be in the US East (N. Virginia) Region (us-east-1).

Choose certificate ▾

Request certificate ↗

Supported HTTP versions
Add support for additional HTTP versions. HTTP/1.0 and HTTP/1.1 are supported by default

HTTP/2
 HTTP/3

Default root object - optional
The object (file name) to return when a viewer requests the root URL (/) instead of a specific object.

index.html

Description - optional

EmployeeData

Set Up CloudFront CDN

- CloudFront is deployed. Copy the domain name and open it in your browser.

The screenshot shows the AWS CloudFront distribution configuration page for a distribution named 'EmployeeData'. The top navigation bar includes 'EmployeeData' and a 'Free plan' badge, along with a 'View metrics' button. The main content area is divided into several sections: 'Details' (Distribution domain name: d3pcchl9n5u5yo.cloudfront.net, Billing: Free plan (\$0/month), ARN: arn:aws:cloudfront::529088293565:distribution/E2T3VRRQ39QHMS, Last modified: November 21, 2025 at 1:33:38 PM UTC), 'General' (selected tab), 'Security', 'Origins', 'Behaviors', 'Error pages', 'Invalidations', 'Logging', and 'Tags'. The 'General' tab displays settings for the distribution, including 'Name' (EmployeeData), 'Description' (EmployeeData), 'Price class' (Use all edge locations (best performance)), and 'Supported HTTP versions' (HTTP/2, HTTP/1.1, HTTP/1.0). It also lists 'Alternate domain names' (empty) and 'Standard logging' (Available with the Pro plan). The 'Edit' button is located in the top right corner of the settings section.

Set Up CloudFront CDN

- CloudFront is deployed. Copy the domain name and open it in your browser.

API stores employee data in DynamoDB and fetches all records on “View All Employees.”

Save and View Employee Data

Employee ID:

Name:

Department:

Age:

Save Employee Data

View all Employees

Employee ID	Name	Department	Age
-------------	------	------------	-----

Troubleshooting & Common Issues

❑ 403 Forbidden

- OAC not configured correctly
- S3 bucket policy misconfigured
- Lambda IAM role missing required permissions
- API CORS Misconfiguration

❑ 404 Not Found

- Default Root Object was not configured in CDN
- API called with wrong resource path → Endpoint not found → 404 error.