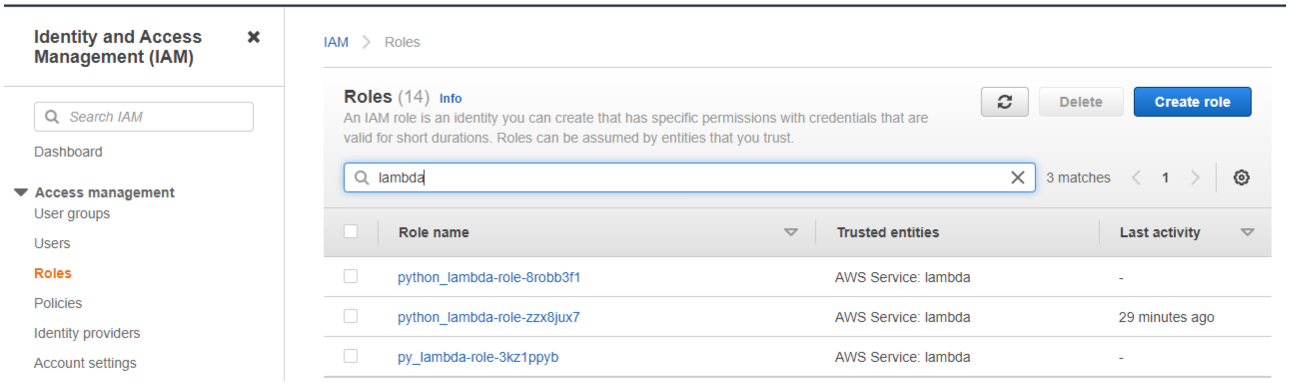
Steps-

1. Open up the IAM Console and under Roles, choose the Role we previously created for the Python Lambda Function.

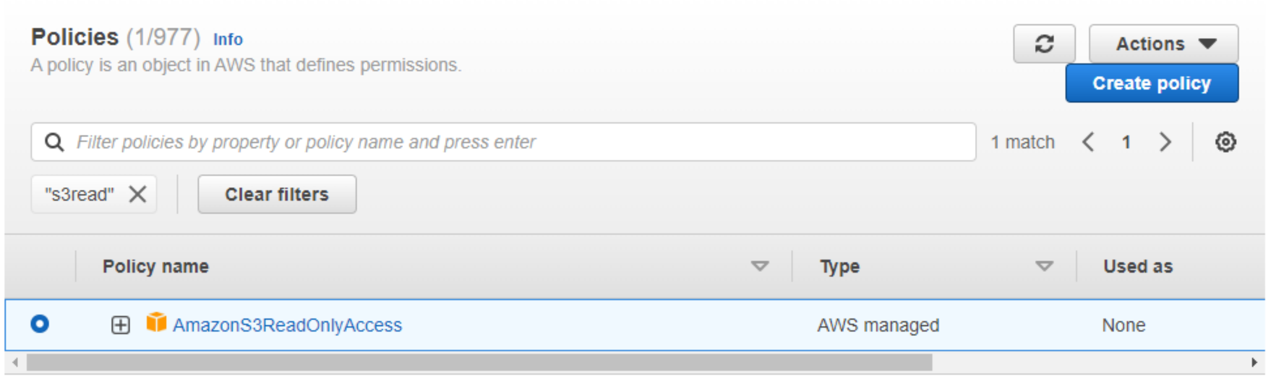


Roles (14) Info

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.

lambda — 3 matches

Role name	Trusted entities	Last activity
python_lambda-role-8robb3f1	AWS Service: lambda	-
python_lambda-role-zzx8jux7	AWS Service: lambda	29 minutes ago
py_lambda-role-3kz1ppyb	AWS Service: lambda	-

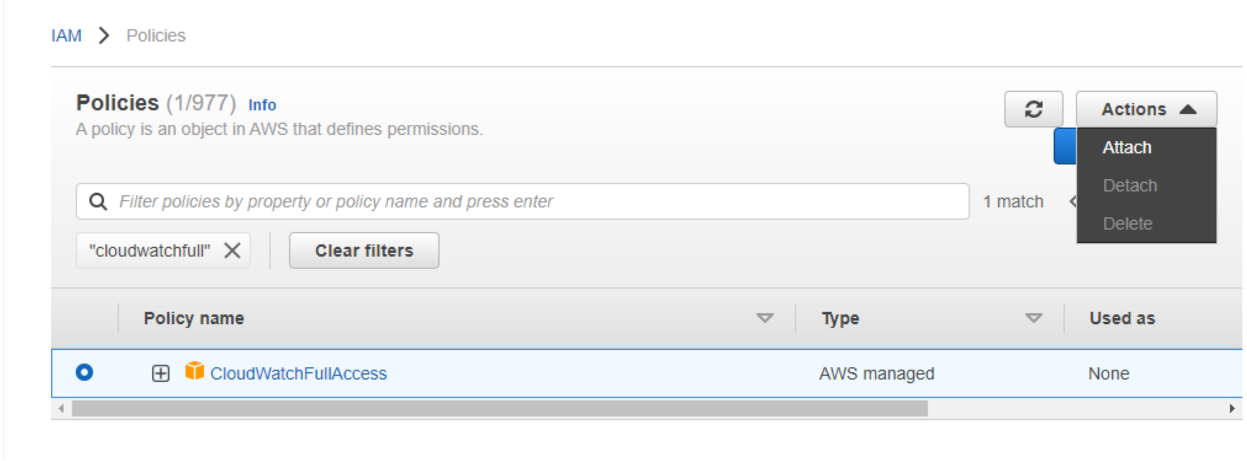


Policies (1/977) Info

A policy is an object in AWS that defines permissions.

"s3read" — 1 match

Policy name	Type	Used as
AmazonS3ReadOnlyAccess	AWS managed	None

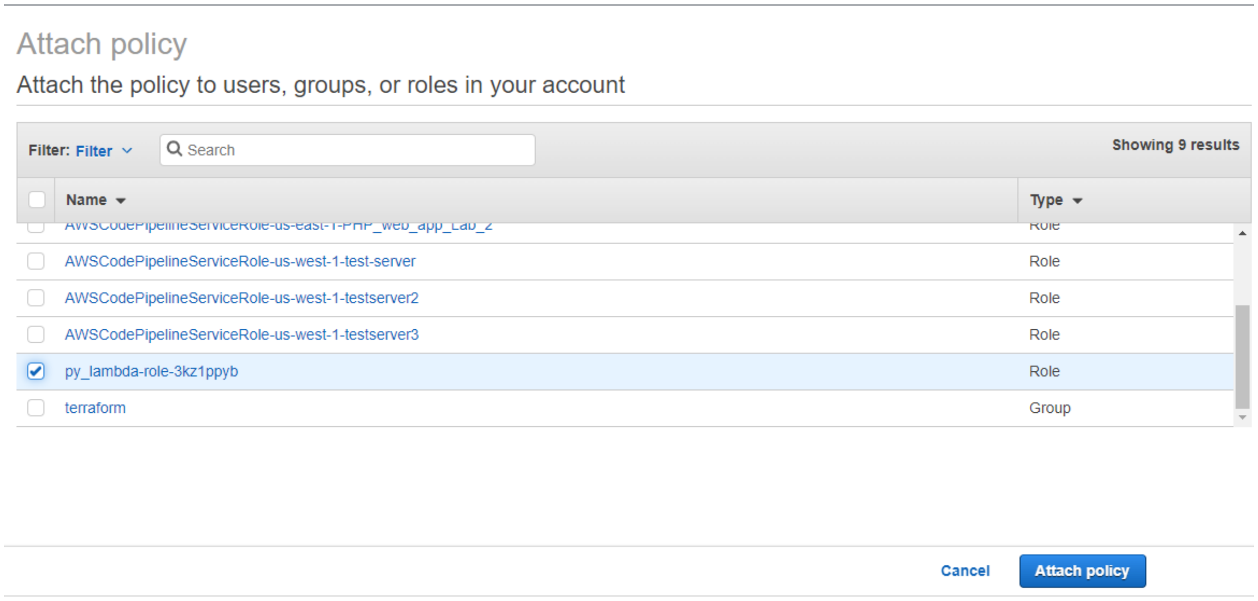


Policies (1/977) Info

A policy is an object in AWS that defines permissions.

"cloudwatchfull" — 1 match

Policy name	Type	Used as
CloudWatchFullAccess	AWS managed	None

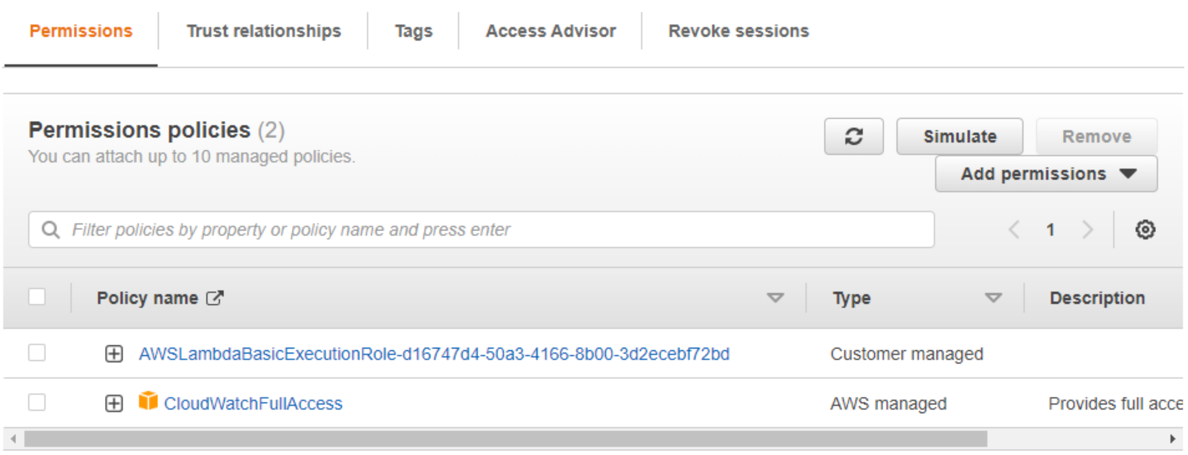


Attach policy

Attach the policy to users, groups, or roles in your account

Filter: Filter | Search | Showing 9 results

	Name	Type
☐	AWSCodePipelineServiceRole-us-east-1-PHP_web_app_Lab_2	Role
☐	AWSCodePipelineServiceRole-us-west-1-test-server	Role
☐	AWSCodePipelineServiceRole-us-west-1-testserver2	Role
☐	AWSCodePipelineServiceRole-us-west-1-testserver3	Role
✓	py_lambda-role-3kz1ppyb	Role
☐	terraform	Group



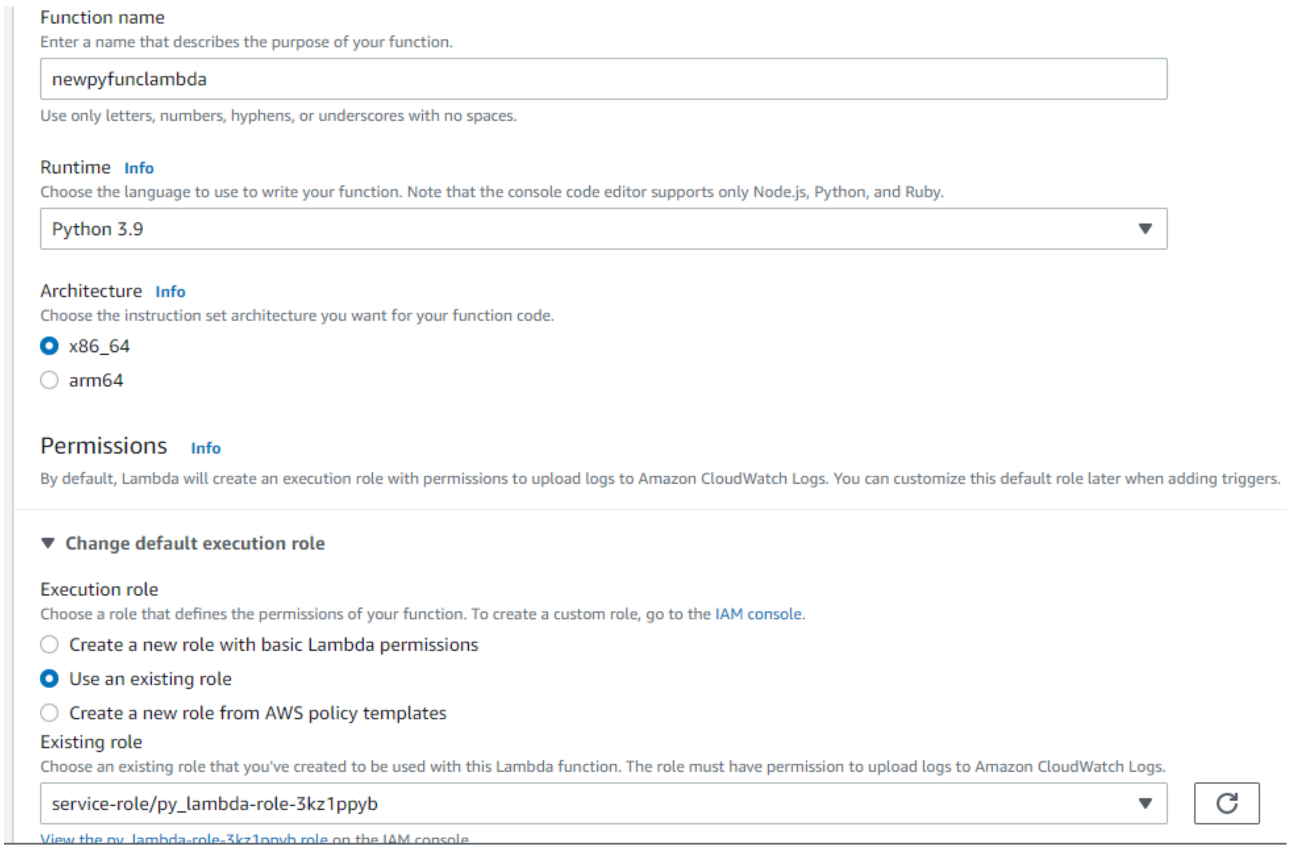
Permissions policies (2)

You can attach up to 10 managed policies.

	Policy name	Type	Description
☐	AWSLambdaBasicExecutionRole-d16747d4-50a3-4166-8b00-3d2ecebf72bd	Customer managed	
☐	CloudWatchFullAccess	AWS managed	Provides full acce

Under Attach Policies, add S3-ReadOnly and CloudWatchFull permissions to this role.

2. Open up AWS Lambda and create a new Python function


Function name
Enter a name that describes the purpose of your function.
newpyfunclambda
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 3.9

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

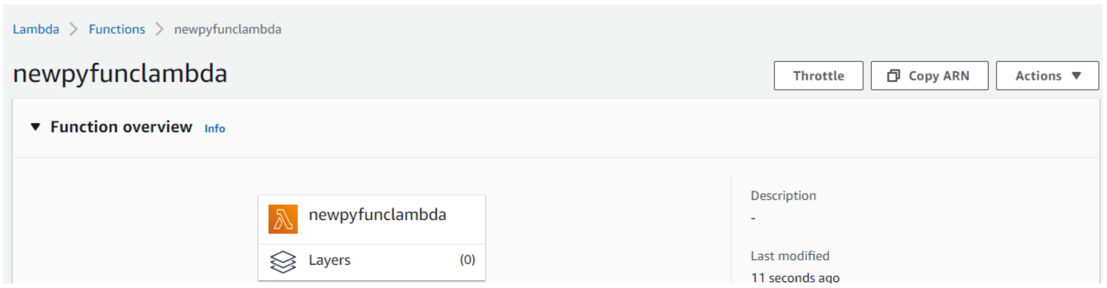
Permissions Info
By default, Lambda will create an execution role with permissions to upload logs to Amazon CloudWatch Logs. You can customize this default role later when adding triggers.

▼ 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.
service-role/py_lambda-role-3kz1ppyb

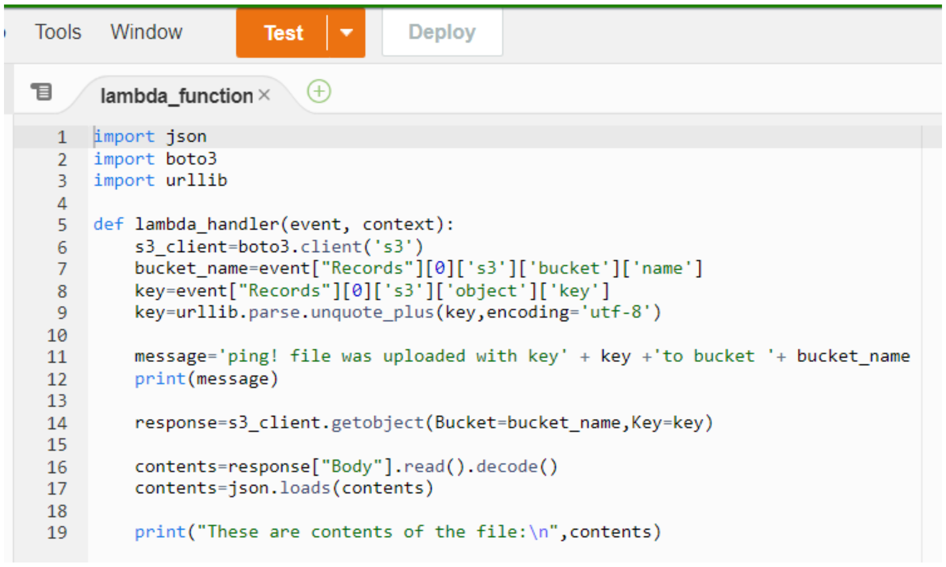
Under Execution Role, choose the existing role, the one which was previously created and to which we just added permissions.

3. The function is up and running.


Lambda > Functions > newpyfunclambda
newpyfunclambda

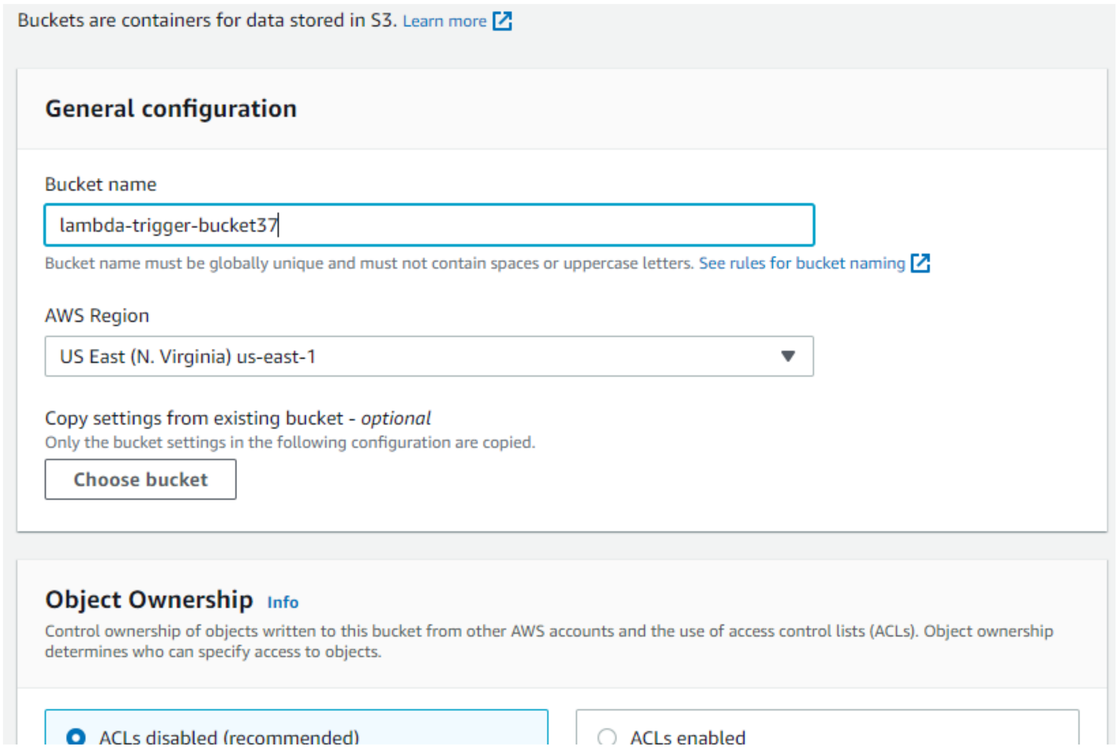
▼ Function overview Info
newpyfunclambda
Layers (0)
Description
-
Last modified
11 seconds ago

4. Make the following changes to the function and click on the deploy button. This code basically logs a message and logs the contents of a JSON file which is uploaded to an S3 Bucket.



```
import json
import boto3
import urllib

def lambda_handler(event, context):
    s3_client=boto3.client('s3')
    bucket_name=event["Records"][0]['s3']['bucket']['name']
    key=event["Records"][0]['s3']['object']['key']
    key=urllib.parse.unquote_plus(key,encoding='utf-8')

    message='ping! file was uploaded with key' + key +'to bucket '+ bucket_name
    print(message)

    response=s3_client.getobject(Bucket=bucket_name,Key=key)

    contents=response["Body"].read().decode()
    contents=json.loads(contents)

    print("These are contents of the file:\n",contents)
```

5. Open up the S3 Console and create a new bucket


Buckets are containers for data stored in S3. Learn more

General configuration

Bucket name: lambda-trigger-bucket37

Bucket name must be globally unique and must not contain spaces or uppercase letters. See rules for bucket naming

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

Copy settings from existing bucket - *optional*

Only the bucket settings in the following configuration are copied.

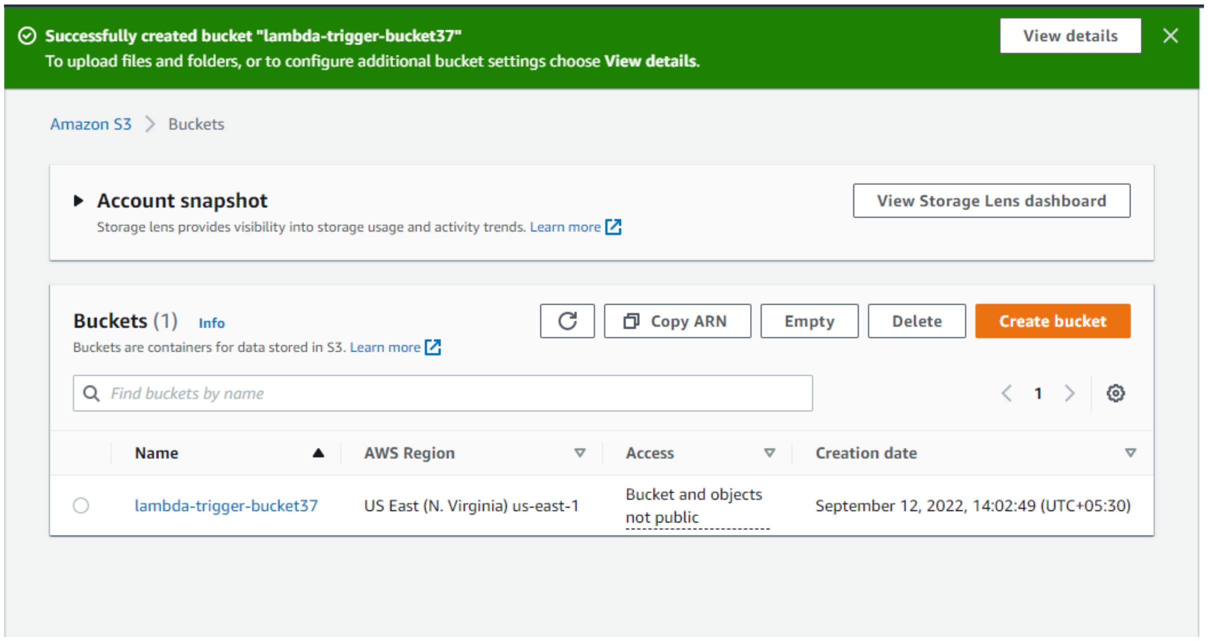
Object Ownership Info

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.

[✓ ACLs disabled (recommended)] ACLs enabled

6. With all general settings, create the bucket in the same region as the function.

7. Click on the created bucket and under properties, look for events.



Successfully created bucket "lambda-trigger-bucket37"
To upload files and folders, or to configure additional bucket settings choose **View details**.

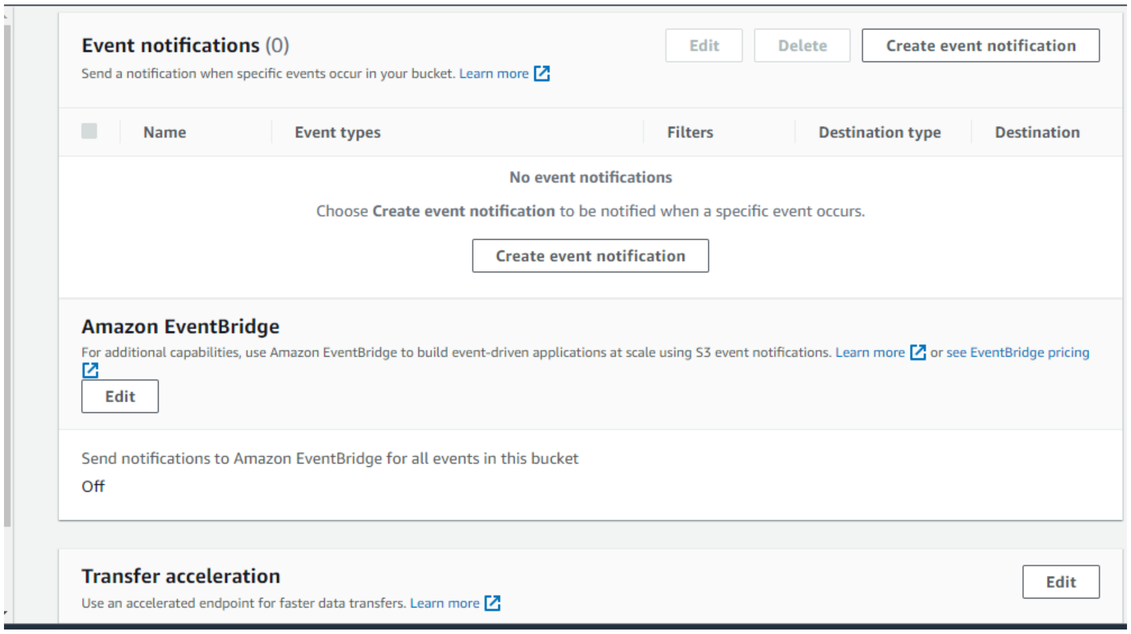
Amazon S3 > Buckets

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

Buckets (1) Info
Buckets are containers for data stored in S3. Learn more

Name	AWS Region	Access	Creation date
lambda-trigger-bucket37	US East (N. Virginia) us-east-1	Bucket and objects not public	September 12, 2022, 14:02:49 (UTC+05:30)

Click on Create Event Notification.



Event notifications (0)
Send a notification when specific events occur in your bucket. Learn more

Name	Event types	Filters	Destination type	Destination

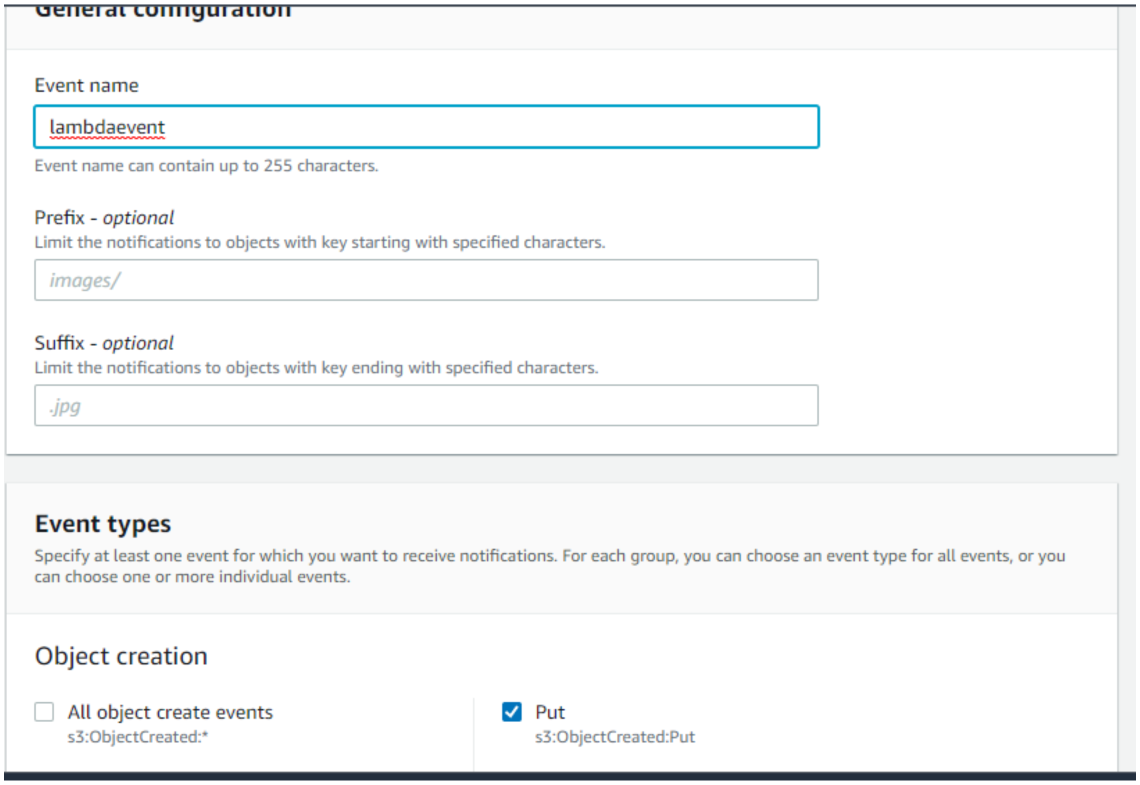
No event notifications
Choose **Create event notification** to be notified when a specific event occurs.

Amazon EventBridge
For additional capabilities, use Amazon EventBridge to build event-driven applications at scale using S3 event notifications. Learn more or see EventBridge pricing

Send notifications to Amazon EventBridge for all events in this bucket
Off

Transfer acceleration
Use an accelerated endpoint for faster data transfers. Learn more

8. Mention an event name and check Put under event types.


General configuration

Event name

lambdaevent

Event name can contain up to 255 characters.

Prefix - *optional*

Limit the notifications to objects with key starting with specified characters.

images/

Suffix - *optional*

Limit the notifications to objects with key ending with specified characters.

.jpg

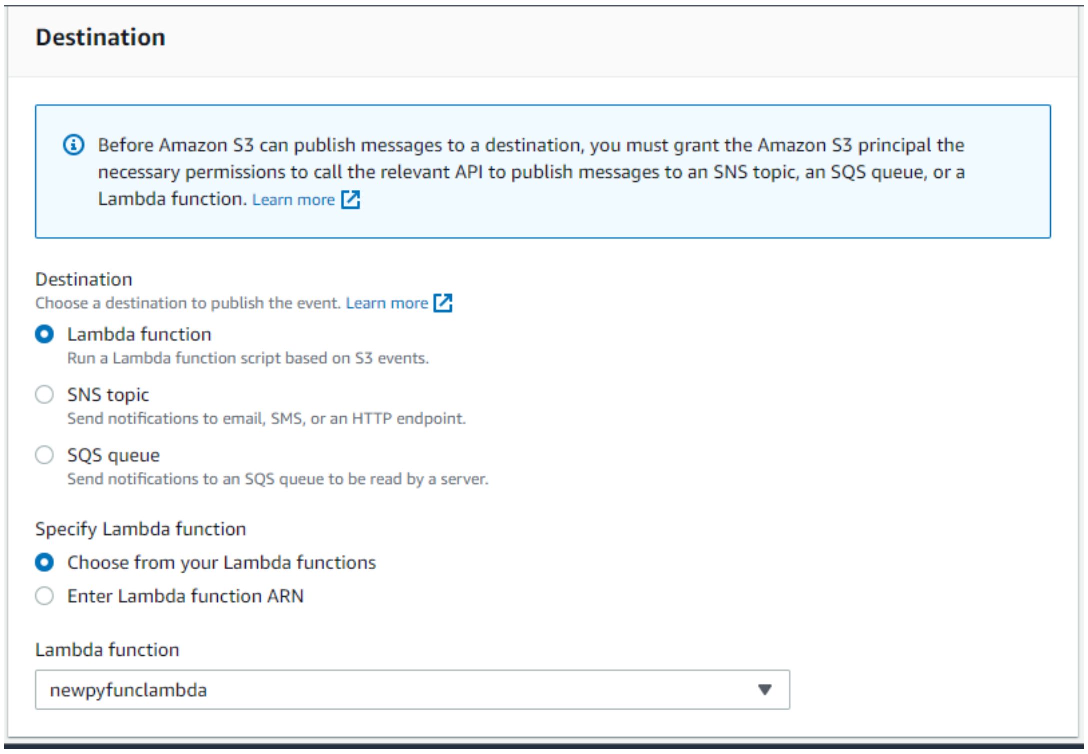
Event types

Specify at least one event for which you want to receive notifications. For each group, you can choose an event type for all events, or you can choose one or more individual events.

Object creation

☐ All object create events
s3:ObjectCreated:*

☑ Put
s3:ObjectCreated:Put


Destination

Before Amazon S3 can publish messages to a destination, you must grant the Amazon S3 principal the necessary permissions to call the relevant API to publish messages to an SNS topic, an SQS queue, or a Lambda function. Learn more

Destination

Choose a destination to publish the event. Learn more

● Lambda function
Run a Lambda function script based on S3 events.

○ SNS topic
Send notifications to email, SMS, or an HTTP endpoint.

○ SQS queue
Send notifications to an SQS queue to be read by a server.

Specify Lambda function

● Choose from your Lambda functions

○ Enter Lambda function ARN

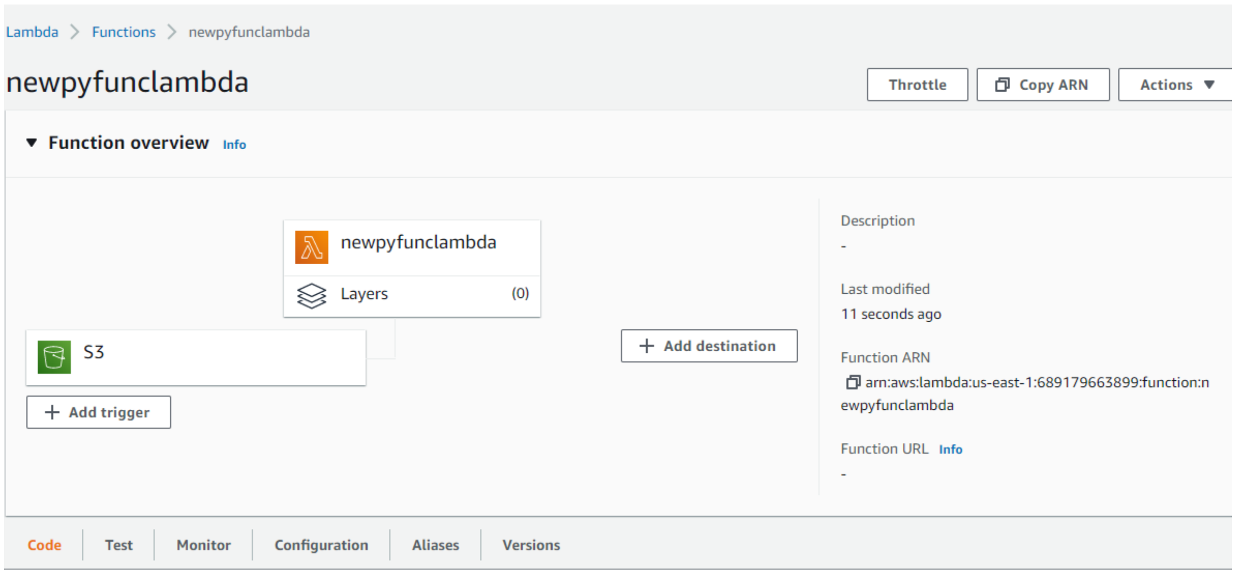
Lambda function

newpyfunclambda

You can optionally choose .json under the suffix since the code only accepts JSON.

Choose the Lambda function as the destination and choose your lambda function and save the changes.

9. Refresh the Lambda function console and you should be able to see an S3 Trigger in the overview.

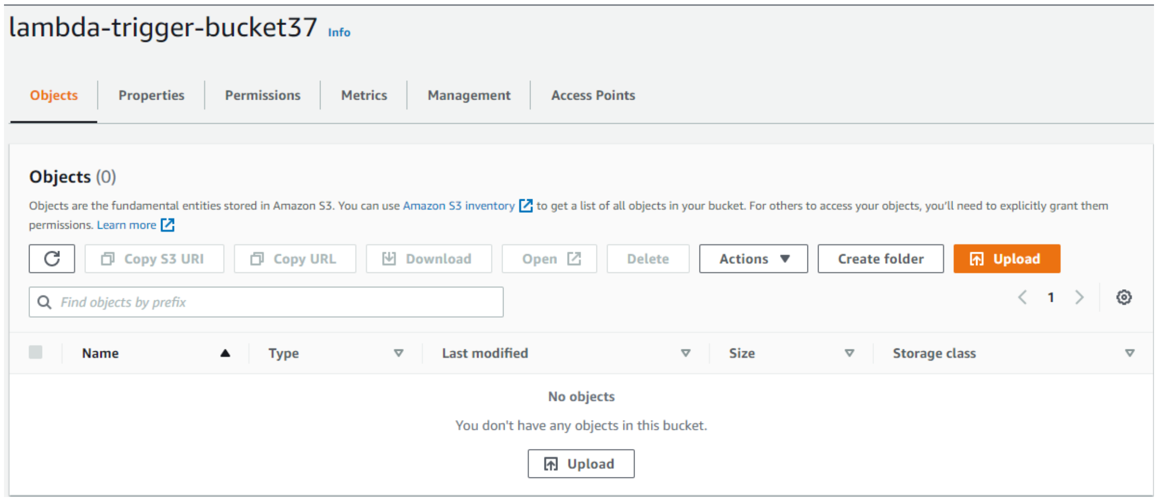


Description
-
Last modified
11 seconds ago
Function ARN
arn:aws:lambda:us-east-1:689179663899:function:newpyfunclambda
Function URL Info
-

10. Now, create a dummy JSON file locally.
    Dummy.json

```
{
        "id":49,
        "name":"Kajal Jewani",
        "Designation":"Assistant Professor",
        "Publications":40
}
```

11. Go back to your S3 Bucket and click on Add Files to upload a new file.


lambda-trigger-bucket37 Info

Objects (0)

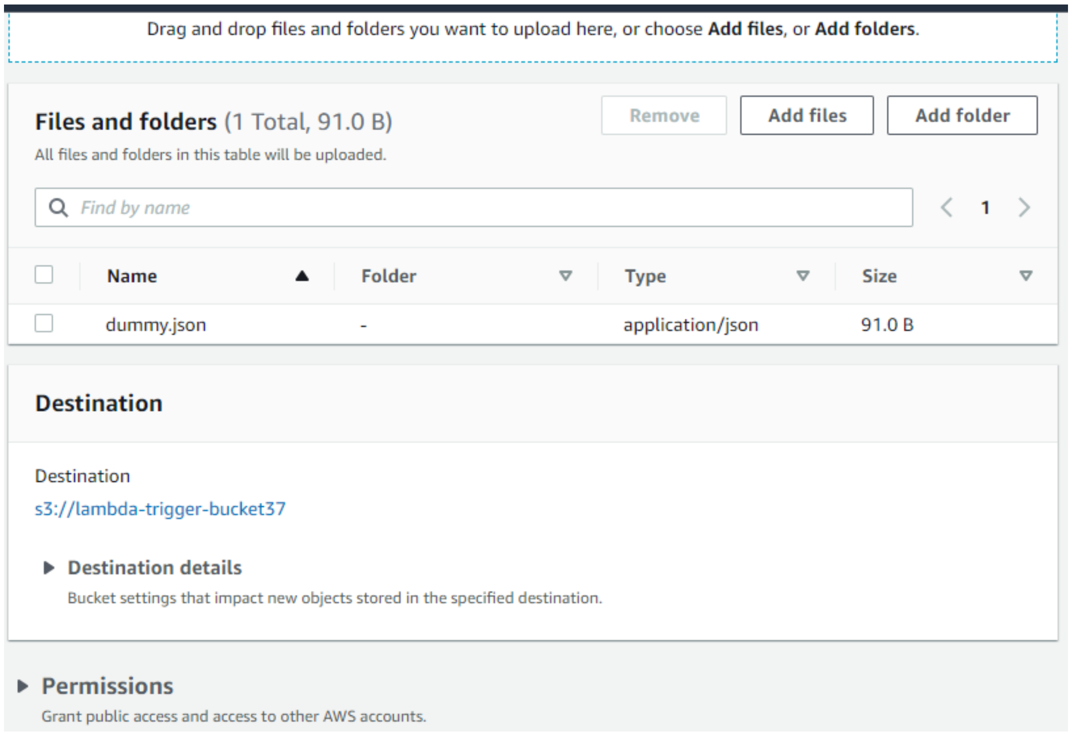
Objects are the fundamental entities stored in Amazon S3. You can use Amazon S3 inventory to get a list of all objects in your bucket. For others to access your objects, you'll need to explicitly grant them permissions. Learn more

Name	Type	Last modified	Size	Storage class

No objects

You don't have any objects in this bucket.

12. Select the dummy data file from your computer and click Upload.


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

Files and folders (1 Total, 91.0 B)

All files and folders in this table will be uploaded.

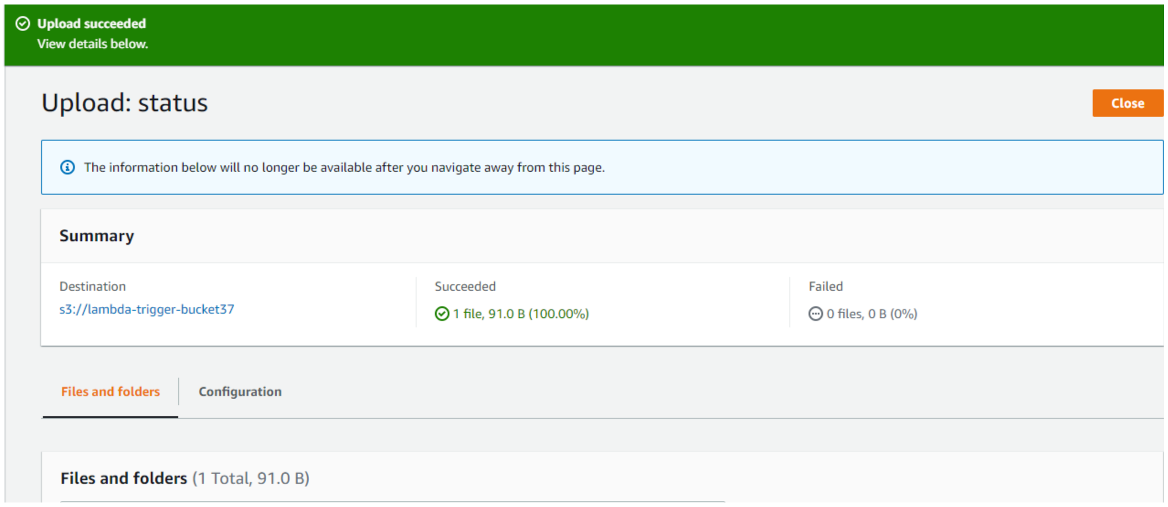
Name	Folder	Type	Size
dummy.json	-	application/json	91.0 B

Destination

Destination
s3://lambda-trigger-bucket37

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

Permissions
Grant public access and access to other AWS accounts.



Upload succeeded
View details below.

Upload: status

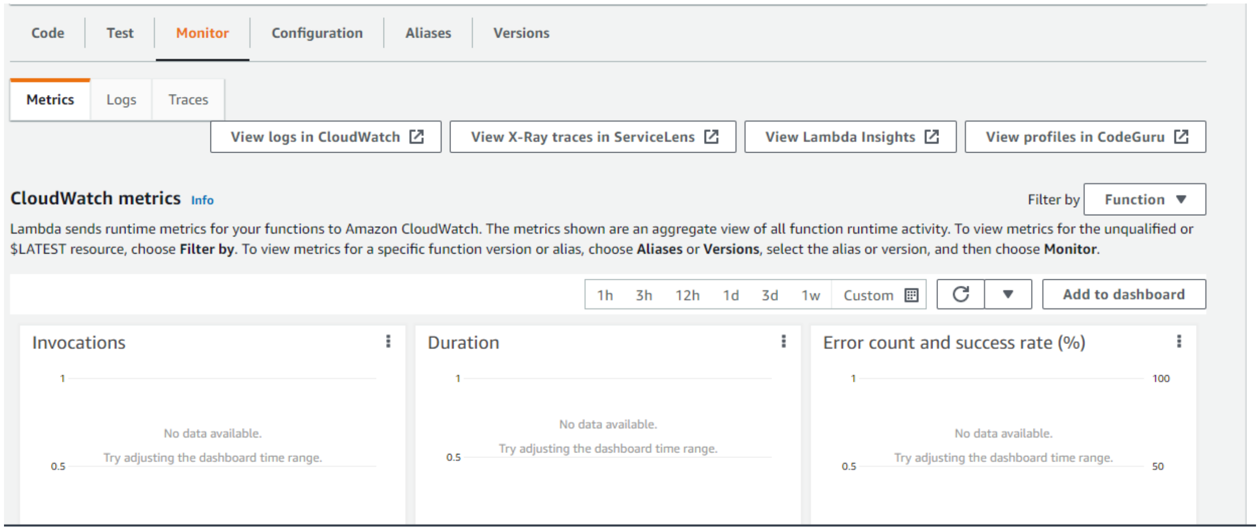
The information below will no longer be available after you navigate away from this page.

Summary

Destination	Succeeded	Failed
s3://lambda-trigger-bucket37	1 file, 91.0 B (100.00%)	0 files, 0 B (0%)

Files and folders (1 Total, 91.0 B)

13.Go back to your Lambda function and check the Monitor tab.

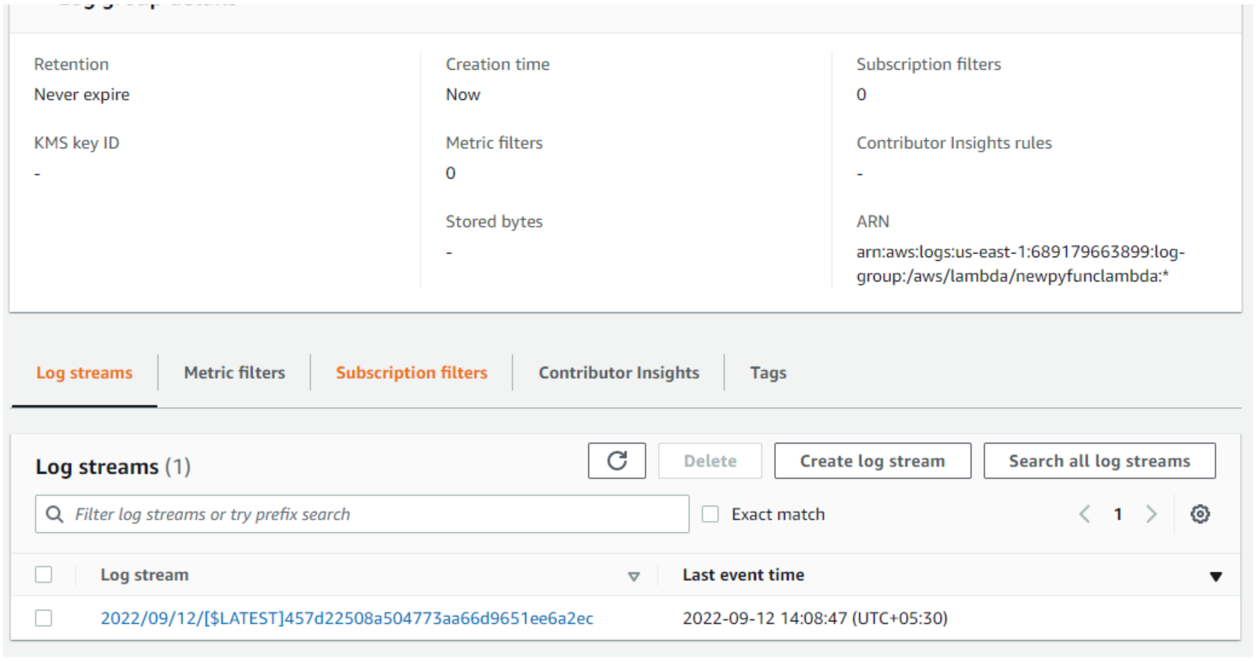


CloudWatch metrics Info

Lambda sends runtime metrics for your functions to Amazon CloudWatch. The metrics shown are an aggregate view of all function runtime activity. To view metrics for the unqualified or $LATEST resource, choose **Filter by**. To view metrics for a specific function version or alias, choose **Aliases** or **Versions**, select the alias or version, and then choose **Monitor**.

No data available.
Try adjusting the dashboard time range.

Under Metrics, click on View logs in Cloudwatch to check the Function logs


Retention	Creation time	Subscription filters
Never expire	Now	0
KMS key ID	Metric filters	Contributor Insights rules
-	0	-
	Stored bytes	ARN
	-	arn:aws:logs:us-east-1:689179663899:log-group:/aws/lambda/newpyfunclambda:*

Log stream	Last event time
2022/09/12/[$LATEST]457d22508a504773aa66d9651ee6a2ec	2022-09-12 14:08:47 (UTC+05:30)

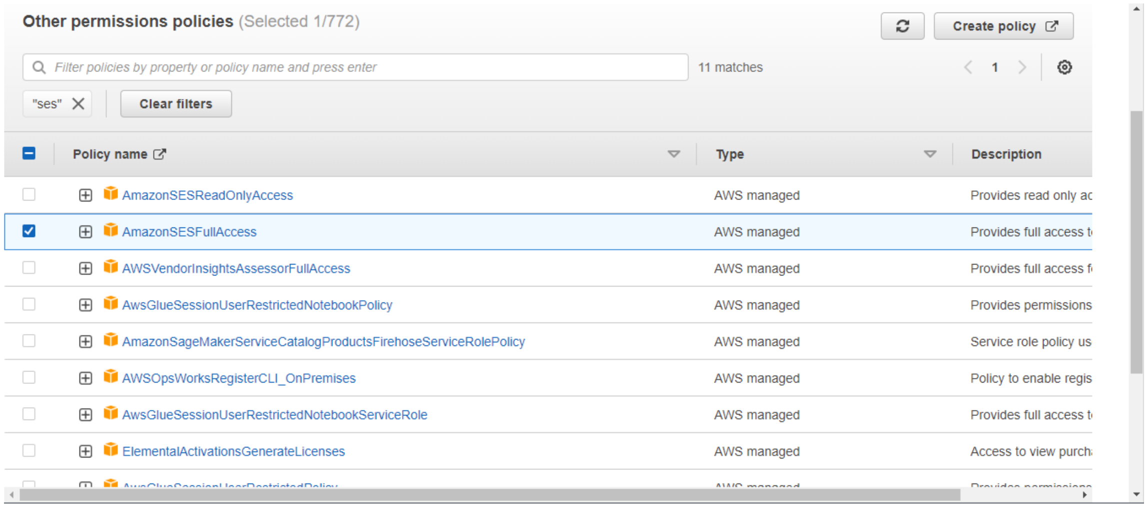
14. Click on this log Stream that was created to view what was logged by your function.

    As you can see, our function logged that a file was uploaded with its file name and the bucket to which it was uploaded. It also mentions the contents inside the file as our function was defined to.
    Hence, we have successfully created a Python function inside AWS Lambda which logs every time an object is uploaded to an S3 Bucket.

Part 2

Sending an Email on Bucket additions to Bucket

1. Go to the IAM console and edit the same Lambda Role. This time, add SESFullAccess Permission to the role.

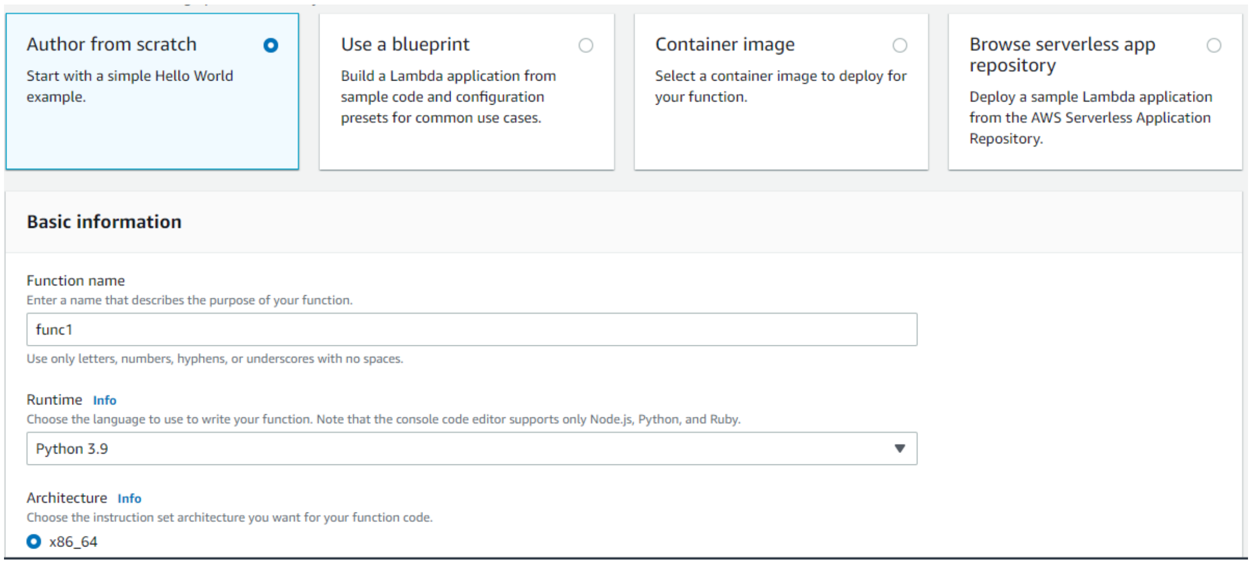

Other permissions policies (Selected 1/772)

Filter policies by property or policy name and press enter — 11 matches

"ses" — Clear filters

	Policy name	Type	Description
☐	AmazonSESReadOnlyAccess	AWS managed	Provides read only ac
✓	AmazonSESFullAccess	AWS managed	Provides full access t
☐	AWSVendorInsightsAssessorFullAccess	AWS managed	Provides full access f
☐	AwsGlueSessionUserRestrictedNotebookPolicy	AWS managed	Provides permissions
☐	AmazonSageMakerServiceCatalogProductsFirehoseServiceRolePolicy	AWS managed	Service role policy us
☐	AWSOpsWorksRegisterCLI_OnPremises	AWS managed	Policy to enable regis
☐	AwsGlueSessionUserRestrictedNotebookServiceRole	AWS managed	Provides full access t
☐	ElementalActivationsGenerateLicenses	AWS managed	Access to view purch

2. Create a new Lambda function in a Python environment. Use the existing role which was previously created.


[✓ 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.

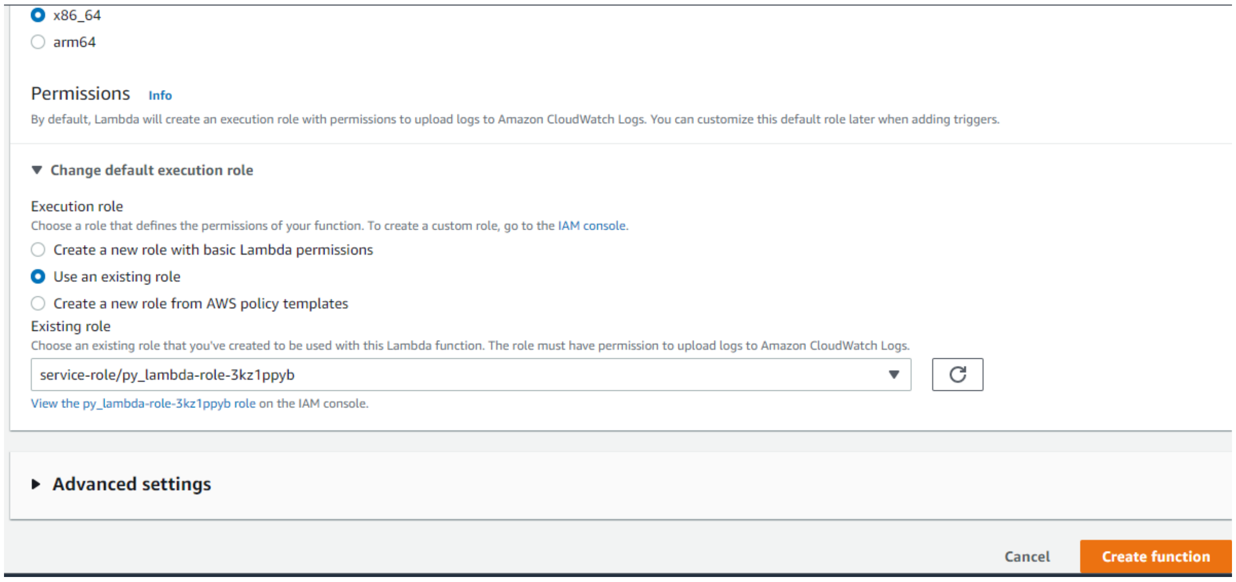
Browse serverless app repository — Deploy a sample Lambda application from the AWS Serverless Application Repository.

Basic information

Function name
Enter a name that describes the purpose of your function.
func1
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 3.9

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


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

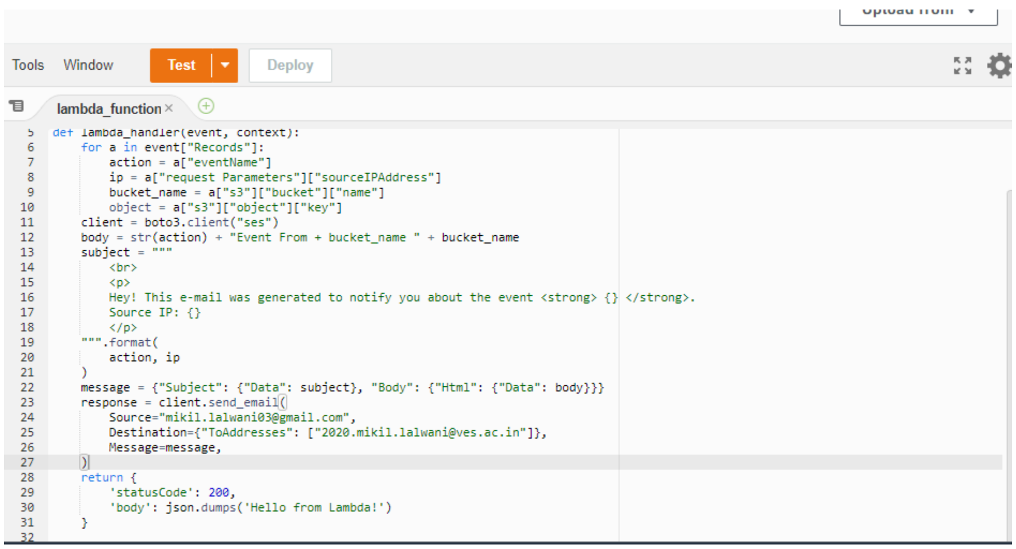
Choose an existing role that you've created to be used with this Lambda function. The role must have permission to upload logs to Amazon CloudWatch Logs.

service-role/py_lambda-role-3kz1ppyb

View the py_lambda-role-3kz1ppyb role on the IAM console.

▶ Advanced settings

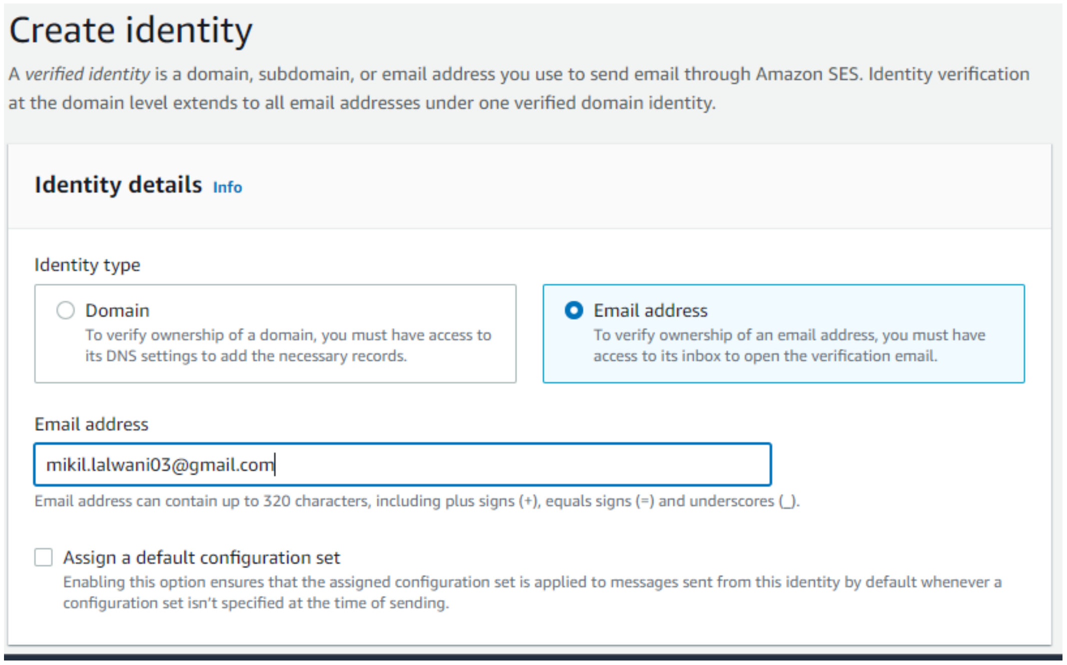
3. In this function, above the default hello-world TODO, add the following code.
   This code is basically to send an email on the creation of an object in the attached S3 Bucket. It sends the bucket name, event, and source IP address. In this code, modify the Source and Destination ToAddresses to your sender and receiver email addresses. Once done, deploy the function.



```
def lambda_handler(event, context):
    for a in event["Records"]:
        action = a["eventName"]
        ip = a["request Parameters"]["sourceIPAddress"]
        bucket_name = a["s3"]["bucket"]["name"]
        object = a["s3"]["object"]["key"]
    client = boto3.client("ses")
    body = str(action) + "Event From + bucket_name " + bucket_name
    subject = """
        <br>
        <p>
        Hey! This e-mail was generated to notify you about the event <strong> {} </strong>.
        Source IP: {}
        </p>
    """.format(
        action, ip
    )
    message = {"Subject": {"Data": subject}, "Body": {"Html": {"Data": body}}}
    response = client.send_email(
        Source="mikil.lalwani03@gmail.com",
        Destination={"ToAddresses": ["2020.mikil.lalwani@ves.ac.in"]},
        Message=message,
    )
    return {
        'statusCode': 200,
        'body': json.dumps('Hello from Lambda!')
    }
```

4. Open up the SES Console and click on Manage Email Addresses.

5. Choose Verify Email Address and verify both sender and receiver email addresses.
   Click on the verification links you are sent and verify the emails.



Create identity

A *verified identity* is a domain, subdomain, or email address you use to send email through Amazon SES. Identity verification at the domain level extends to all email addresses under one verified domain identity.

Identity details Info

Identity type

Domain
To verify ownership of a domain, you must have access to its DNS settings to add the necessary records.

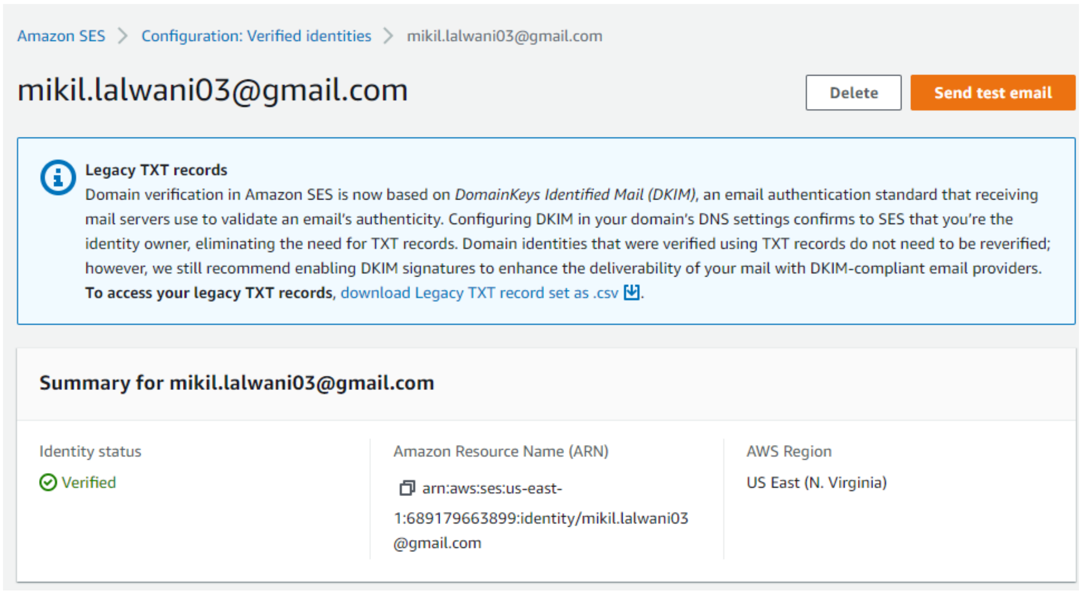
[✓ Email address]
To verify ownership of an email address, you must have access to its inbox to open the verification email.

Email address

mikil.lalwani03@gmail.com

Email address can contain up to 320 characters, including plus signs (+), equals signs (=) and underscores (_).

Assign a default configuration set
Enabling this option ensures that the assigned configuration set is applied to messages sent from this identity by default whenever a configuration set isn't specified at the time of sending.


Amazon SES > Configuration: Verified identities > mikil.lalwani03@gmail.com
Delete
Send test email

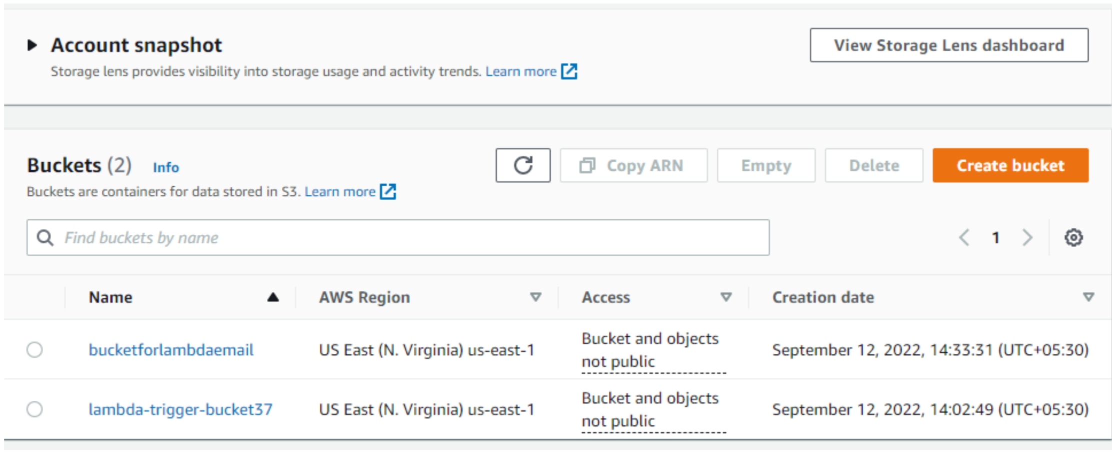
mikil.lalwani03@gmail.com

Legacy TXT records
Domain verification in Amazon SES is now based on *DomainKeys Identified Mail (DKIM)*, an email authentication standard that receiving mail servers use to validate an email's authenticity. Configuring DKIM in your domain's DNS settings confirms to SES that you're the identity owner, eliminating the need for TXT records. Domain identities that were verified using TXT records do not need to be reverified; however, we still recommend enabling DKIM signatures to enhance the deliverability of your mail with DKIM-compliant email providers.
To access your legacy TXT records, download Legacy TXT record set as .csv.

Summary for mikil.lalwani03@gmail.com

Identity status	Amazon Resource Name (ARN)	AWS Region
Verified	arn:aws:ses:us-east-1:689179663899:identity/mikil.lalwani03@gmail.com	US East (N. Virginia)

6. Now, open up the S3 Console, create a new bucket as you did previously and add an event notification inside events and attach it to your Lambda function.



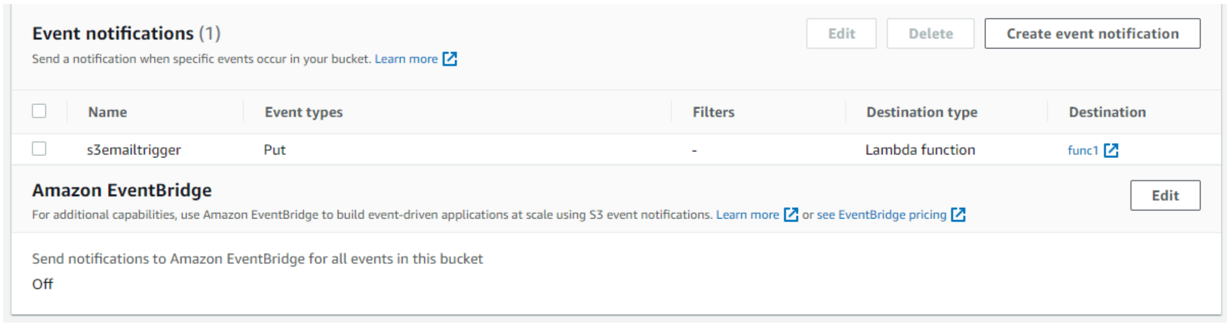
Account snapshot

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

Buckets (2) Info

Buckets are containers for data stored in S3. Learn more

Name	AWS Region	Access	Creation date
bucketforlambdaemail	US East (N. Virginia) us-east-1	Bucket and objects not public	September 12, 2022, 14:33:31 (UTC+05:30)
lambda-trigger-bucket37	US East (N. Virginia) us-east-1	Bucket and objects not public	September 12, 2022, 14:02:49 (UTC+05:30)



Event notifications (1)

Send a notification when specific events occur in your bucket. Learn more

Name	Event types	Filters	Destination type	Destination
s3emailtrigger	Put	-	Lambda function	func1

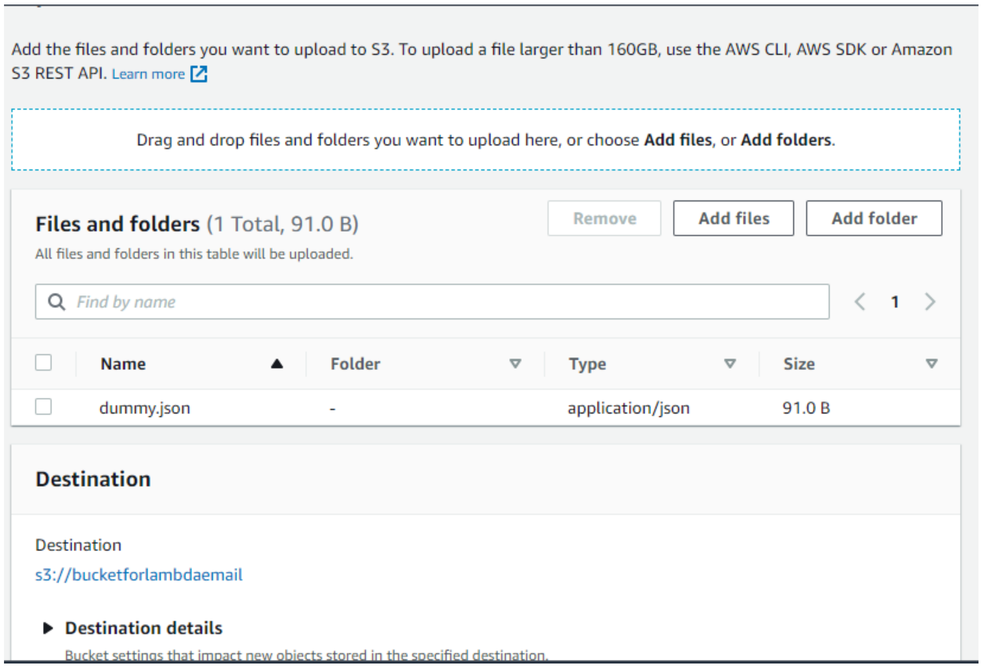
Amazon EventBridge

For additional capabilities, use Amazon EventBridge to build event-driven applications at scale using S3 event notifications. Learn more or see EventBridge pricing

Send notifications to Amazon EventBridge for all events in this bucket

Off

7. Once that's done, upload any file to your S3 Bucket. I'll upload the same dummy JSON file again.



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 folders**.

Files and folders (1 Total, 91.0 B)

All files and folders in this table will be uploaded.

Name	Folder	Type	Size
dummy.json	-	application/json	91.0 B

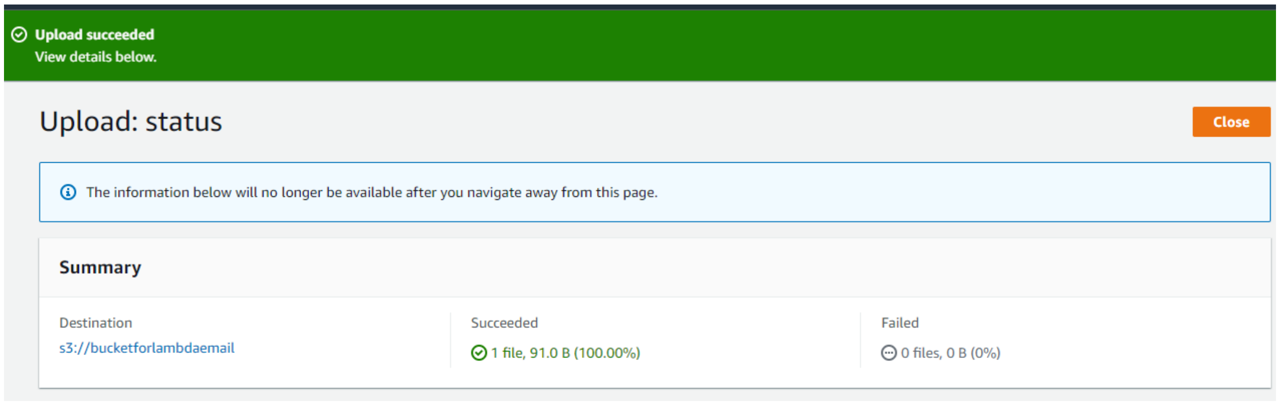
Destination

Destination

s3://bucketforlambdaemail

Destination details

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


Upload succeeded
View details below.

Upload: status

The information below will no longer be available after you navigate away from this page.

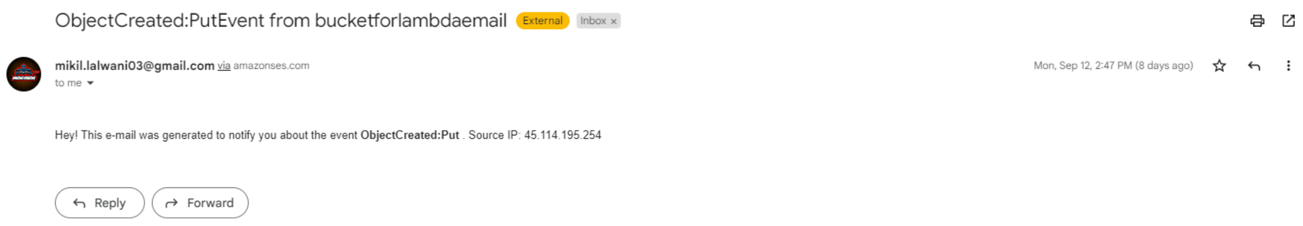
Summary

Destination
s3://bucketforlambdaemail

Succeeded
1 file, 91.0 B (100.00%)

Failed
0 files, 0 B (0%)

8. Check your ToAddress email. You'll receive an email from the Source Address via Amazon SES.


ObjectCreated:PutEvent from bucketforlambdaemail

mikil.lalwani03@gmail.com via amazonses.com
to me

Mon, Sep 12, 2:47 PM (8 days ago)

Hey! This e-mail was generated to notify you about the event ObjectCreated:Put . Source IP: 45.114.195.254

In this way, we successfully created a function in AWS Lambda that sends an email on uploading an object to an S3 Bucket using Amazon SES.

Recommended Cleanup

Once done with the experiment, it is recommended to delete all resources which have been created and used by us to avoid charges in AWS.
Here is a list of things you may delete:

1. AWS Lambda Function
2. Amazon S3 Storage Bucket
3. Amazon SES Verified Emails
4. AWS Cloudwatch Logs (Optional, won't affect bills)
5. AWS IAM Role (the one which was created for the function, again, won't affect bills)