Name:Brijesh R Sharma **D15C** **Roll No: 28**

Advance Devops Practical Examination: AWS Case Study Assignment

Topic : Serverless Image Processing Workflow

1. Introduction

Concepts Used: AWS Lambda, S3, and CodePipeline.

Problem Statement: "Create a serverless workflow that triggers an AWS Lambda function when a new image is uploaded to an S3 bucket. Use CodePipeline to automate the deployment of the Lambda function."

Tasks:

- Create a Lambda function in Python that logs and processes an image when uploaded to a specific S3 bucket.
- Set up AWS CodePipeline to automatically deploy updates to the Lambda function.
- Upload a sample image to S3 and verify that the Lambda function is triggered and logs the event.

Theory:

1. AWS Lambda

AWS Lambda is a **serverless compute service** that allows you to run code without provisioning or managing servers. It automatically scales your application by running code in response to triggers, such as changes in data or HTTP requests, without you needing to worry about infrastructure. Lambda supports various languages (e.g., Python, Node.js, Java, etc.).

- **Key Features**:
  - **Event-driven**: Triggered by events (e.g., S3 uploads, API Gateway requests).
  - **Auto-scaling**: Scales based on demand.
  - **Pay-as-you-go**: Charges based on the number of requests and the compute time used.

2. Amazon S3 (Simple Storage Service)

Amazon S3 is an **object storage service** that allows you to store and retrieve any amount of data from anywhere. It is widely used for storing large amounts of unstructured data like images, videos, backups, and logs.

- **Key Features**:
    - **Durability & Scalability**: Highly durable and scalable for storing large data sets.
    - **Access Control**: Offers fine-grained access controls using policies and permissions.
    - **Integration**: Integrates with other AWS services like Lambda, CloudFront, and Glacier for archiving.

3. AWS CodePipeline

AWS CodePipeline is a **continuous integration and continuous delivery (CI/CD) service** that automates the software release process. It defines a workflow (pipeline) for building, testing, and deploying your code automatically.

- **Key Features**:
    - **Automation**: Automates code deployment after every change.
    - **Multi-stage Pipeline**: Supports stages like source control, build, and deploy.
    - **Integration**: Integrates with tools like GitHub, Jenkins, and AWS services like CodeBuild and Lambda.

4. AWS IAM (Identity and Access Management)

AWS IAM is a service that helps you manage **access to AWS resources** securely. It allows you to create users, groups, and roles and assign permissions to control who can access what.

- **Key Features**:
    - **Granular Permissions**: Control access to AWS services and resources at a fine level.
    - **Multi-factor Authentication (MFA)**: Adds an extra layer of security for users.
    - **Roles**: Allows temporary access for services or users to perform specific tasks.

5.AWS CloudWatch:

AWS CloudWatch is a monitoring service that provides data and actionable insights to monitor applications, understand system-wide performance changes, and optimize resource usage. In this experiment, CloudWatch was used to capture logs from the Lambda function, allowing us to track S3 events and troubleshoot any issues that occurred during image uploads and processing.

- **Key Features**:
    - Logs: Collects and stores logs from AWS services like Lambda.
    - Metrics: Provides metrics based on the logs and AWS services.
    - Alerts: Configures alarms based on metrics to monitor resources.

6. AWS CodeBuild:

AWS CodeBuild is a fully managed build service in AWS that compiles source code, runs tests, and produces software packages. In this experiment, CodeBuild was used as the build stage of the pipeline to package the Lambda function code and deploy it automatically using AWS CLI.

- **Key Features**:
    - Continuous Integration: Automates the build and test phases.
    - Scalable: Scales automatically to handle multiple builds.
    - Integration: Easily integrates with other AWS services like CodePipeline and Lambda.

7. S3 Event Notifications:

S3 Event Notifications enable you to receive notifications when specific events occur in an S3 bucket. In this case study, S3 Event Notifications were used to trigger the Lambda function when an image was uploaded, ensuring the function is only invoked when necessary.

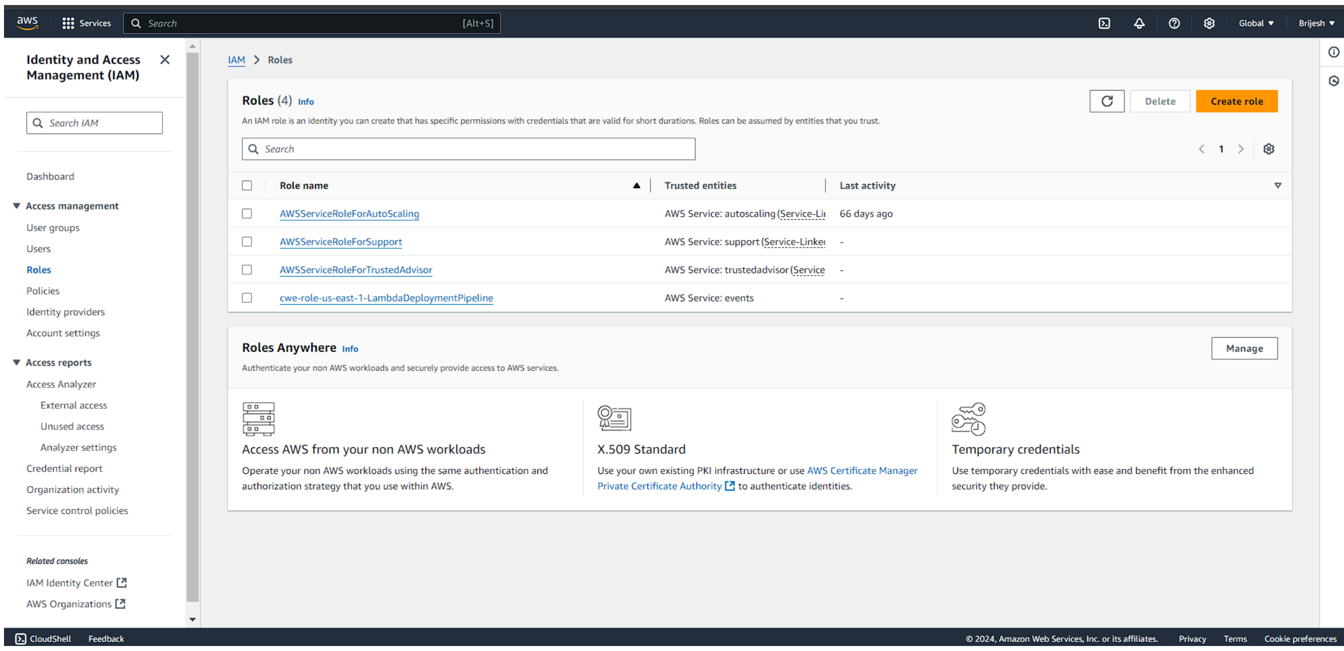
- **Key Features**:
    - Event Triggers: Supports events like object creation, deletion, or replication.
    - Destination: Can trigger Lambda functions, SNS, or SQS notifications.
    - Granular Control: Can configure events to be triggered for specific objects or prefixes in the bucket.

Name:Brijesh R Sharma **D15C** **Roll No: 28**

2. Step-by-Step Explanation

1. Create an IAM Role :

- Log in to the **AWS Management Console**.
- Go to the **IAM Console** in AWS.



Identity and Access Management (IAM)

Search IAM

Dashboard

▼ Access management
User groups
Users
Roles
Policies
Identity providers
Account settings

▼ Access reports
Access Analyzer
External access
Unused access
Analyzer settings
Credential report
Organization activity
Service control policies

Related consoles
IAM Identity Center
AWS Organizations

IAM > Roles

Roles (4) Info

Delete | Create role

An IAM role is an identity you can create that has specific permissions with credentials that are valid for short durations. Roles can be assumed by entities that you trust.

Search

Role name	Trusted entities	Last activity
AWSServiceRoleForAutoScaling	AWS Service: autoscaling (Service-Li	66 days ago
AWSServiceRoleForSupport	AWS Service: support (Service-Linke	-
AWSServiceRoleForTrustedAdvisor	AWS Service: trustedadvisor (Service	-
cwe-role-us-east-1-LambdaDeploymentPipeline	AWS Service: events	-

Roles Anywhere Info

Manage

Authenticate your non AWS workloads and securely provide access to AWS services.

Access AWS from your non AWS workloads
Operate your non AWS workloads using the same authentication and authorization strategy that you use within AWS.

X.509 Standard
Use your own existing PKI infrastructure or use AWS Certificate Manager Private Certificate Authority to authenticate identities.

Temporary credentials
Use temporary credentials with ease and benefit from the enhanced security they provide.

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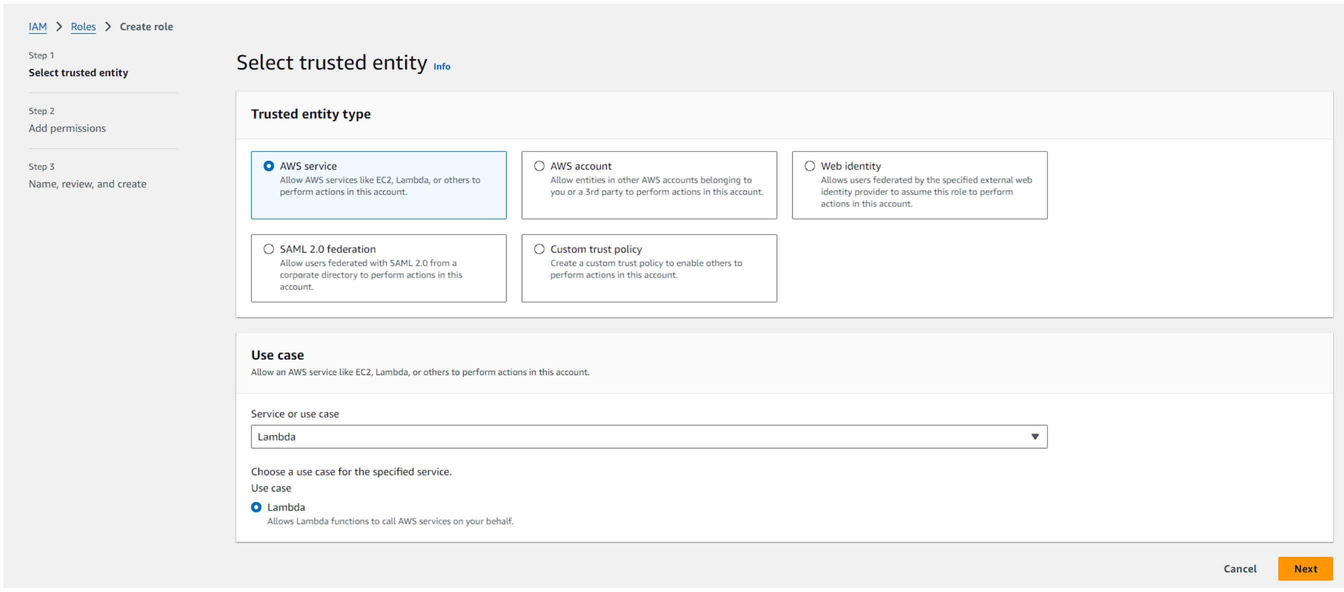
- Click on **Roles** and choose **Create Role**.
- Select **AWS service** as the trusted entity type, and choose **Lambda** as the use case.



IAM > Roles > Create role

Step 1
Select trusted entity

Step 2
Add permissions

Step 3
Name, review, and create

Select trusted entity Info

Trusted entity type

[✓ AWS service]
Allow AWS services like EC2, Lambda, or others to perform actions in this account.

AWS account
Allow entities in other AWS accounts belonging to you or a 3rd party to perform actions in this account.

Web identity
Allows users federated by the specified external web identity provider to assume this role to perform actions in this account.

SAML 2.0 federation
Allow users federated with SAML 2.0 from a corporate directory to perform actions in this account.

Custom trust policy
Create a custom trust policy to enable others to perform actions in this account.

Use case
Allow an AWS service like EC2, Lambda, or others to perform actions in this account.

Service or use case
Lambda

Choose a use case for the specified service.
Use case
[✓ Lambda]
Allows Lambda functions to call AWS services on your behalf.

Cancel Next

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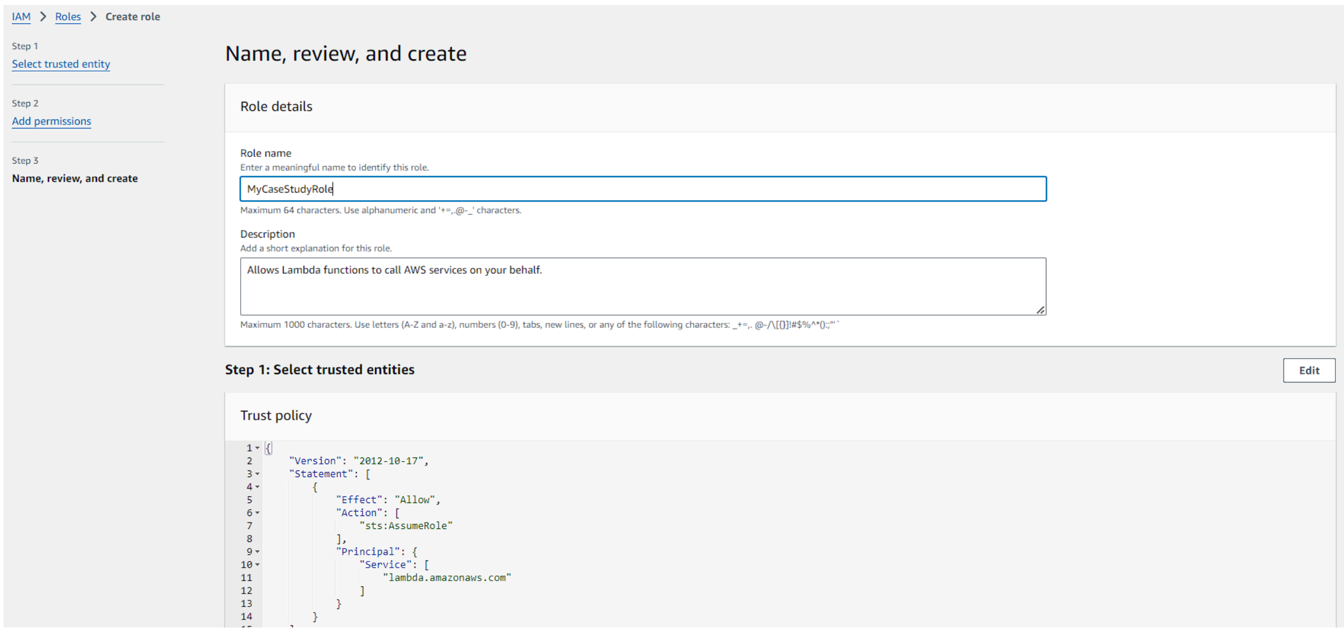
- Attach policies such as:
  - **AmazonS3FullAccess**
  - **AWSCodeBuildAdminAccess**
  - **AWSCodePipeline_FullAccess**
  - **AWSLambda_FullAccess**
  - **CloudWatchLogsFullAccess**
- Give the role a name: **MyCaseStudyRole48** and create it.



IAM > Roles > Create role

Step 1
Select trusted entity

Step 2
Add permissions

Step 3
Name, review, and create

Name, review, and create

Role details

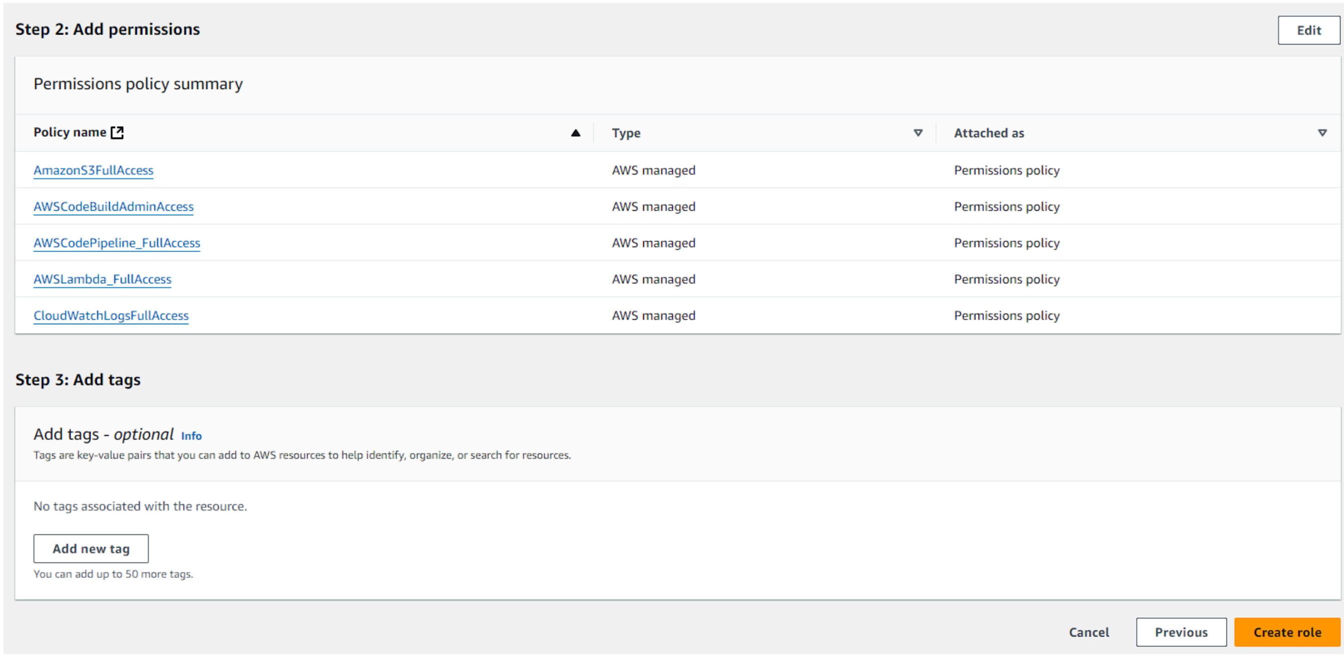
Role name
Enter a meaningful name to identify this role.
MyCaseStudyRole
Maximum 64 characters. Use alphanumeric and '+=,.@-_' characters.

Description
Add a short explanation for this role.
Allows Lambda functions to call AWS services on your behalf.
Maximum 1000 characters. Use letters (A-Z and a-z), numbers (0-9), tabs, new lines, or any of the following characters: _+=,. @-/\[{}]!#$%^*():;"'`

Step 1: Select trusted entities

Trust policy

```
{
    "Version": "2012-10-17",
    "Statement": [
        {
            "Effect": "Allow",
            "Action": [
                "sts:AssumeRole"
            ],
            "Principal": {
                "Service": [
                    "lambda.amazonaws.com"
                ]
            }
        }
```



Step 2: Add permissions

Permissions policy summary

Policy name	Type	Attached as
AmazonS3FullAccess	AWS managed	Permissions policy
AWSCodeBuildAdminAccess	AWS managed	Permissions policy
AWSCodePipeline_FullAccess	AWS managed	Permissions policy
AWSLambda_FullAccess	AWS managed	Permissions policy
CloudWatchLogsFullAccess	AWS managed	Permissions policy

Step 3: Add tags

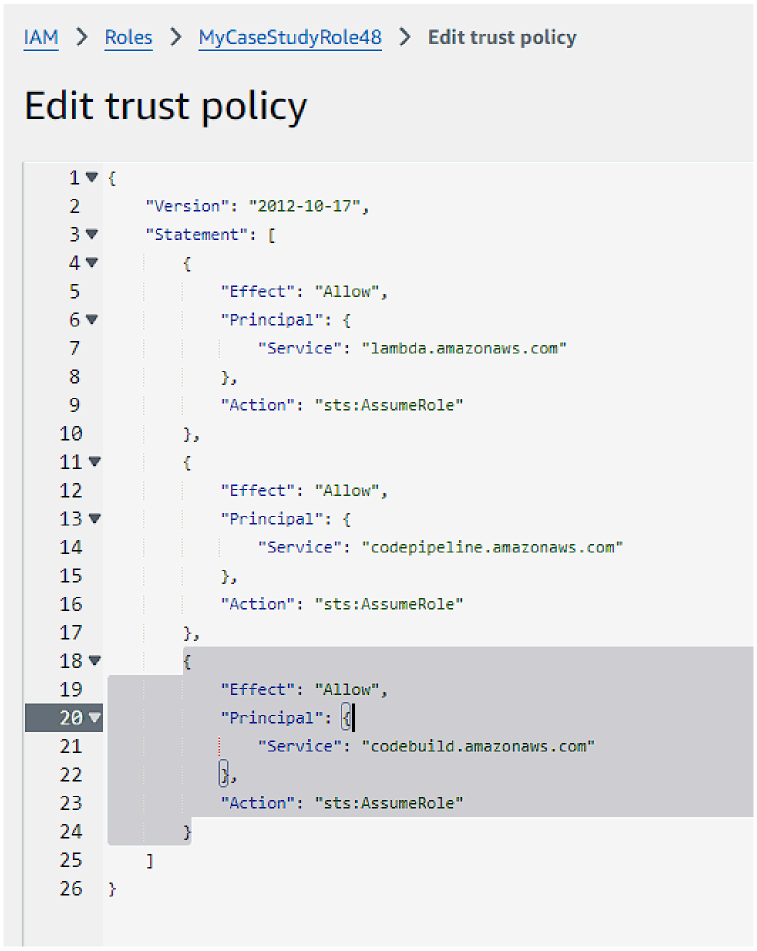
Add tags - *optional* Info
Tags are key-value pairs that you can add to AWS resources to help identify, organize, or search for resources.

No tags associated with the resource.

You can add up to 50 more tags.

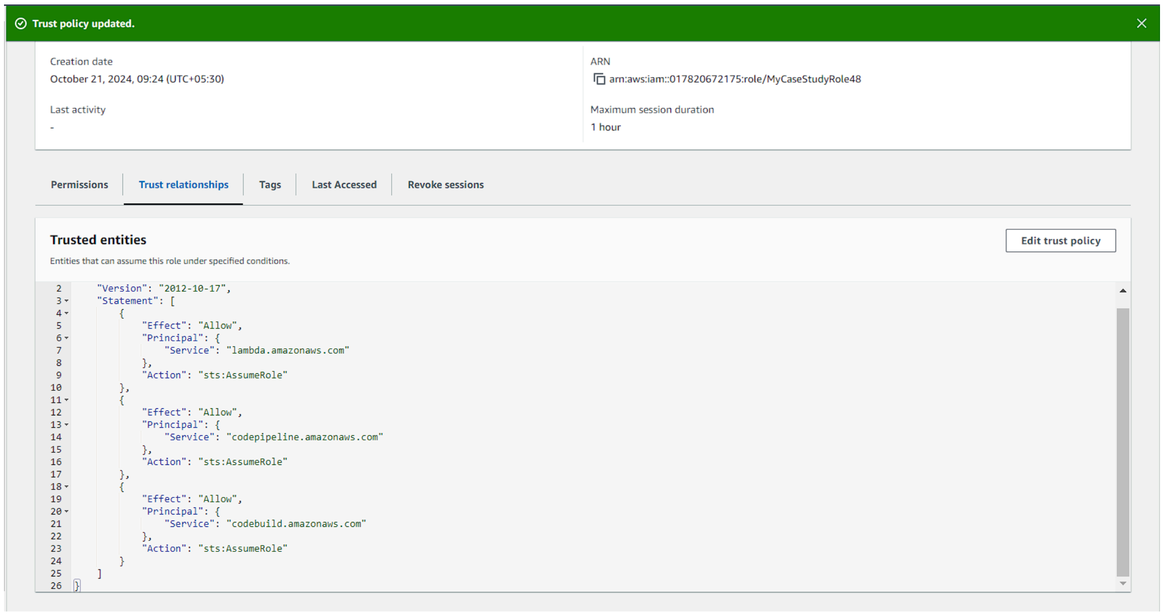
- After creating the role, in Trust Realtionship/Policy attach below policy in Statement.

```
{
    "Effect": "Allow",
    "Principal": {
        "Service": "codepipeline.amazonaws.com"
    },
    "Action": "sts:AssumeRole"
},
{
    "Effect": "Allow",
    "Principal": {
        "Service": "codebuild.amazonaws.com"
    },
    "Action": "sts:AssumeRole"
}
```



Edit trust policy

```
{
    "Version": "2012-10-17",
    "Statement": [
        {
            "Effect": "Allow",
            "Principal": {
                "Service": "lambda.amazonaws.com"
            },
            "Action": "sts:AssumeRole"
        },
        {
            "Effect": "Allow",
            "Principal": {
                "Service": "codepipeline.amazonaws.com"
            },
            "Action": "sts:AssumeRole"
        },
        {
            "Effect": "Allow",
            "Principal": {
                "Service": "codebuild.amazonaws.com"
            },
            "Action": "sts:AssumeRole"
        }
    ]
}
```



Trust policy updated.

Creation date
October 21, 2024, 09:24 (UTC+05:30)

Last activity
-

ARN
arn:aws:iam::017820672175:role/MyCaseStudyRole48

Maximum session duration
1 hour

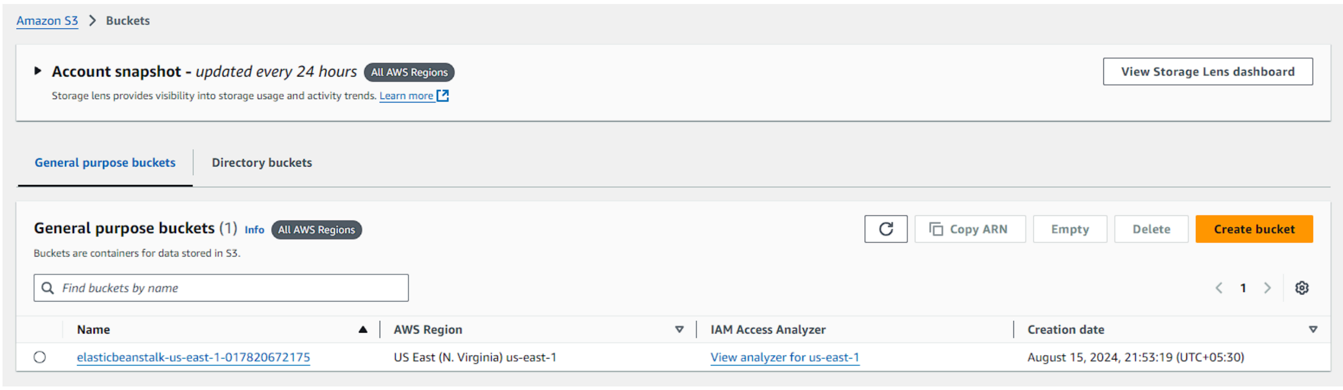
Trusted entities

Entities that can assume this role under specified conditions.

```
    "Version": "2012-10-17",
    "Statement": [
        {
            "Effect": "Allow",
            "Principal": {
                "Service": "lambda.amazonaws.com"
            },
            "Action": "sts:AssumeRole"
        },
        {
            "Effect": "Allow",
            "Principal": {
                "Service": "codepipeline.amazonaws.com"
            },
            "Action": "sts:AssumeRole"
        },
        {
            "Effect": "Allow",
            "Principal": {
                "Service": "codebuild.amazonaws.com"
            },
            "Action": "sts:AssumeRole"
        }
    ]
}
```

2. Create an S3 Bucket:

- Navigate to the **S3** service.



Amazon S3 > Buckets

Account snapshot - *updated every 24 hours* All AWS Regions

Storage lens provides visibility into storage usage and activity trends. Learn more

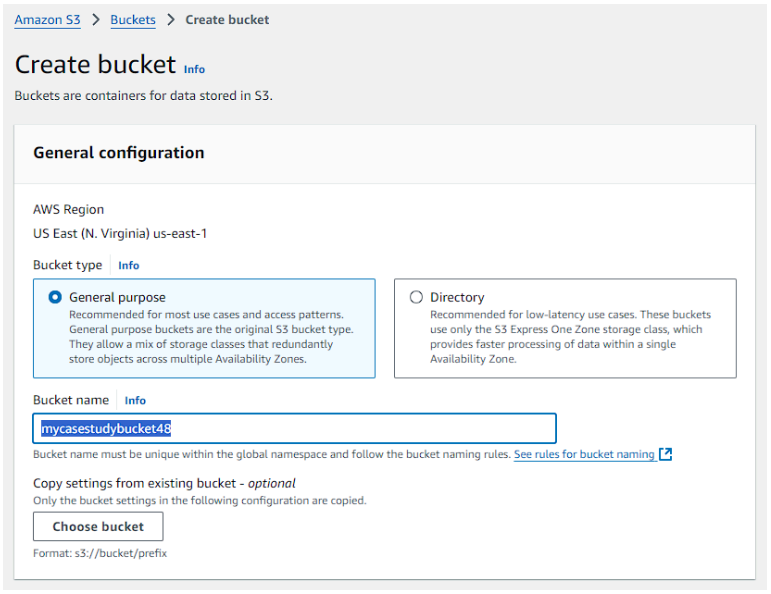
General purpose buckets (1) Info All AWS Regions

Buckets are containers for data stored in S3.

Name	AWS Region	IAM Access Analyzer	Creation date
elasticbeanstalk-us-east-1-017820672175	US East (N. Virginia) us-east-1	View analyzer for us-east-1	August 15, 2024, 21:53:19 (UTC+05:30)

- Click on **Create Bucket**.
    - Bucket Type: **General Purpose.**
    - Provide a unique bucket name. **(mycasestudybucket48)**
    - **Uncheck the Block all public access option.**
    - Keep Rest of the things to default.

Name:Brijesh R Sharma **D15C** **Roll No: 28**



Amazon S3 > Buckets > Create bucket

Create bucket Info

Buckets are containers for data stored in S3.

General configuration

AWS Region
US East (N. Virginia) us-east-1

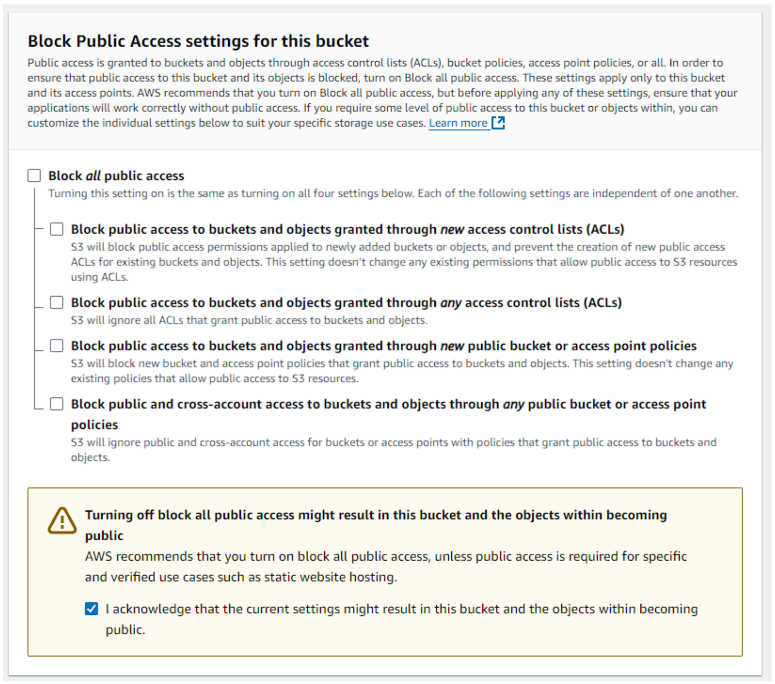
Bucket type Info

[✓ 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 low-latency use cases. These buckets use only the S3 Express One Zone storage class, which provides faster processing of data within a single Availability Zone.

Bucket name Info
mycasestudybucket48
Bucket name must be unique within the global namespace and follow the bucket naming rules. See rules for bucket naming

Copy settings from existing bucket - *optional*
Only the bucket settings in the following configuration are copied.
Choose bucket
Format: s3://bucket/prefix



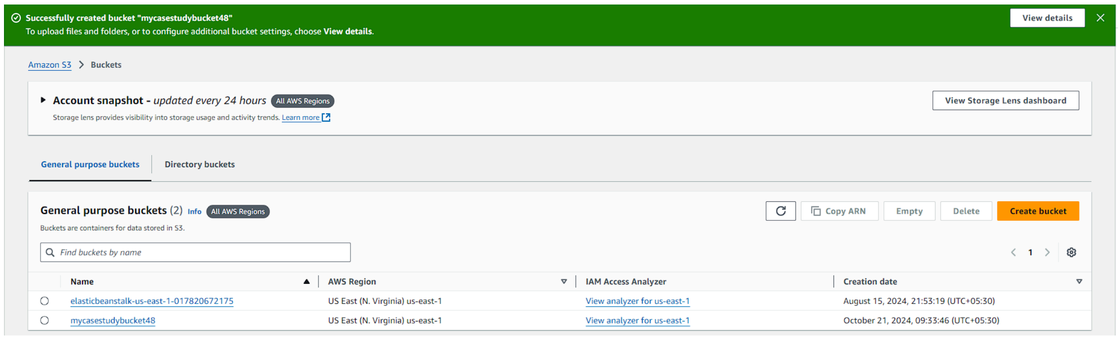
Block Public Access settings for this bucket

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.
  - ☐ **Block public access to buckets and objects granted through *any* access control lists (ACLs)**
    S3 will ignore all ACLs that grant public access to buckets and objects.
  - ☐ **Block public access to buckets and objects granted through *new* public bucket or access point policies**
    S3 will block new bucket and access point policies that grant public access to buckets and objects. This setting doesn't change any existing policies that allow public access to S3 resources.
  - ☐ **Block public and cross-account access to buckets and objects through *any* public bucket or access point policies**
    S3 will ignore public and cross-account access for buckets or access points with policies that grant public access to buckets and objects.

Turning off block all public access might result in this bucket and the objects within becoming public
AWS recommends that you turn on block all public access, unless public access is required for specific and verified use cases such as static website hosting.

☑ I acknowledge that the current settings might result in this bucket and the objects within becoming public.



Successfully created bucket "mycasestudybucket48"
To upload files and folders, or to configure additional bucket settings, choose **View details**.

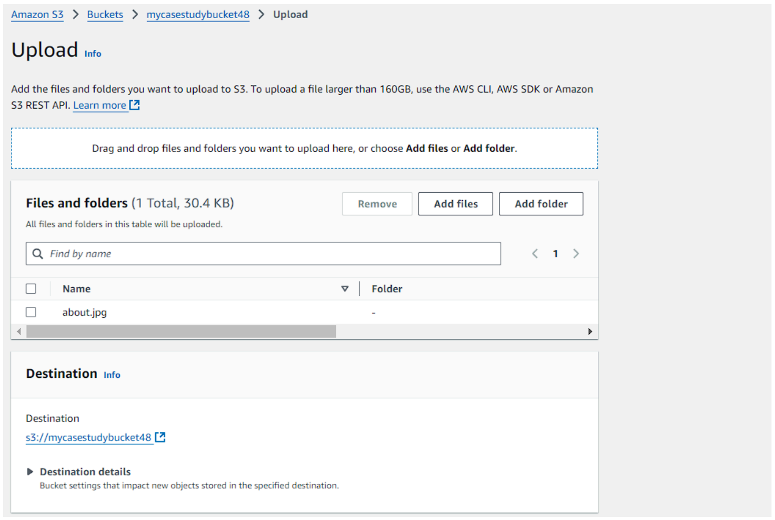
Amazon S3 > Buckets

Account snapshot - *updated every 24 hours* All AWS Regions
Storage lens provides visibility into storage usage and activity trends. Learn more

General purpose buckets (2) Info All AWS Regions
Buckets are containers for data stored in S3.

	Name	AWS Region	IAM Access Analyzer	Creation date
○	elasticbeanstalk-us-east-1-017820672175	US East (N. Virginia) us-east-1	View analyzer for us-east-1	August 15, 2024, 21:53:19 (UTC+05:30)
○	mycasestudybucket48	US East (N. Virginia) us-east-1	View analyzer for us-east-1	October 21, 2024, 09:33:46 (UTC+05:30)

- You can upload a test image to ensure the bucket is working properly.



Amazon S3 > Buckets > mycasestudybucket48 > Upload

Upload Info

Add the files and folders you want to upload to S3. To upload a file larger than 160GB, use the AWS CLI, AWS SDK or Amazon S3 REST API. Learn more

Drag and drop files and folders you want to upload here, or choose **Add files** or **Add folder**.

Files and folders (1 Total, 30.4 KB)

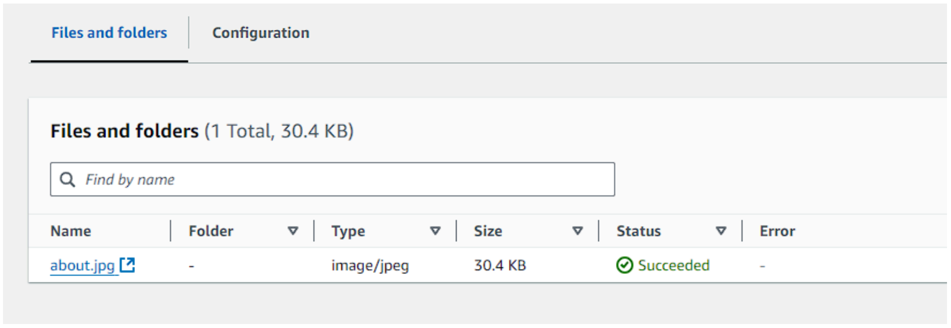
All files and folders in this table will be uploaded.

Name	Folder
about.jpg	-

Destination Info

Destination
s3://mycasestudybucket48

Destination details
Bucket settings that impact new objects stored in the specified destination.

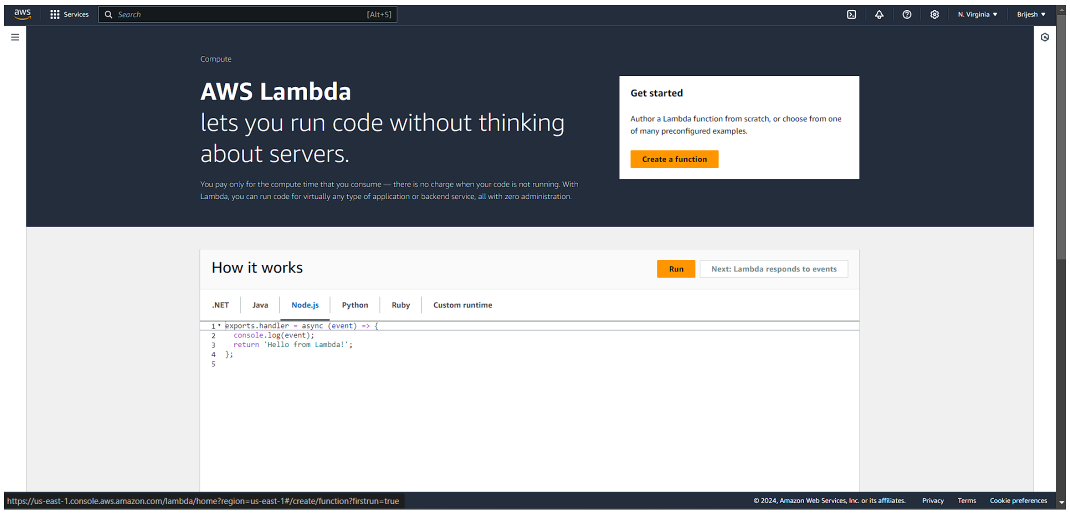


Files and folders (1 Total, 30.4 KB)

Name	Folder	Type	Size	Status	Error
about.jpg	-	image/jpeg	30.4 KB	✓ Succeeded	-

3. Create a Lambda Function:

- Navigate to the **Lambda Console**.



AWS Lambda
lets you run code without thinking about servers.

You pay only for the compute time that you consume — there is no charge when your code is not running. With Lambda, you can run code for virtually any type of application or backend service, all with zero administration.

Get started

Author a Lambda function from scratch, or choose from one of many preconfigured examples.

How it works

```
exports.handler = async (event) => {
  console.log(event);
  return 'Hello from Lambda!';
};
```

https://us-east-1.console.aws.amazon.com/lambda/home?region=us-east-1#/create/function?firstrun=true

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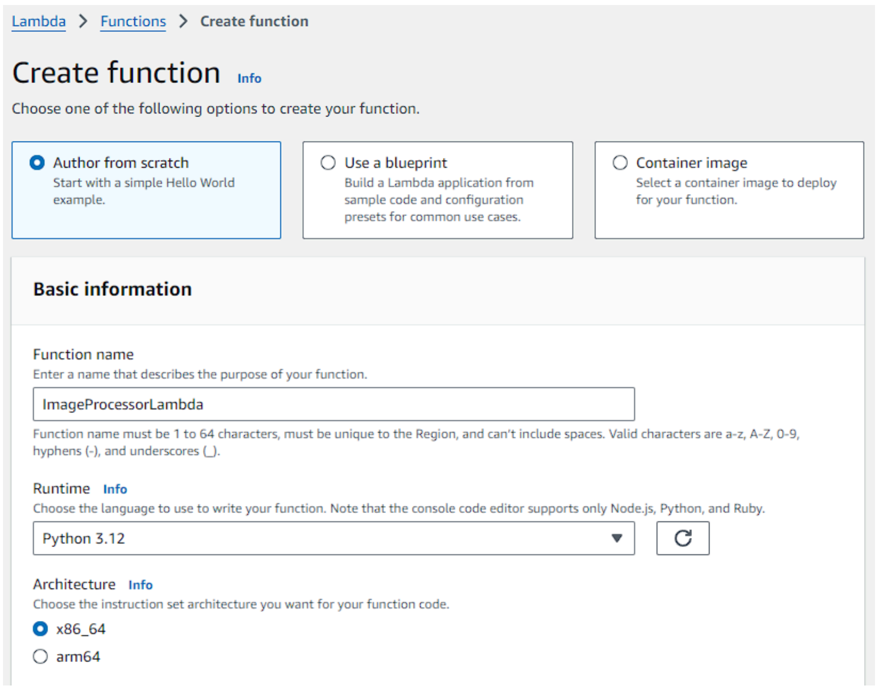
- Click **Create Function**.
    - Choose **Author from scratch**.
    - Provide a function name **ImageProcessorLambda**.
    - Choose a free-tier eligible runtime **Python 3.12**.
    - Assign the **IAM role** created earlier **MyCaseStudyRole48**.
    - Keep Rest of things to default.



Lambda > Functions > Create function

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.

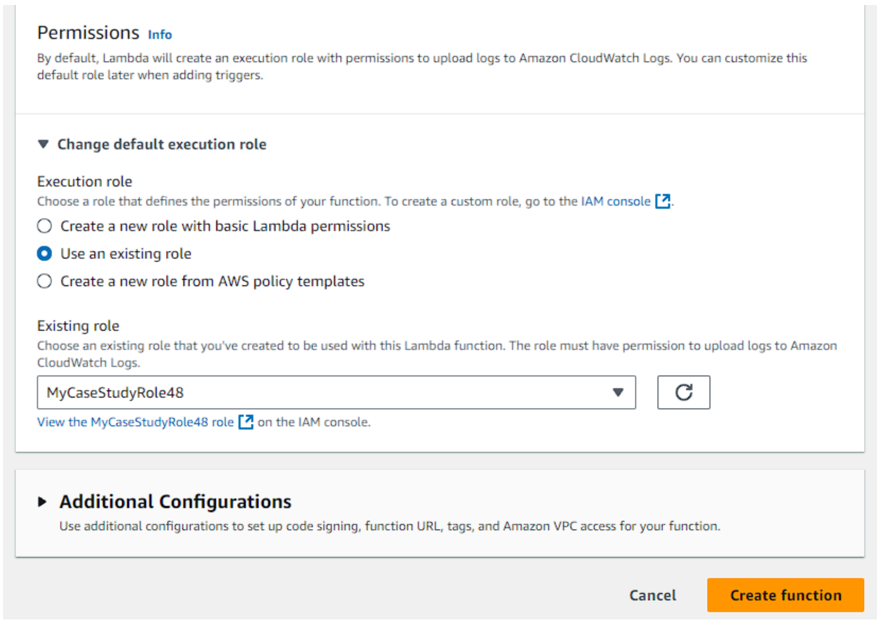
Container image — Select a container image to deploy for your function.

Basic information

Function name
Enter a name that describes the purpose of your function.
ImageProcessorLambda
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.
Python 3.12

Architecture Info
Choose the instruction set architecture you want for your function code.
[✓ x86_64] arm64



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.
MyCaseStudyRole48
View the MyCaseStudyRole48 role on the IAM console.

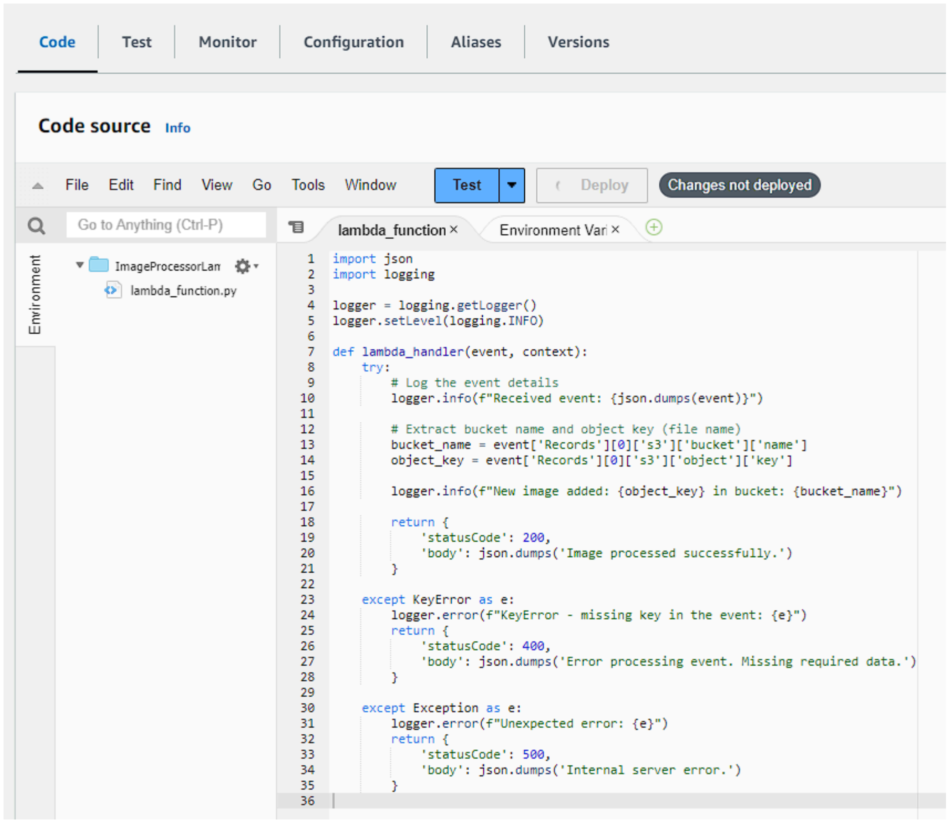
Additional Configurations
Use additional configurations to set up code signing, function URL, tags, and Amazon VPC access for your function.

Cancel | Create function

- In the **Function Code** section, add the logic to log when the image is uploaded to S3.

  Code:

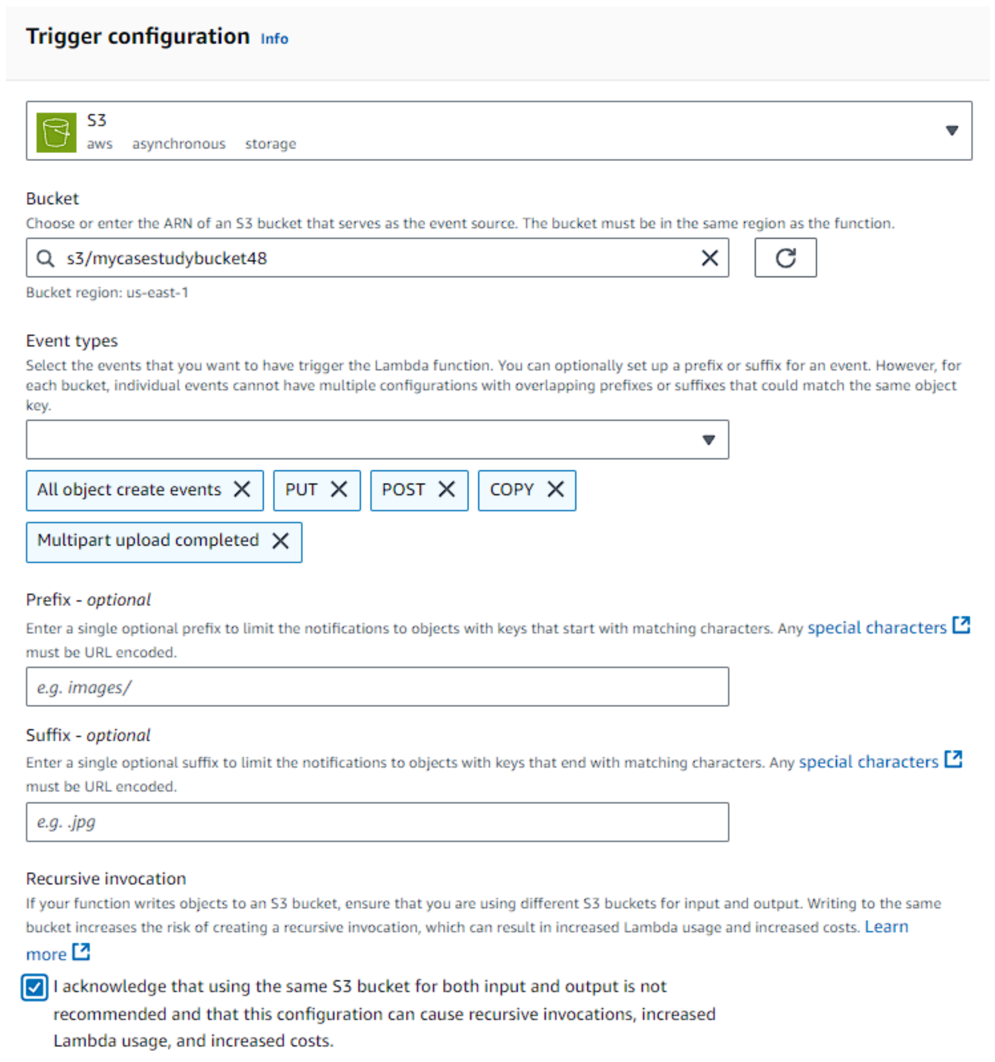
```
import json
import logging

logger = logging.getLogger()
logger.setLevel(logging.INFO)

def lambda_handler(event, context):
    try:
        # Log the event details
        logger.info(f"Received event: {json.dumps(event)}")

        # Extract bucket name and object key (file name)
        bucket_name = event['Records'][0]['s3']['bucket']['name']
        object_key = event['Records'][0]['s3']['object']['key']

        logger.info(f"New image added: {object_key} in bucket: {bucket_name}")

        return {
            'statusCode': 200,
            'body': json.dumps('Image processed successfully.')
        }

    except KeyError as e:
        logger.error(f"KeyError - missing key in the event: {e}")
        return {
            'statusCode': 400,
            'body': json.dumps('Error processing event. Missing required data.')
        }

    except Exception as e:
        logger.error(f"Unexpected error: {e}")
        return {
            'statusCode': 500,
            'body': json.dumps('Internal server error.')
        }
```



```python
import json
import logging

logger = logging.getLogger()
logger.setLevel(logging.INFO)

def lambda_handler(event, context):
    try:
        # Log the event details
        logger.info(f"Received event: {json.dumps(event)}")

        # Extract bucket name and object key (file name)
        bucket_name = event['Records'][0]['s3']['bucket']['name']
        object_key = event['Records'][0]['s3']['object']['key']

        logger.info(f"New image added: {object_key} in bucket: {bucket_name}")

        return {
            'statusCode': 200,
            'body': json.dumps('Image processed successfully.')
        }

    except KeyError as e:
        logger.error(f"KeyError - missing key in the event: {e}")
        return {
            'statusCode': 400,
            'body': json.dumps('Error processing event. Missing required data.')
        }

    except Exception as e:
        logger.error(f"Unexpected error: {e}")
        return {
            'statusCode': 500,
            'body': json.dumps('Internal server error.')
        }
```

- Now Add the **Trigger** (Click on Trigger).
    - In Trigger Configuration Select S3.
    - Select Bucket which we have created.**(mycasestudybucket48)**
    - Select Event Types
        - All object create events
        - PUT
        - POST
        - COPY
        - Multipart upload completed

Name:Brijesh R Sharma **D15C** **Roll No: 28**



Trigger configuration Info

S3
aws asynchronous storage

Bucket
Choose or enter the ARN of an S3 bucket that serves as the event source. The bucket must be in the same region as the function.
s3/mycasestudybucket48
Bucket region: us-east-1

Event types
Select the events that you want to have trigger the Lambda function. You can optionally set up a prefix or suffix for an event. However, for each bucket, individual events cannot have multiple configurations with overlapping prefixes or suffixes that could match the same object key.

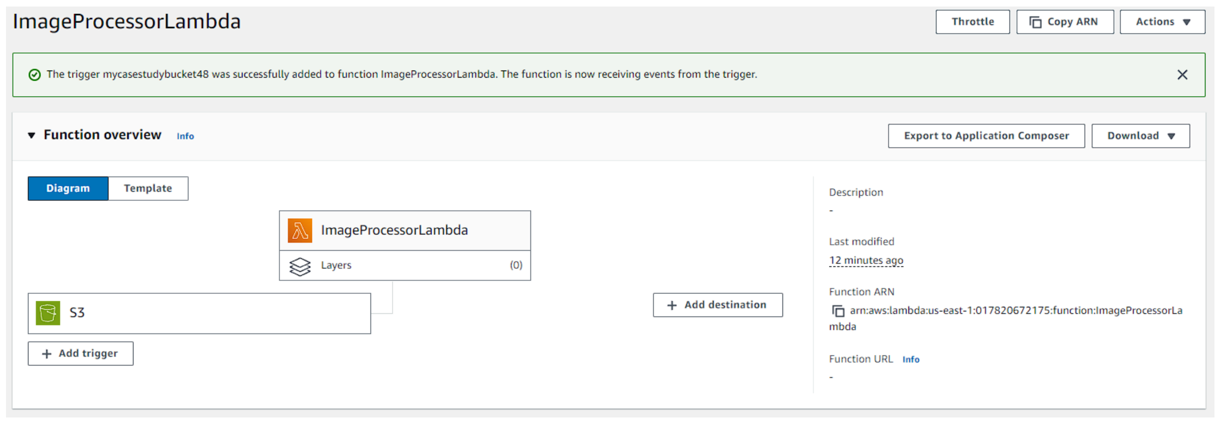
All object create events ✕ PUT ✕ POST ✕ COPY ✕
Multipart upload completed ✕

Prefix - *optional*
Enter a single optional prefix to limit the notifications to objects with keys that start with matching characters. Any special characters must be URL encoded.
e.g. images/

Suffix - *optional*
Enter a single optional suffix to limit the notifications to objects with keys that end with matching characters. Any special characters must be URL encoded.
e.g. .jpg

Recursive invocation
If your function writes objects to an S3 bucket, ensure that you are using different S3 buckets for input and output. Writing to the same bucket increases the risk of creating a recursive invocation, which can result in increased Lambda usage and increased costs. Learn more

✓ I acknowledge that using the same S3 bucket for both input and output is not recommended and that this configuration can cause recursive invocations, increased Lambda usage, and increased costs.



ImageProcessorLambda

The trigger mycasestudybucket48 was successfully added to function ImageProcessorLambda. The function is now receiving events from the trigger.

Function overview Info

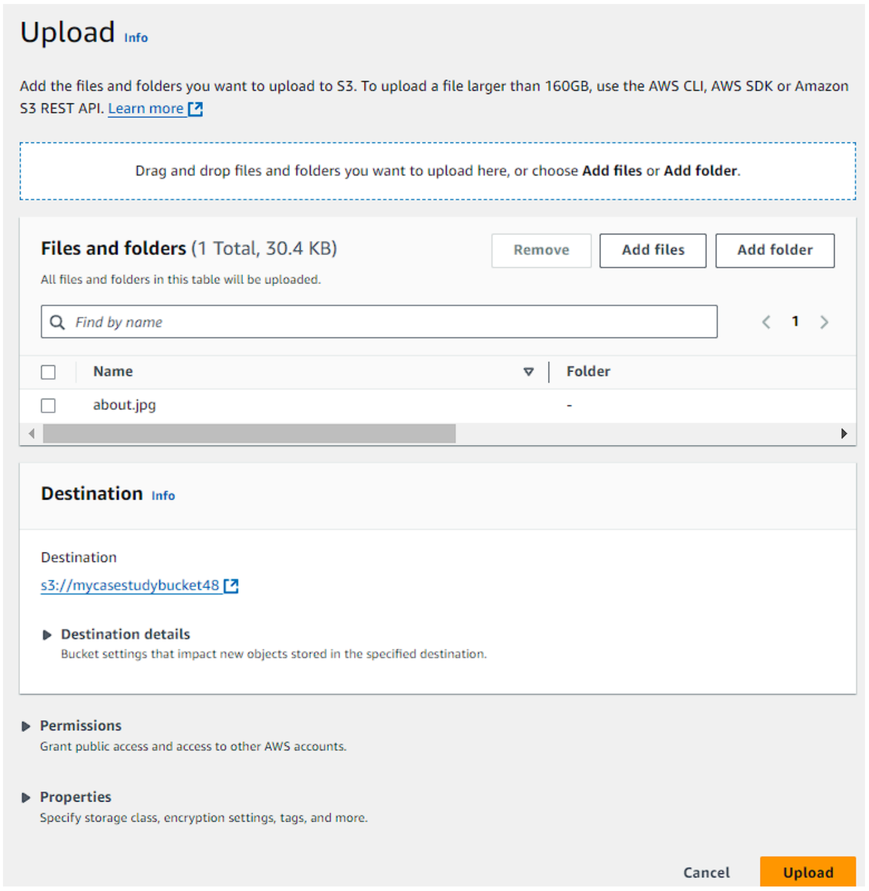
Description
-

Last modified
12 minutes ago

Function ARN
arn:aws:lambda:us-east-1:017820672175:function:ImageProcessorLambda

Function URL Info
-

- Now Let's test that Lambda is properly working and check logs.
- Go to the bucket and upload your image.



Upload Info

Add the files and folders you want to upload to S3. To upload a file larger than 160GB, use the AWS CLI, AWS SDK or Amazon S3 REST API. Learn more

Drag and drop files and folders you want to upload here, or choose **Add files** or **Add folder**.

Files and folders (1 Total, 30.4 KB)

All files and folders in this table will be uploaded.

Name	Folder
about.jpg	-

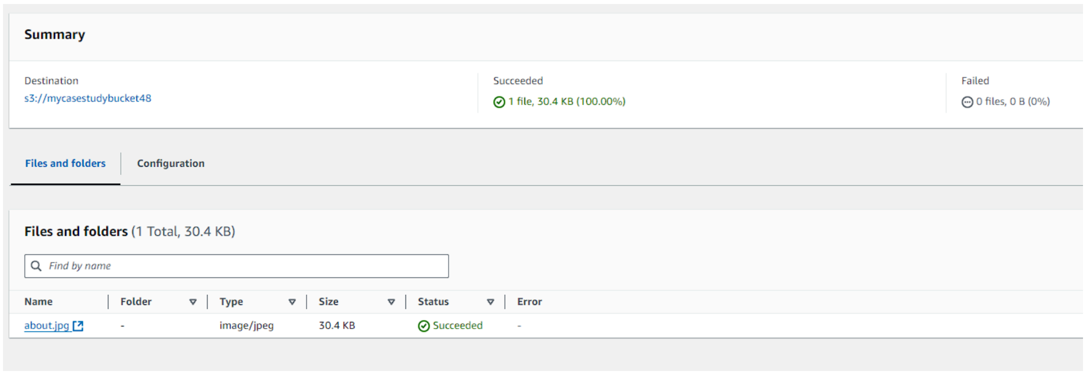
Destination Info

Destination
s3://mycasestudybucket48

Destination details
Bucket settings that impact new objects stored in the specified destination.

Permissions
Grant public access and access to other AWS accounts.

Properties
Specify storage class, encryption settings, tags, and more.

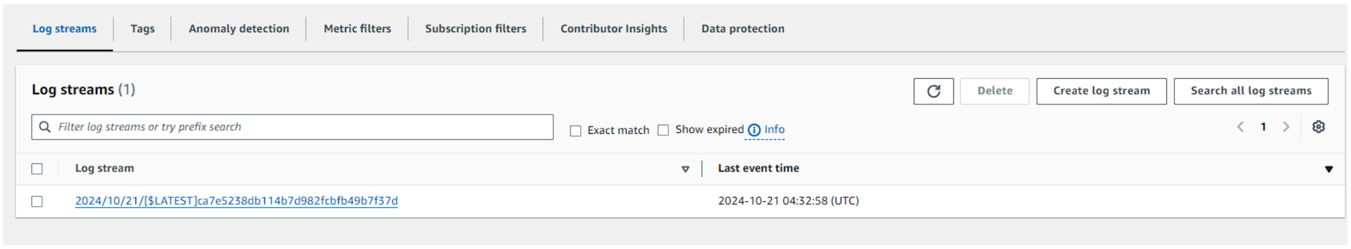


Summary

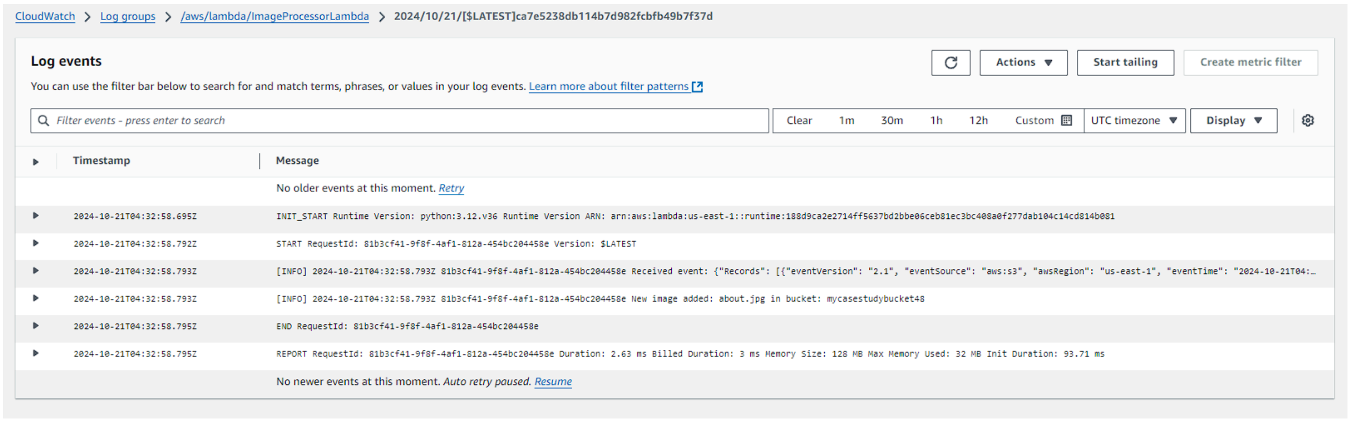
Destination	Succeeded	Failed
s3://mycasestudybucket48	1 file, 30.4 KB (100.00%)	0 files, 0 B (0%)

Files and folders (1 Total, 30.4 KB)

Name	Folder	Type	Size	Status	Error
about.jpg	-	image/jpeg	30.4 KB	Succeeded	-



Log stream	Last event time
2024/10/21/[$LATEST]ca7e5238db114b7d982fcbfb49b7f37d	2024-10-21 04:32:58 (UTC)


CloudWatch > Log groups > /aws/lambda/ImageProcessorLambda > 2024/10/21/[$LATEST]ca7e5238db114b7d982fcbfb49b7f37d
Log events
Actions
Start tailing
Create metric filter
Filter events - press enter to search
Clear
1m
30m
1h
12h
Custom
UTC timezone
Display

You can use the filter bar below to search for and match terms, phrases, or values in your log events. Learn more about filter patterns

```
Timestamp                   Message
                            No older events at this moment. Retry
2024-10-21T04:32:58.695Z    INIT_START Runtime Version: python:3.12.v36 Runtime Version ARN: arn:aws:lambda:us-east-1::runtime:188d9ca2e2714ff5637bd2bbe06ceb81ec3bc408a0f277dab104c14cd814b081
2024-10-21T04:32:58.792Z    START RequestId: 81b3cf41-9f8f-4af1-812a-454bc204458e Version: $LATEST
2024-10-21T04:32:58.793Z    [INFO] 2024-10-21T04:32:58.793Z 81b3cf41-9f8f-4af1-812a-454bc204458e Received event: {"Records": [{"eventVersion": "2.1", "eventSource": "aws:s3", "awsRegion": "us-east-1", "eventTime": "2024-10-21T04:…
2024-10-21T04:32:58.793Z    [INFO] 2024-10-21T04:32:58.793Z 81b3cf41-9f8f-4af1-812a-454bc204458e New image added: about.jpg in bucket: mycasestudybucket48
2024-10-21T04:32:58.795Z    END RequestId: 81b3cf41-9f8f-4af1-812a-454bc204458e
2024-10-21T04:32:58.795Z    REPORT RequestId: 81b3cf41-9f8f-4af1-812a-454bc204458e Duration: 2.63 ms Billed Duration: 3 ms Memory Size: 128 MB Max Memory Used: 32 MB Init Duration: 93.71 ms
                            No newer events at this moment. Auto retry paused. Resume
```

4. Create a Github Repository:

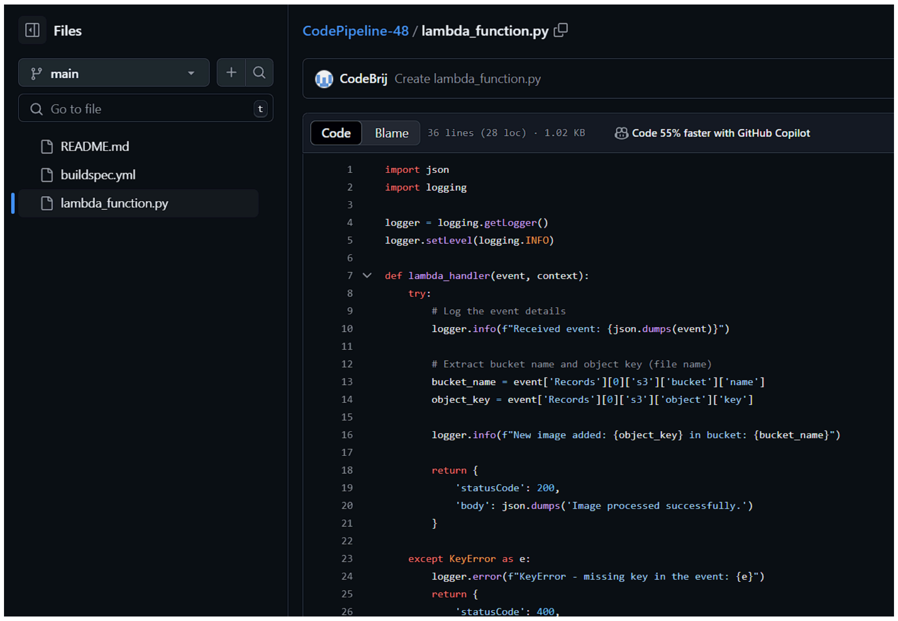
- Create Repositorywith name **CodePipeline-48.**
- Add the file **buildspec.yml** and **lambda_function.py**.

buidspec.yml

```
version: 0.2
phases:
  install:
    commands:
      - pip install awscli  # Ensure AWS CLI is available
  build:
    commands:
      - echo "Packaging Lambda function..."
      - zip -r lambda_function.zip .
      - echo "Updating Lambda function in AWS..."
      - aws lambda update-function-code --function-name ImageProcessorLambda --zip-file
fileb://lambda_function.zip
```

lambda_function.py Same as in step 3

Name:Brijesh R Sharma **D15C** **Roll No: 28**



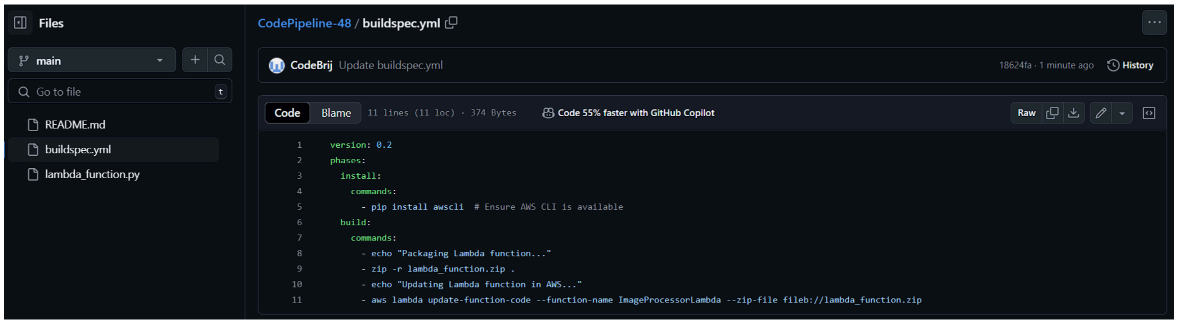
CodePipeline-48 / lambda_function.py

CodeBrij Create lambda_function.py

Code Blame 36 lines (28 loc) · 1.02 KB Code 55% faster with GitHub Copilot

Files: main — README.md, buildspec.yml, lambda_function.py

```python
import json
import logging

logger = logging.getLogger()
logger.setLevel(logging.INFO)

def lambda_handler(event, context):
    try:
        # Log the event details
        logger.info(f"Received event: {json.dumps(event)}")

        # Extract bucket name and object key (file name)
        bucket_name = event['Records'][0]['s3']['bucket']['name']
        object_key = event['Records'][0]['s3']['object']['key']

        logger.info(f"New image added: {object_key} in bucket: {bucket_name}")

        return {
            'statusCode': 200,
            'body': json.dumps('Image processed successfully.')
        }

    except KeyError as e:
        logger.error(f"KeyError - missing key in the event: {e}")
        return {
            'statusCode': 400,
```



CodePipeline-48 / buildspec.yml

CodeBrij Update buildspec.yml 18624fa · 1 minute ago History

Code Blame 11 lines (11 loc) · 374 Bytes Code 55% faster with GitHub Copilot

Files: main — README.md, buildspec.yml, lambda_function.py

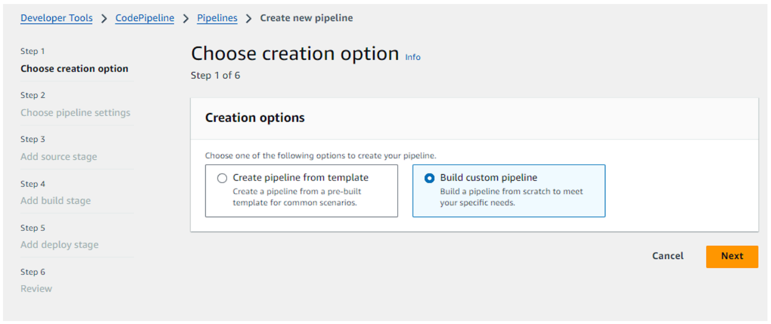
```yaml
version: 0.2
phases:
  install:
    commands:
      - pip install awscli  # Ensure AWS CLI is available
  build:
    commands:
      - echo "Packaging Lambda function..."
      - zip -r lambda_function.zip .
      - echo "Updating Lambda function in AWS..."
      - aws lambda update-function-code --function-name ImageProcessorLambda --zip-file fileb://lambda_function.zip
```

5. Create a CodePipeline:

- Go to **AWS CodePipeline** in the AWS Management Console and create a new pipeline.

Step 1:Choose Creation option.

- In creation option Select **Build Custom pipeline.**



Developer Tools > CodePipeline > Pipelines > Create new pipeline

Step 1 Choose creation option
Step 2 Choose pipeline settings
Step 3 Add source stage
Step 4 Add build stage
Step 5 Add deploy stage
Step 6 Review

Choose creation option Info
Step 1 of 6

Creation options

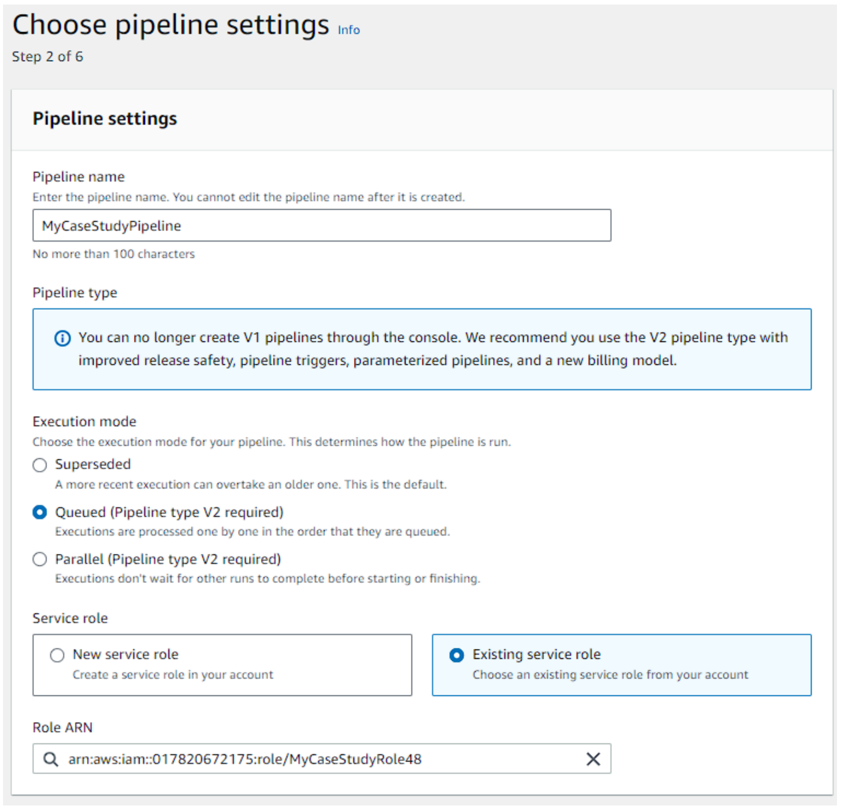
Choose one of the following options to create your pipeline.

Create pipeline from template — Create a pipeline from a pre-built template for common scenarios.
[✓ Build custom pipeline — Build a pipeline from scratch to meet your specific needs.]

Cancel Next

Step 2:Choose Pipeline Settings.

- Pipeline Name: **ImageDetectorPipeline** .
- Select Existing Role : **MyCaseStudyRole48** .
- Keep Rest all to default.



Choose pipeline settings Info

Step 2 of 6

Pipeline settings

Pipeline name

Enter the pipeline name. You cannot edit the pipeline name after it is created.

MyCaseStudyPipeline

No more than 100 characters

Pipeline type

You can no longer create V1 pipelines through the console. We recommend you use the V2 pipeline type with improved release safety, pipeline triggers, parameterized pipelines, and a new billing model.

Execution mode

Choose the execution mode for your pipeline. This determines how the pipeline is run.

○ Superseded
A more recent execution can overtake an older one. This is the default.

● Queued (Pipeline type V2 required)
Executions are processed one by one in the order that they are queued.

○ Parallel (Pipeline type V2 required)
Executions don't wait for other runs to complete before starting or finishing.

Service role

○ New service role
Create a service role in your account

● Existing service role
Choose an existing service role from your account

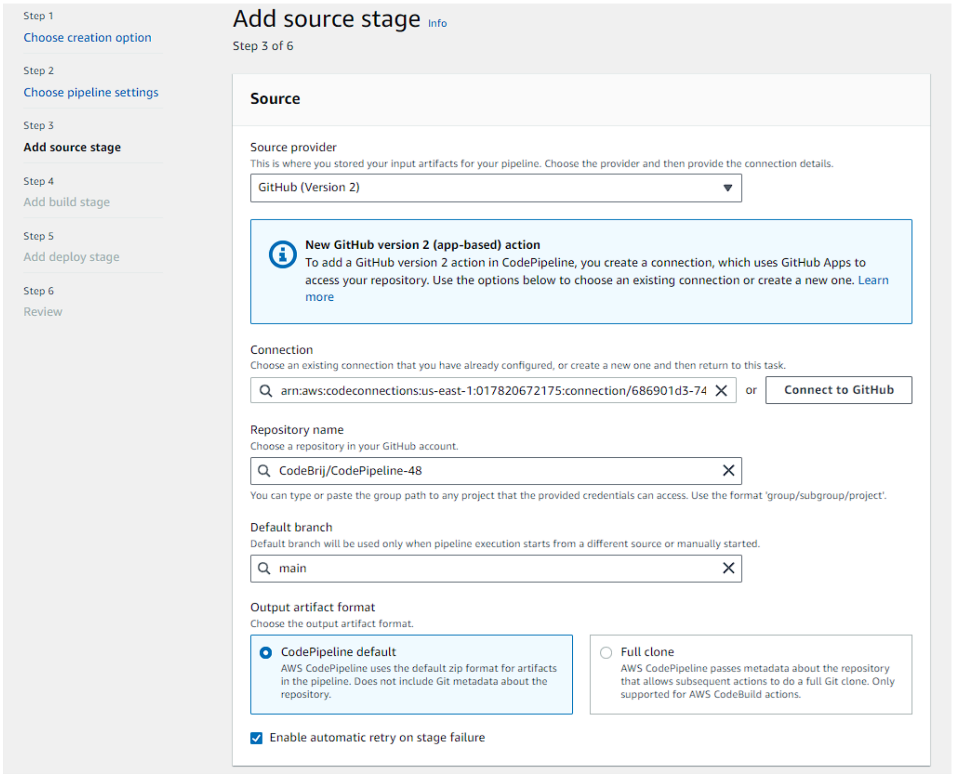
Role ARN

arn:aws:iam::017820672175:role/MyCaseStudyRole48

Step 3: Add Source Storage.

- Source provider: **GitHub (Version 2)** .
- Connect Your account where you have created the repository. **(CodeBrij)**
- Select Repository. **(CodeBrij/CodePipeline-48)**
- Select Branch to **main**.
- In Trigger Just add **main** in include.
- Keep Rest all to default.

Name:Brijesh R Sharma **D15C** **Roll No: 28**



Step 1
Choose creation option

Step 2
Choose pipeline settings

Step 3
Add source stage

Step 4
Add build stage

Step 5
Add deploy stage

Step 6
Review

Add source stage Info

Step 3 of 6

Source

Source provider
This is where you stored your input artifacts for your pipeline. Choose the provider and then provide the connection details.
GitHub (Version 2)

New GitHub version 2 (app-based) action
To add a GitHub version 2 action in CodePipeline, you create a connection, which uses GitHub Apps to access your repository. Use the options below to choose an existing connection or create a new one. Learn more

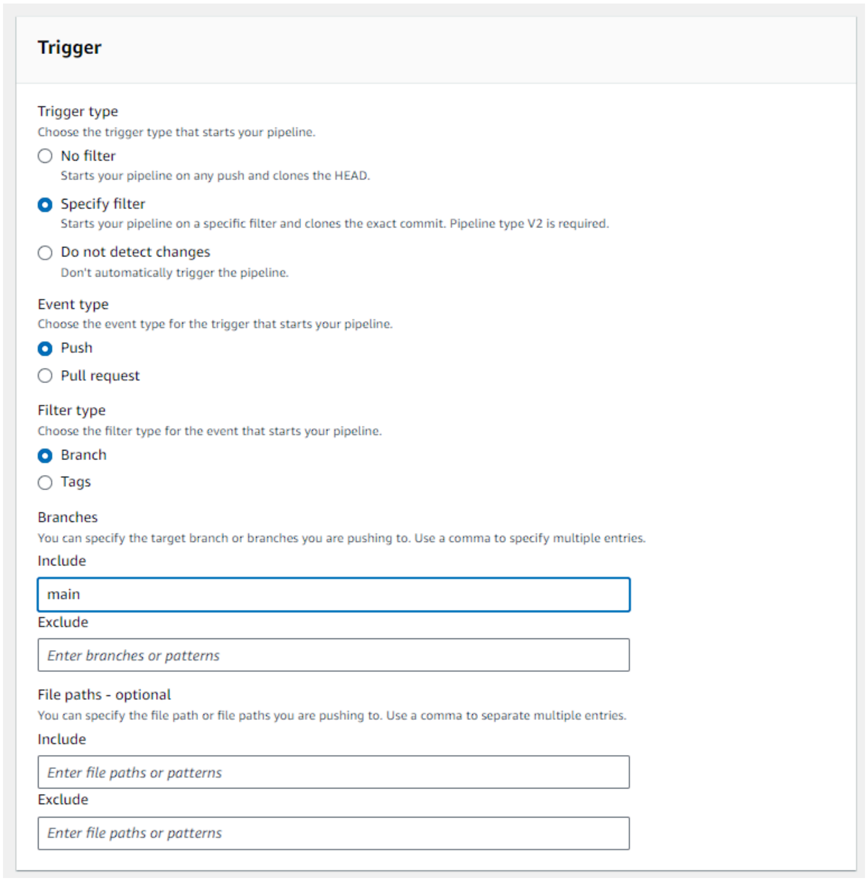
Connection
Choose an existing connection that you have already configured, or create a new one and then return to this task.
arn:aws:codeconnections:us-east-1:017820672175:connection/686901d3-74 or Connect to GitHub

Repository name
Choose a repository in your GitHub account.
CodeBrij/CodePipeline-48
You can type or paste the group path to any project that the provided credentials can access. Use the format 'group/subgroup/project'.

Default branch
Default branch will be used only when pipeline execution starts from a different source or manually started.
main

Output artifact format
Choose the output artifact format.
[✓ CodePipeline default] AWS CodePipeline uses the default zip format for artifacts in the pipeline. Does not include Git metadata about the repository.
Full clone — AWS CodePipeline passes metadata about the repository that allows subsequent actions to do a full Git clone. Only supported for AWS CodeBuild actions.

[✓] Enable automatic retry on stage failure



Trigger

Trigger type
Choose the trigger type that starts your pipeline.
No filter — Starts your pipeline on any push and clones the HEAD.
[✓ Specify filter] — Starts your pipeline on a specific filter and clones the exact commit. Pipeline type V2 is required.
Do not detect changes — Don't automatically trigger the pipeline.

Event type
Choose the event type for the trigger that starts your pipeline.
[✓ Push]
Pull request

Filter type
Choose the filter type for the event that starts your pipeline.
[✓ Branch]
Tags

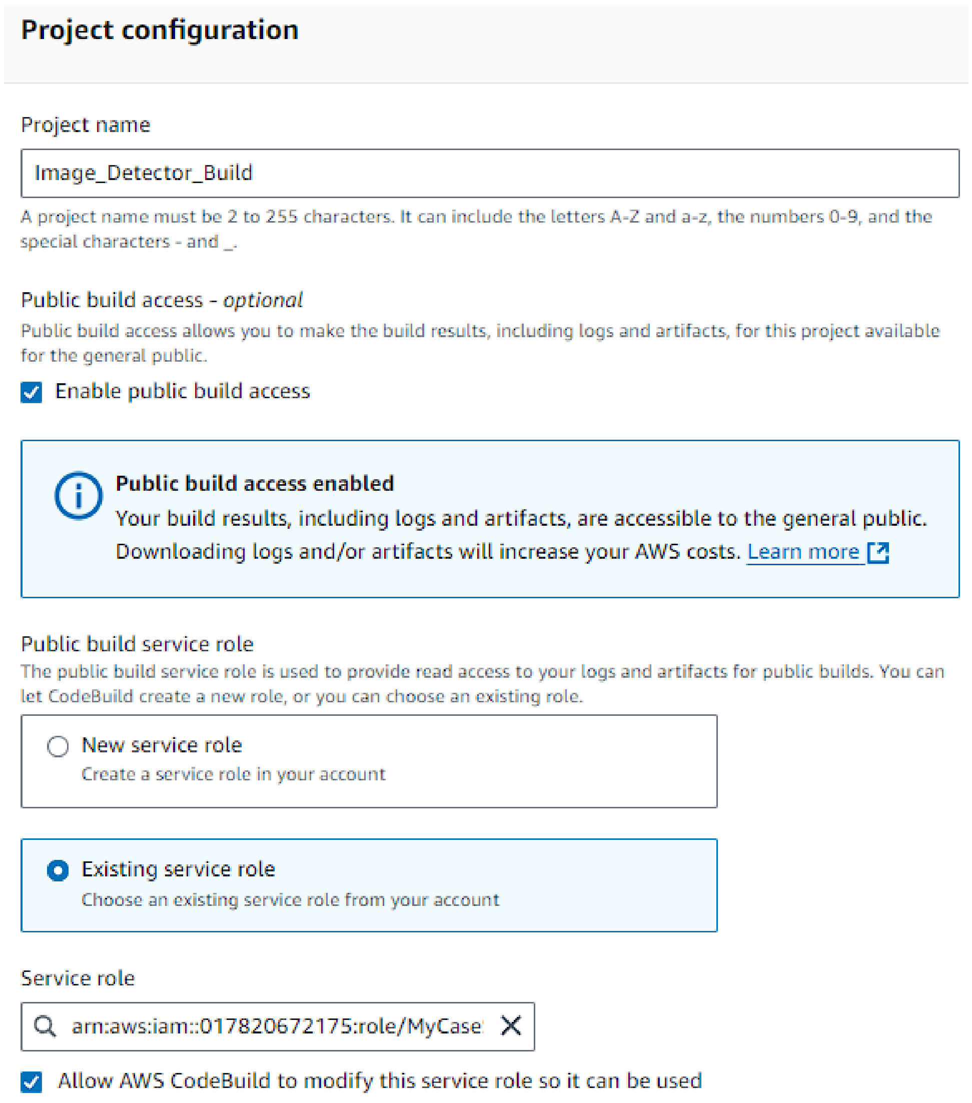
Branches
You can specify the target branch or branches you are pushing to. Use a comma to specify multiple entries.
Include
main
Exclude
Enter branches or patterns

File paths - optional
You can specify the file path or file paths you are pushing to. Use a comma to separate multiple entries.
Include
Enter file paths or patterns
Exclude
Enter file paths or patterns

Name:Brijesh R Sharma D15C Roll No: 28

Step 4: Add Build Stage.

- Select **Other build Provider**.
- Select **AWS CodeBuild**.
  - Now Click on **Create Project**.
  - Project name: **Image_Detector_Build**
  - Enable public access.
  - Select Existing Role : **AWS_Case_Study** On 2 Places.
  - Buildspec: **Use a buildespec file** .
  - Buildspec name: **buildspec.yml** .
  - Keep Rest all to Default.
- Select Created Project.
- Keep Rest all to default.


Project configuration

Project name

Image_Detector_Build

A project name must be 2 to 255 characters. It can include the letters A-Z and a-z, the numbers 0-9, and the special characters - and _.

Public build access - *optional*

Public build access allows you to make the build results, including logs and artifacts, for this project available for the general public.

☑ Enable public build access

Public build access enabled
Your build results, including logs and artifacts, are accessible to the general public. Downloading logs and/or artifacts will increase your AWS costs. Learn more

Public build service role

The public build service role is used to provide read access to your logs and artifacts for public builds. You can let CodeBuild create a new role, or you can choose an existing role.

○ New service role
Create a service role in your account

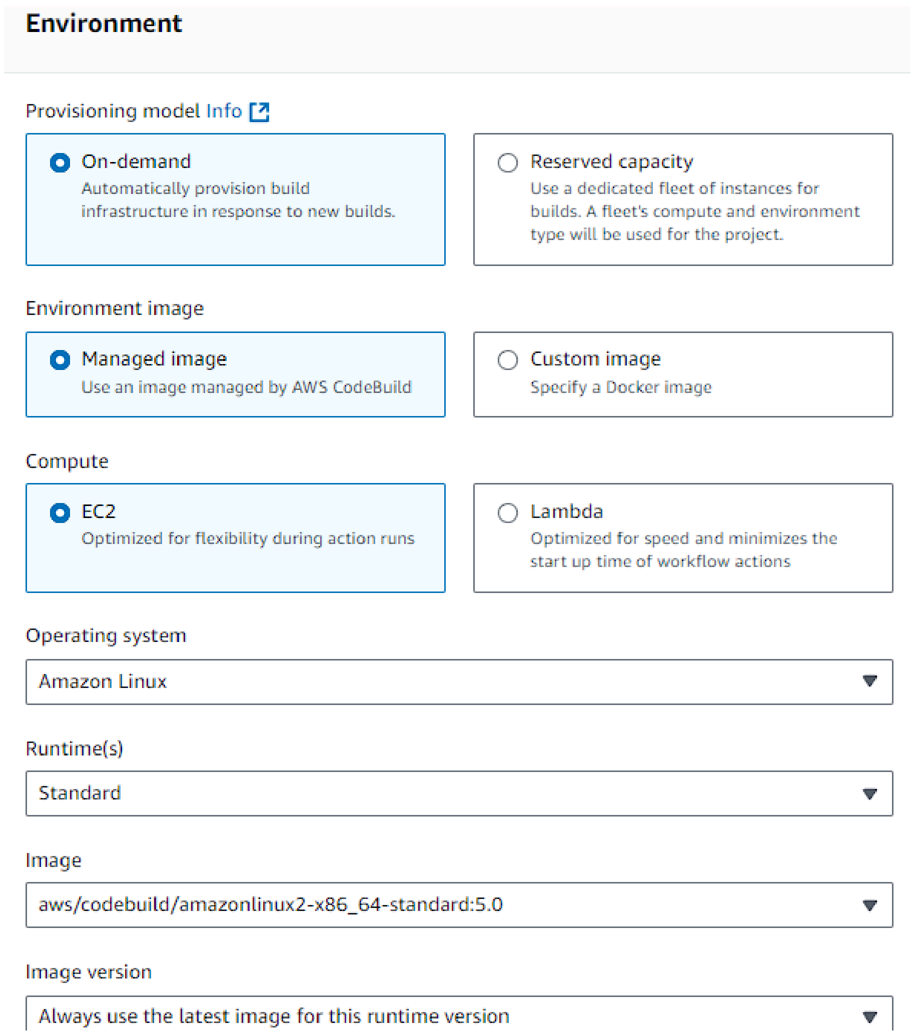
● Existing service role
Choose an existing service role from your account

Service role

arn:aws:iam::017820672175:role/MyCase

☑ Allow AWS CodeBuild to modify this service role so it can be used

Name:Brijesh R Sharma **D15C** **Roll No: 28**



Environment

Provisioning model Info

[✓ On-demand] Automatically provision build infrastructure in response to new builds.

Reserved capacity Use a dedicated fleet of instances for builds. A fleet's compute and environment type will be used for the project.

Environment image

[✓ Managed image] Use an image managed by AWS CodeBuild

Custom image Specify a Docker image

Compute

[✓ EC2] Optimized for flexibility during action runs

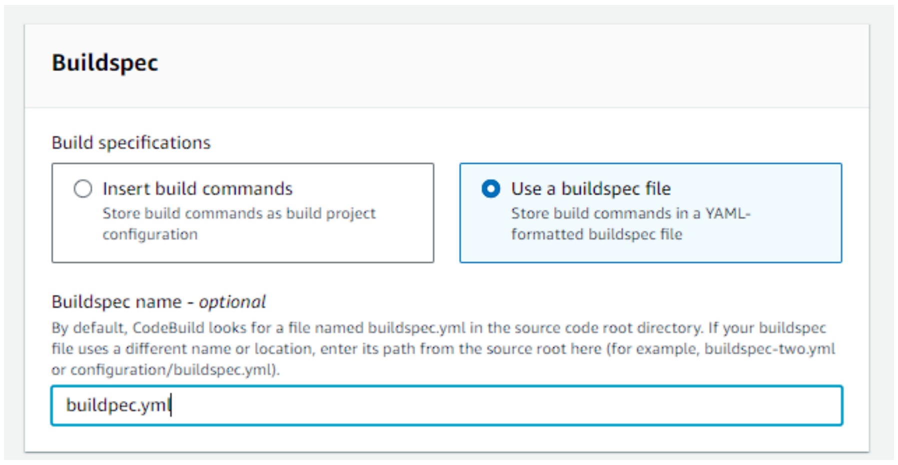
Lambda Optimized for speed and minimizes the start up time of workflow actions

Operating system: Amazon Linux

Runtime(s): Standard

Image: aws/codebuild/amazonlinux2-x86_64-standard:5.0

Image version: Always use the latest image for this runtime version



Buildspec

Build specifications

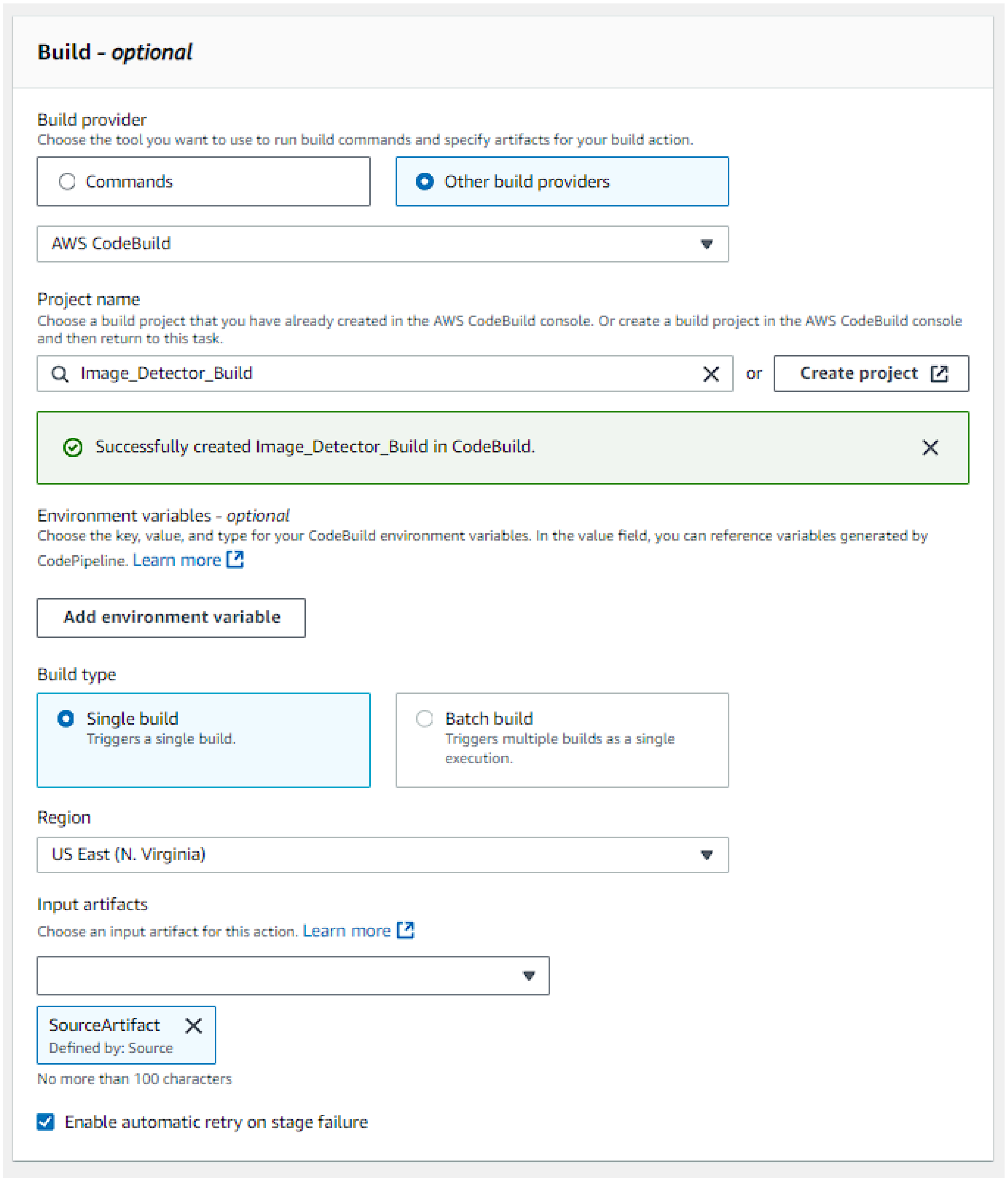
Insert build commands Store build commands as build project configuration

[✓ Use a buildspec file] Store build commands in a YAML-formatted buildspec file

Buildspec name - *optional*

By default, CodeBuild looks for a file named buildspec.yml in the source code root directory. If your buildspec file uses a different name or location, enter its path from the source root here (for example, buildspec-two.yml or configuration/buildspec.yml).

buildspec.yml



Build - *optional*

Build provider
Choose the tool you want to use to run build commands and specify artifacts for your build action.

○ Commands [✓ Other build providers]

AWS CodeBuild

Project name
Choose a build project that you have already created in the AWS CodeBuild console. Or create a build project in the AWS CodeBuild console and then return to this task.

Image_Detector_Build or Create project

Successfully created Image_Detector_Build in CodeBuild.

Environment variables - *optional*
Choose the key, value, and type for your CodeBuild environment variables. In the value field, you can reference variables generated by CodePipeline. Learn more

Add environment variable

Build type

[✓ Single build] Triggers a single build.

○ Batch build Triggers multiple builds as a single execution.

Region
US East (N. Virginia)

Input artifacts
Choose an input artifact for this action. Learn more

SourceArtifact
Defined by: Source

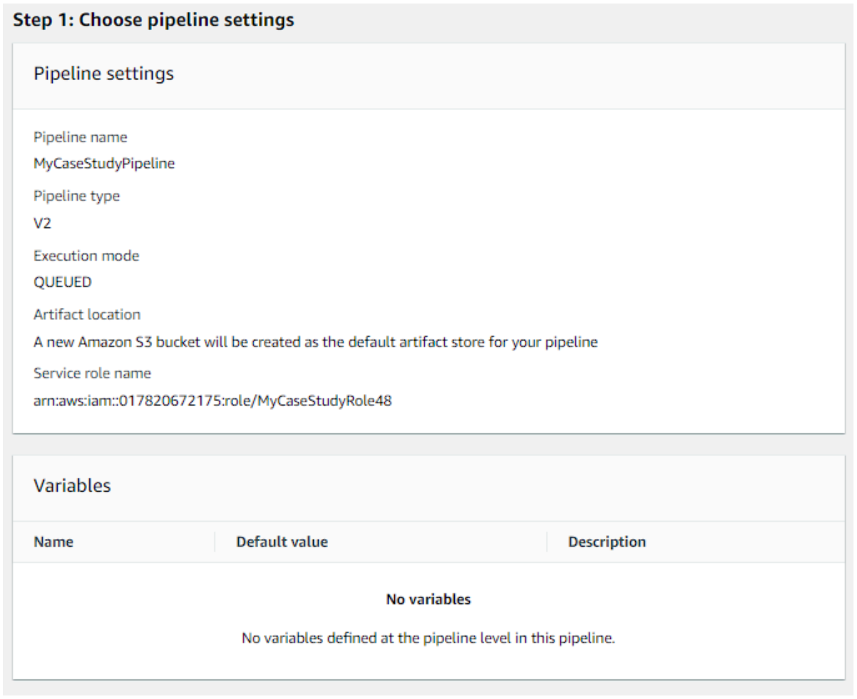
No more than 100 characters

☑ Enable automatic retry on stage failure

Step 5: Skip The Deploy Stage.

Step 6: Review the Pipeline and Click on Create.

Name:Brijesh R Sharma **D15C** **Roll No: 28**



Step 1: Choose pipeline settings

Pipeline settings

Pipeline name
MyCaseStudyPipeline

Pipeline type
V2

Execution mode
QUEUED

Artifact location
A new Amazon S3 bucket will be created as the default artifact store for your pipeline

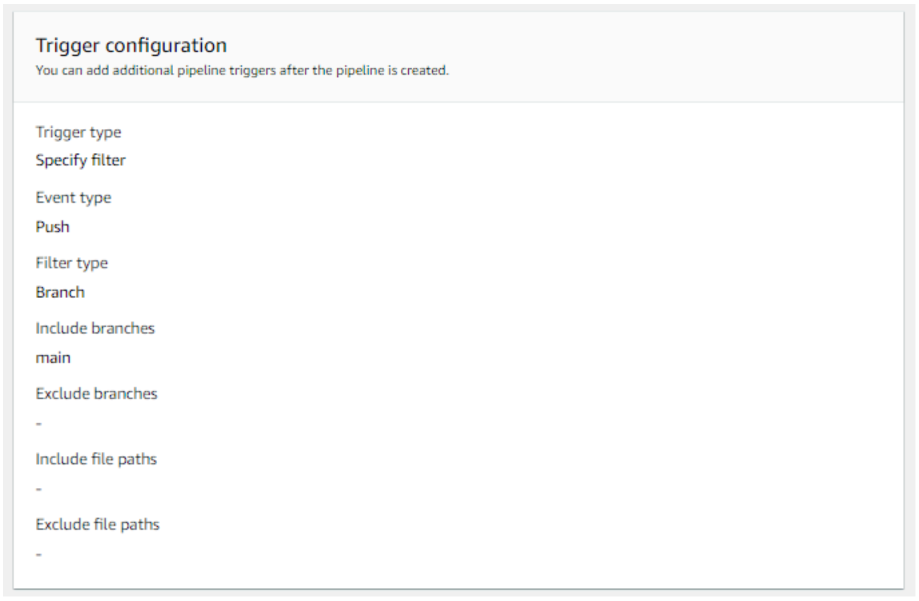
Service role name
arn:aws:iam::017820672175:role/MyCaseStudyRole48

Variables

Name	Default value	Description

No variables

No variables defined at the pipeline level in this pipeline.



Trigger configuration
You can add additional pipeline triggers after the pipeline is created.

Trigger type
Specify filter

Event type
Push

Filter type
Branch

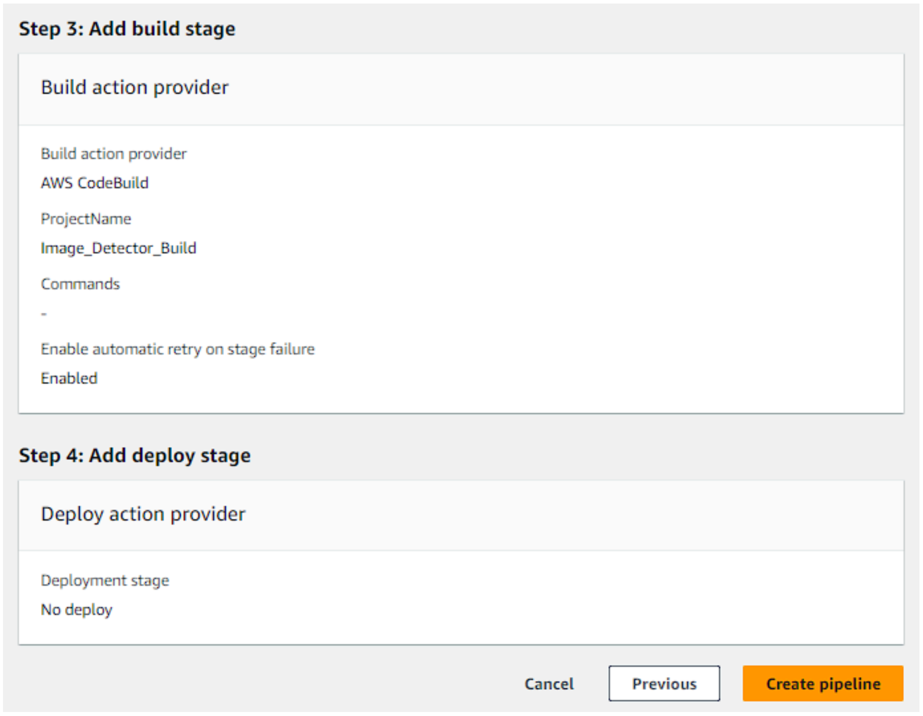
Include branches
main

Exclude branches
-

Include file paths
-

Exclude file paths
-

Name:Brijesh R Sharma **D15C** **Roll No: 28**



Step 3: Add build stage

Build action provider

Build action provider
AWS CodeBuild

ProjectName
Image_Detector_Build

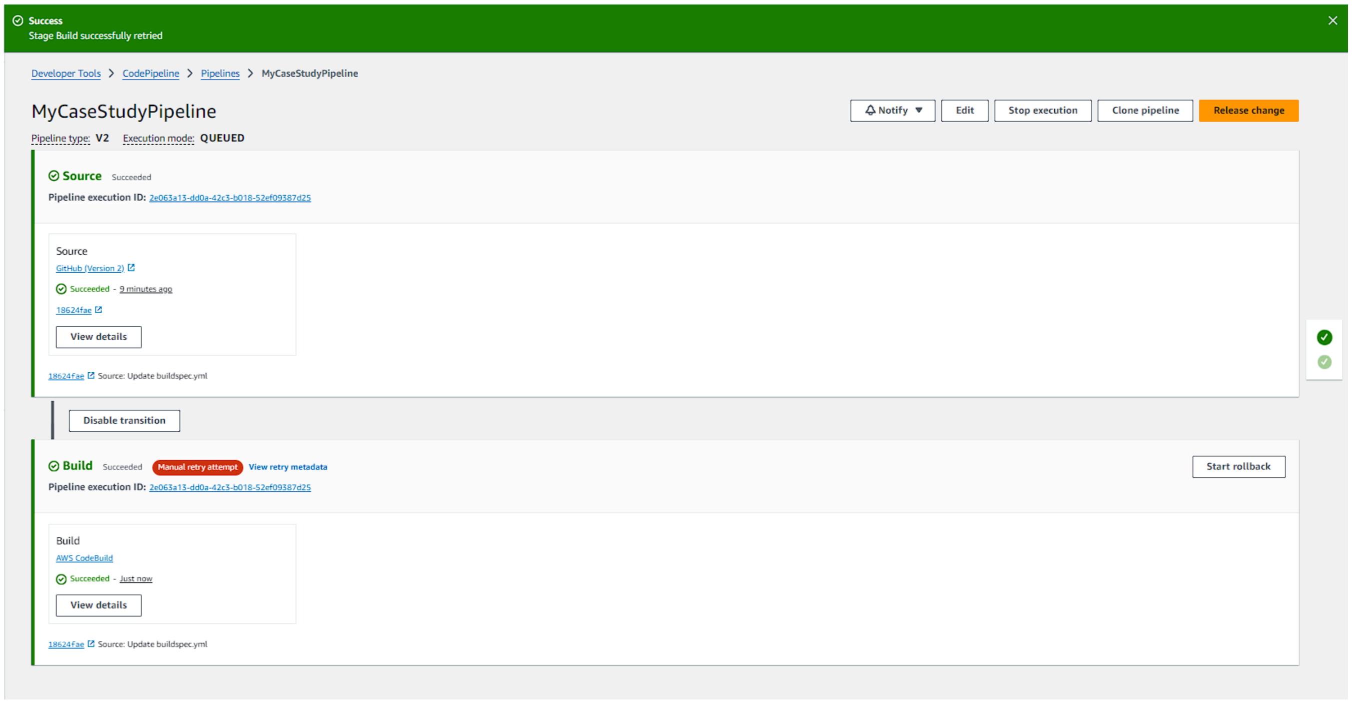
Commands
-

Enable automatic retry on stage failure
Enabled

Step 4: Add deploy stage

Deploy action provider

Deployment stage
No deploy



Success
Stage Build successfully retried

Developer Tools > CodePipeline > Pipelines > MyCaseStudyPipeline

MyCaseStudyPipeline

Pipeline type: V2 Execution mode: QUEUED

Source Succeeded
Pipeline execution ID: 2e063a13-dd0a-42c3-b018-52ef09387d25

Source
GitHub (Version 2)
Succeeded - 9 minutes ago
18624fae

18624fae Source: Update buildspec.yml

Build Succeeded Manual retry attempt View retry metadata
Pipeline execution ID: 2e063a13-dd0a-42c3-b018-52ef09387d25

Build
AWS CodeBuild
Succeeded - Just now

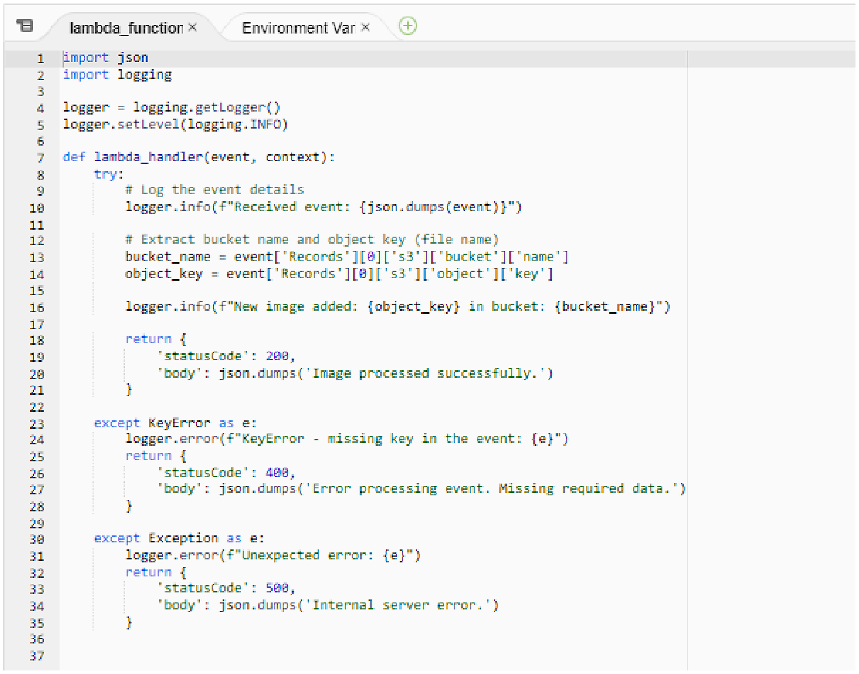
18624fae Source: Update buildspec.yml

6.Test the Pipeline:

- Push/Update code to your GitHub repository.

- CodePipeline will trigger the CodeBuild project, which will package the code and update the Lambda function using the AWS CLI command aws lambda update-function-code.

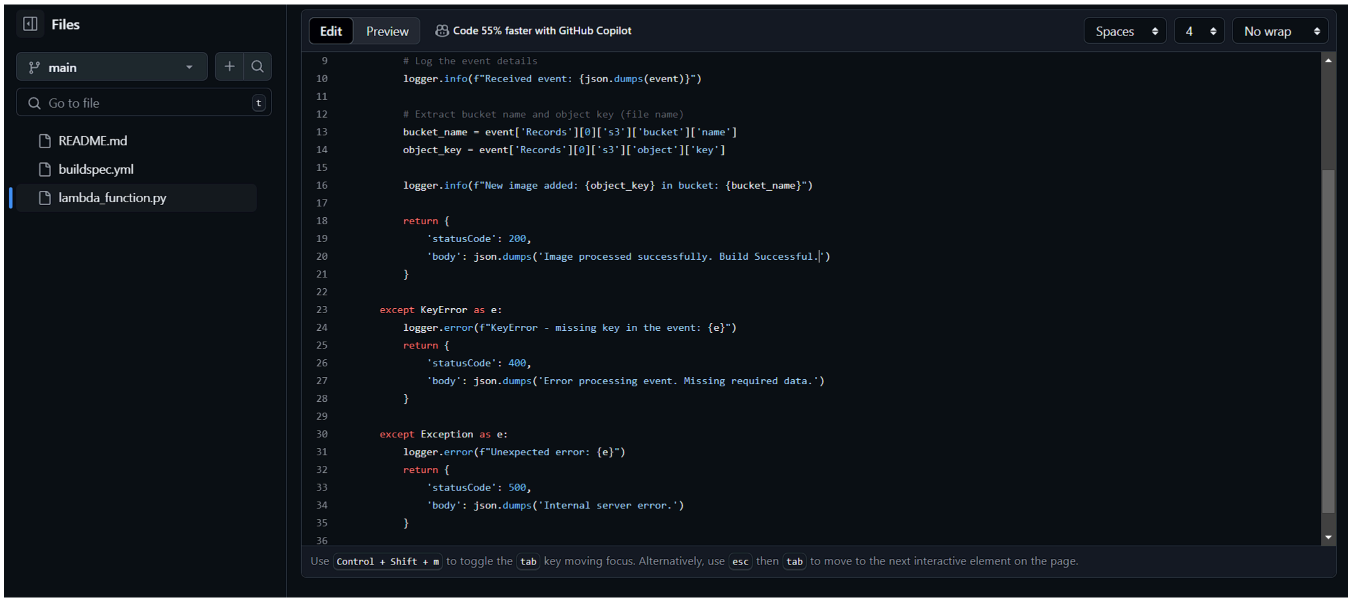
Lambda function before changes



lambda_function × Environment Var ×

```python
import json
import logging

logger = logging.getLogger()
logger.setLevel(logging.INFO)

def lambda_handler(event, context):
    try:
        # Log the event details
        logger.info(f"Received event: {json.dumps(event)}")

        # Extract bucket name and object key (file name)
        bucket_name = event['Records'][0]['s3']['bucket']['name']
        object_key = event['Records'][0]['s3']['object']['key']

        logger.info(f"New image added: {object_key} in bucket: {bucket_name}")

        return {
            'statusCode': 200,
            'body': json.dumps('Image processed successfully.')
        }

    except KeyError as e:
        logger.error(f"KeyError - missing key in the event: {e}")
        return {
            'statusCode': 400,
            'body': json.dumps('Error processing event. Missing required data.')
        }

    except Exception as e:
        logger.error(f"Unexpected error: {e}")
        return {
            'statusCode': 500,
            'body': json.dumps('Internal server error.')
        }
```

Code Change in Repository

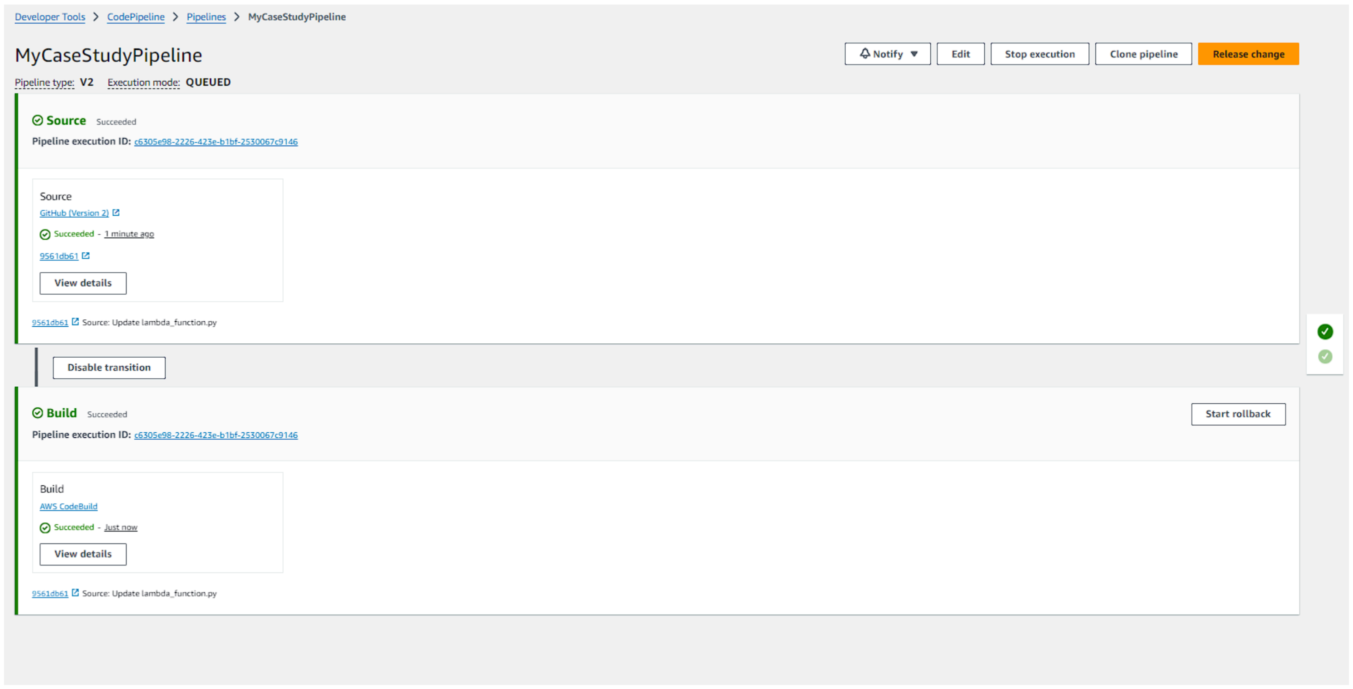


```python
        # Log the event details
        logger.info(f"Received event: {json.dumps(event)}")

        # Extract bucket name and object key (file name)
        bucket_name = event['Records'][0]['s3']['bucket']['name']
        object_key = event['Records'][0]['s3']['object']['key']

        logger.info(f"New image added: {object_key} in bucket: {bucket_name}")

        return {
            'statusCode': 200,
            'body': json.dumps('Image processed successfully. Build Successful.')
        }

    except KeyError as e:
        logger.error(f"KeyError - missing key in the event: {e}")
        return {
            'statusCode': 400,
            'body': json.dumps('Error processing event. Missing required data.')
        }

    except Exception as e:
        logger.error(f"Unexpected error: {e}")
        return {
            'statusCode': 500,
            'body': json.dumps('Internal server error.')
        }
```

Use Control + Shift + m to toggle the tab key moving focus. Alternatively, use esc then tab to move to the next interactive element on the page.

Auto Triggered Pipeline

Name:Brijesh R Sharma **D15C** **Roll No: 28**



Developer Tools > CodePipeline > Pipelines > MyCaseStudyPipeline

MyCaseStudyPipeline

Pipeline type: V2 Execution mode: QUEUED

Source Succeeded
Pipeline execution ID: c6305e98-2226-423e-b1bf-2530067c9146

Source
GitHub (Version 2)
Succeeded - 1 minute ago
9561db61

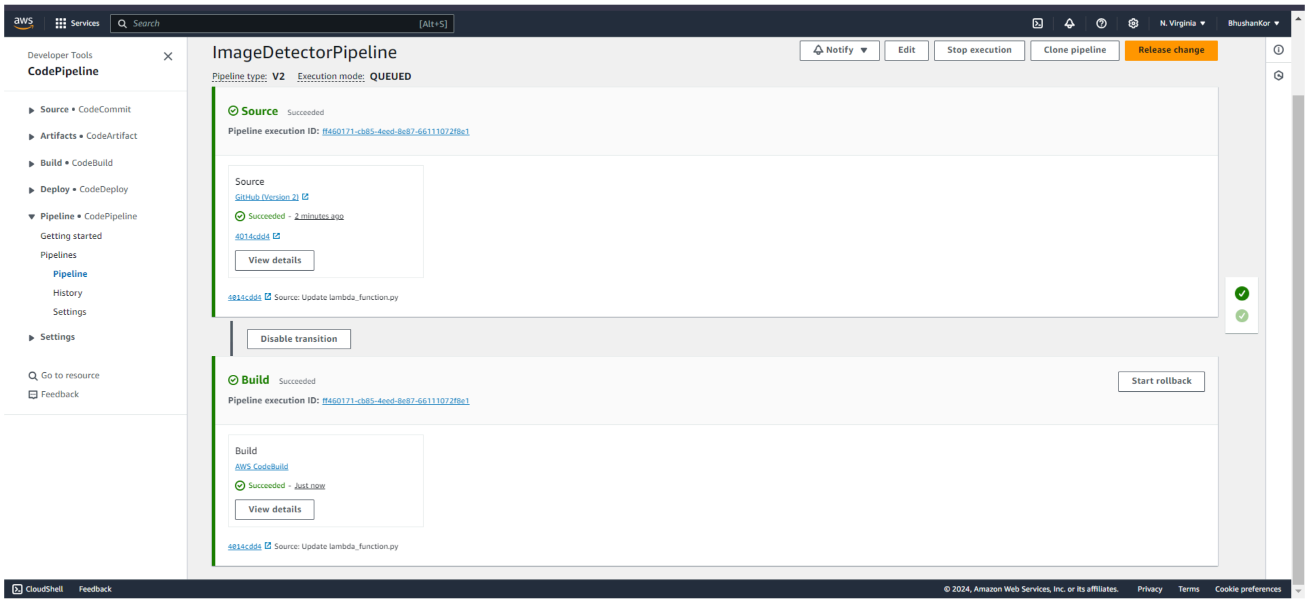
9561db61 Source: Update lambda_function.py

Build Succeeded
Pipeline execution ID: c6305e98-2226-423e-b1bf-2530067c9146

Build
AWS CodeBuild
Succeeded - Just now

9561db61 Source: Update lambda_function.py

Successful Build.



ImageDetectorPipeline

Pipeline type: V2 Execution mode: QUEUED

Source Succeeded
Pipeline execution ID: ff460171-cb85-4eed-8e87-66111072f8e1

Source
GitHub (Version 2)
Succeeded - 2 minutes ago
4014cdd4

4014cdd4 Source: Update lambda_function.py

Build Succeeded
Pipeline execution ID: ff460171-cb85-4eed-8e87-66111072f8e1

Build
AWS CodeBuild
Succeeded - Just now

4014cdd4 Source: Update lambda_function.py

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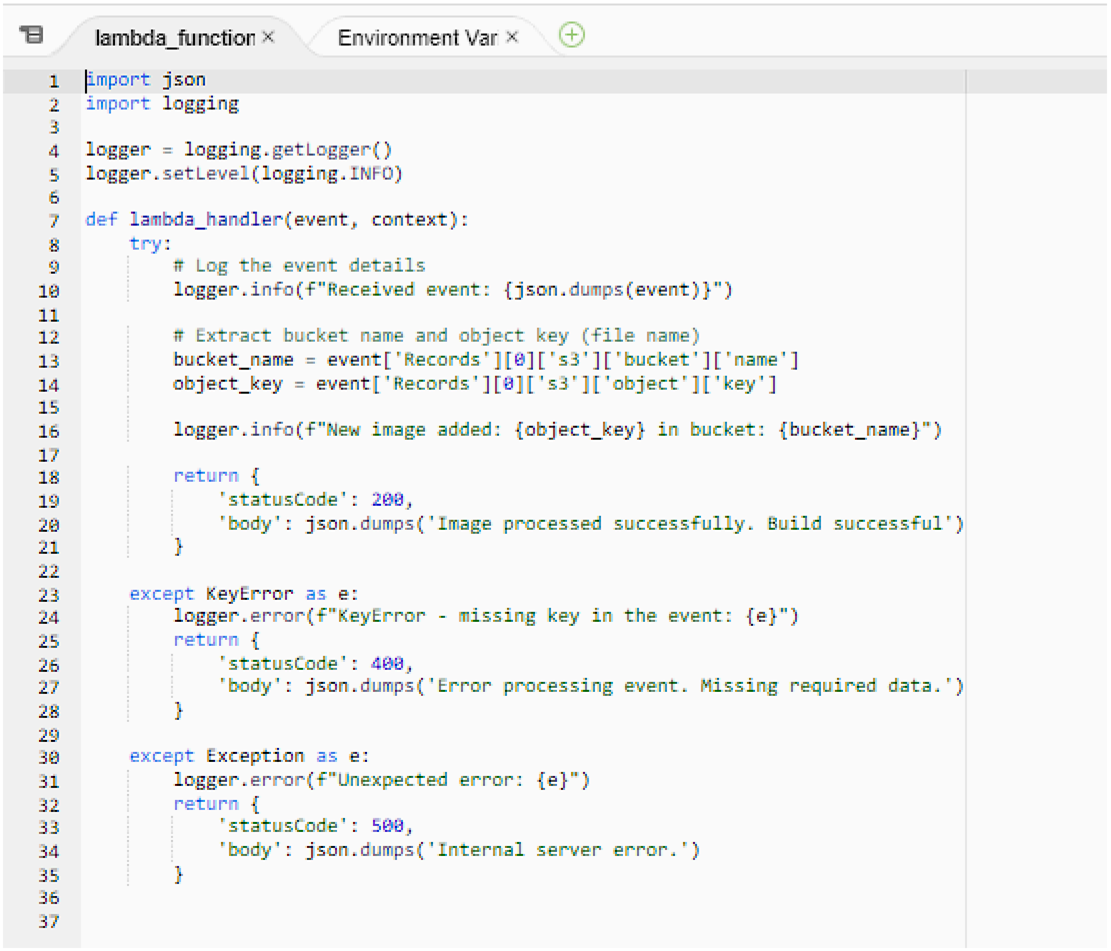
Lambda After push of new code in repository .



```python
import json
import logging

logger = logging.getLogger()
logger.setLevel(logging.INFO)

def lambda_handler(event, context):
    try:
        # Log the event details
        logger.info(f"Received event: {json.dumps(event)}")

        # Extract bucket name and object key (file name)
        bucket_name = event['Records'][0]['s3']['bucket']['name']
        object_key = event['Records'][0]['s3']['object']['key']

        logger.info(f"New image added: {object_key} in bucket: {bucket_name}")

        return {
            'statusCode': 200,
            'body': json.dumps('Image processed successfully. Build successful')
        }

    except KeyError as e:
        logger.error(f"KeyError - missing key in the event: {e}")
        return {
            'statusCode': 400,
            'body': json.dumps('Error processing event. Missing required data.')
        }

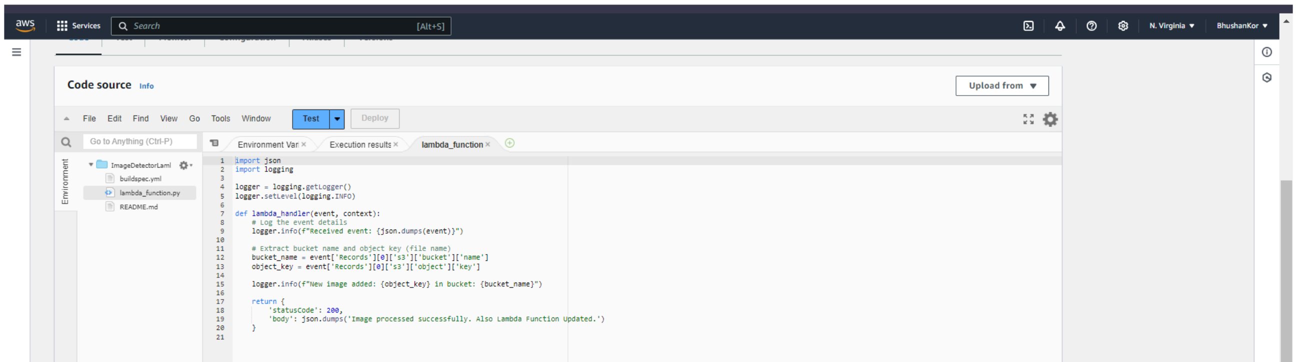
    except Exception as e:
        logger.error(f"Unexpected error: {e}")
        return {
            'statusCode': 500,
            'body': json.dumps('Internal server error.')
        }
```

Conclusion:

In this case study, we successfully implemented a serverless image processing workflow using AWS Lambda, S3, and CodePipeline. The solution demonstrated how Lambda functions can be triggered by S3 events, allowing real-time image processing without manual intervention. By leveraging CodePipeline, we automated the deployment of updates to the Lambda function, ensuring a streamlined CI/CD process. Testing confirmed that the workflow functions as expected, with images uploaded to S3 triggering the Lambda function, which logs the event and processes the image.

Guidelines:

- **Use AWS Personal.**



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    logger.info(f"New image added: {object_key} in bucket: {bucket_name}")

    return {
        'statusCode': 200,
        'body': json.dumps('Image processed successfully. Also Lambda Function Updated.')
    }
```

- **IAM Role Creation**:
  - **Why It's Important**: The IAM role is critical as it grants the necessary permissions for Lambda, CodeBuild, and CodePipeline to interact with each other and with other AWS services like S3. Without proper permissions, the workflow will not function, and components will fail to trigger or deploy.
  - **Guidelines**:
    - Attach policies such as **`AWSLambda_FullAccess`**, **`AmazonS3FullAccess`**, **`AmazonCodeBuildAdminAccess`**, **`AmazonCodePipeline_FullAccess`**, and **`CloudWatchLogsFullAccess`** to allow access to Lambda, S3, CodeBuild, and CodePipeline.
    - Ensure that the trust relationship includes both **`codepipeline.amazonaws.com`** and **`codebuild.amazonaws.com`** services to allow these services to assume the role.