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**Department of Information Technology**

**(NBA Accredited)**



**Semester: V**

**Academic Year: 2022-23**

**Class / Branch: TE IT**

**Subject: Advanced Devops Lab (ADL)**

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**Student ID: 21104010**

## EXPERIMENT NO. 12

**Aim:** To create a Lambda function which will log “An Image has been added” once you add an object to a specific bucket in S3

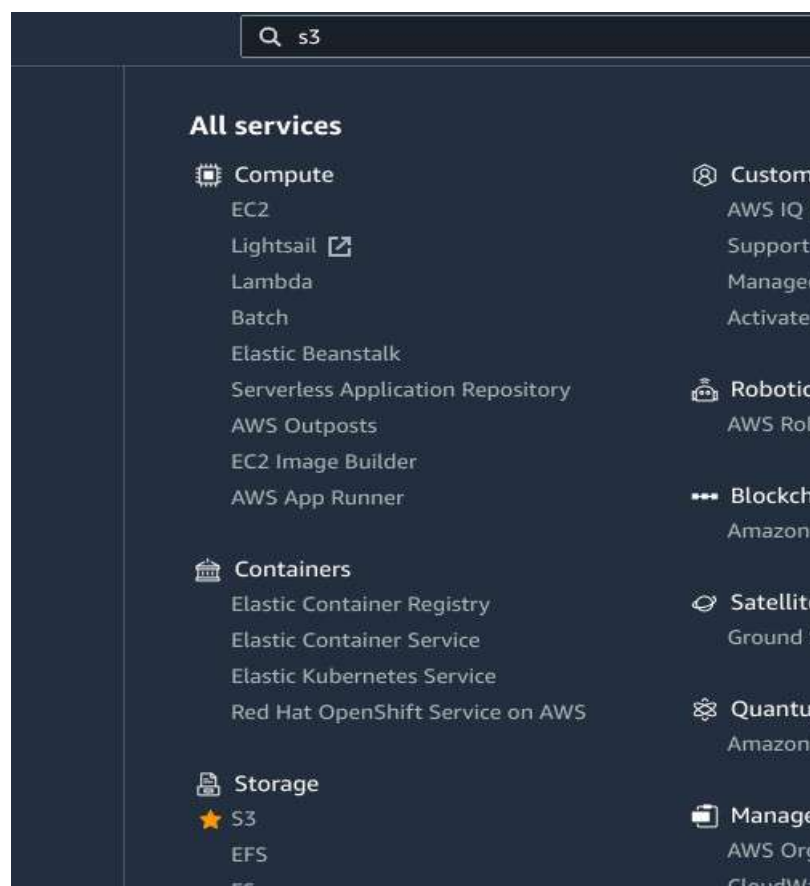
### Theory:

#### Creating S3 Bucket

Let us start first by creating a s3 bucket in AWS console using the steps given below –

#### Step 1

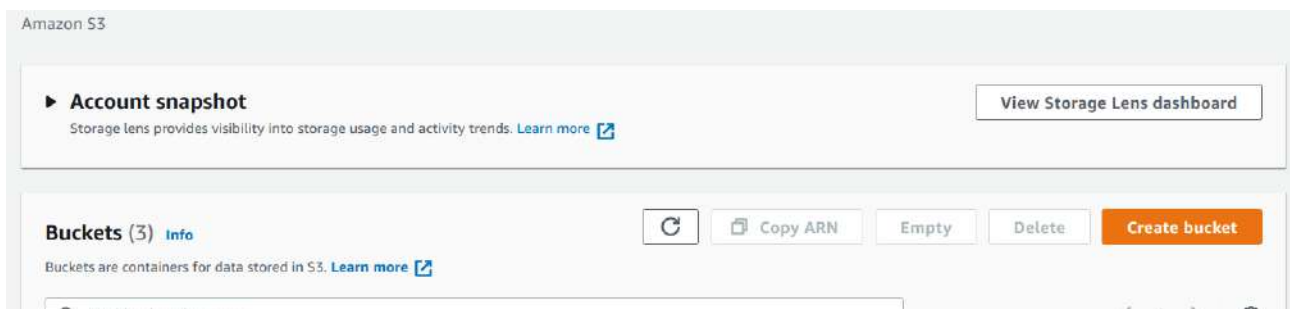
Go to Amazon services and click **S3** in storage section as highlighted in the image given below –





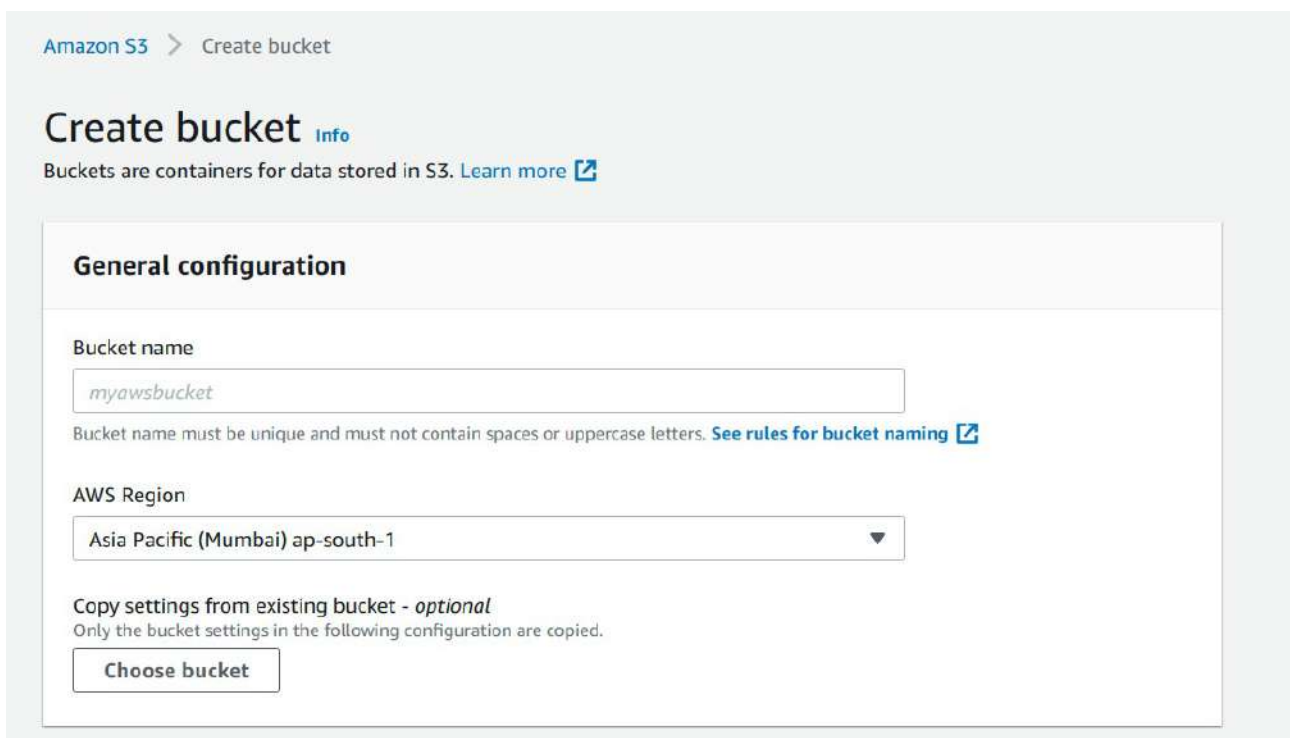
## Step 2

Click **S3** storage and **Create bucket** which will store the files uploaded.



## Step 3

Once you click Create bucket button, you can see a screen as follows –





#### Step 4

Enter the details Bucket name, Select the Region and click Create button at the bottom left side. Thus, we have created bucket with name :

<input type="radio"/>	lambdawiths3	Asia Pacific (Mumbai) ap-south-1	Bucket and objects not public	August 3, 2021, 11:22:23 (UTC+05:30)
-----------------------	--------------	----------------------------------	-------------------------------	--------------------------------------

#### Step 5

Now, click the bucket name and it will ask you to upload files as shown below –

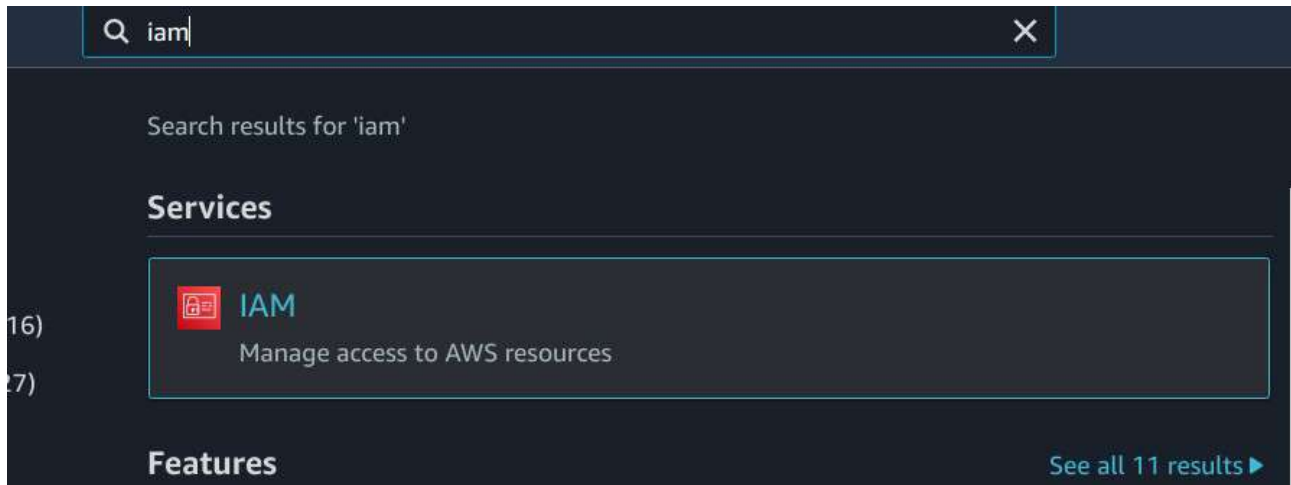
Thus, we are done with bucket creation in S3.

### Create Role that Works with S3 and Lambda

To create role that works with S3 and Lambda, please follow the Steps given below –

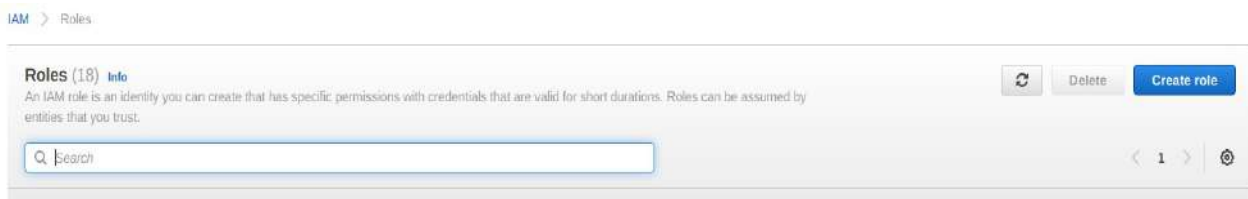
#### Step 1

Go to AWS services and select IAM as shown below –



## Step 2

Now, click **IAM** -> **Roles** as shown below –



## Step 3


Now, click **Create role** and choose the services that will use this role. Select Lambda and click **Permission** button.





Create role


1 2 3 4

Select type of trusted entity

**AWS service**  
EC2, Lambda and others

**Another AWS account**  
Belonging to you or 3rd party

**Web identity**  
Cognito or any OpenID provider

**SAML 2.0 federation**  
Your corporate directory

Allows AWS services to perform actions on your behalf. [Learn more](#)

Choose a use case

Common use cases

**EC2**

Allows EC2 instances to call AWS services on your behalf.

**Lambda**

Allows Lambda functions to call AWS services on your behalf.

Or select a service to view its use cases

<a href="#">API Gateway</a>	<a href="#">CodeBuild</a>	<a href="#">EMR Containers</a>	<a href="#">IoT SiteWise</a>	<a href="#">RDS</a>
<a href="#">AWS Backup</a>	<a href="#">CodeDeploy</a>	<a href="#">ElastiCache</a>	<a href="#">IoT Things Graph</a>	<a href="#">Redshift</a>
<a href="#">AWS Chatbot</a>	<a href="#">CodeGuru</a>	<a href="#">Elastic Beanstalk</a>	<a href="#">KMS</a>	<a href="#">Rekognition</a>
<a href="#">AWS Marketplace</a>	<a href="#">CodeStar Notifications</a>	<a href="#">Elastic Container Registry</a>	<a href="#">Kinesis</a>	<a href="#">RoboMaker</a>
<a href="#">AWS Support</a>	<a href="#">Comprehend</a>	<a href="#">Elastic Container Service</a>	<a href="#">Lake Formation</a>	<a href="#">S3</a>
<a href="#">Amplify</a>	<a href="#">Config</a>	<a href="#">Elastic Transcoder</a>	<a href="#">Lambda</a>	<a href="#">SMS</a>
<a href="#">AppStream 2.0</a>	<a href="#">Connect</a>	<a href="#">ElasticLoadBalancing</a>	<a href="#">Lex</a>	<a href="#">SNS</a>
<a href="#">AppSync</a>	<a href="#">DMS</a>	<a href="#">EventBridge</a>	<a href="#">License Manager</a>	<a href="#">SWF</a>
<a href="#">Application Auto Scaling</a>	<a href="#">Data Lifecycle Manager</a>	<a href="#">Forecast</a>	<a href="#">MQ</a>	<a href="#">SageMaker</a>
<a href="#">Application Discovery</a>	<a href="#">Data Pipeline</a>	<a href="#">GameLift</a>	<a href="#">Machine Learning</a>	<a href="#">Security Hub</a>

\* Required

Cancel

Next: Permissions

## Step 4

Add the permission from below and click Review.

**AmazonS3FullAccess, AWSLambdaFullAccess and CloudWatchFullAccess.**

## Step 5

Observe that we have chosen the following permissions –



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Create role

1

2

3

Review

Provide the required information below and review this role before you create it.

Role name\*

Use alphanumeric and '+', '@', '-' characters. Maximum 64 characters.

Role description

Allows Lambda functions to call AWS services on your behalf.

Maximum 1000 characters. Use alphanumeric and '+', '@', '-' characters.

Trusted entities

AWS service: lambda.amazonaws.com

Policies



AmazonS3FullAccess



AWSLambda\_FullAccess



CloudWatchFullAccess

Permissions boundary

Permissions boundary is not set

No tags were added.

Observe that the Policies that we have selected are **AmazonS3FullAccess**, **AWSLambdaFullAccess** and **CloudWatchFullAccess**.

## Step 6

Now, enter the Role name, Role description and click Create Role button at the bottom.



lambdawiths3service

AWS Service: lambda

Thus, our role named lambdawiths3service is created.

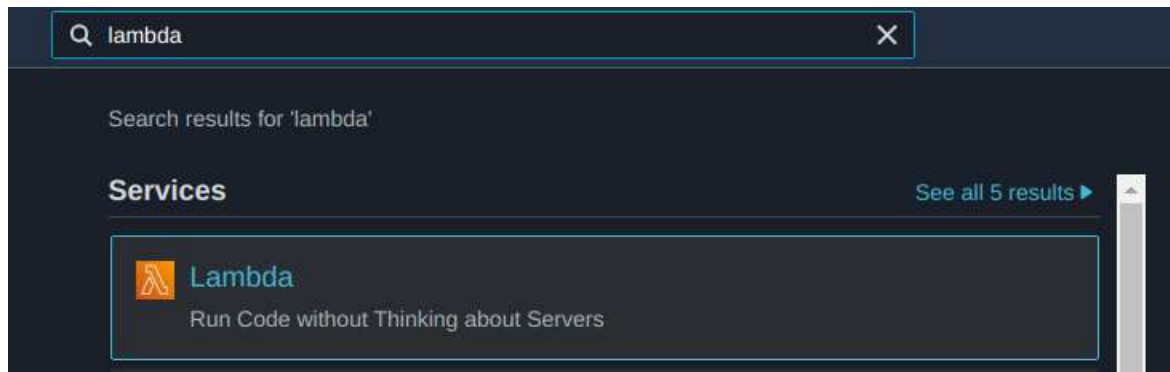
## Create Lambda function and Add S3 Trigger

In this section, let us see how to create a Lambda function and add a S3 trigger to it. For this purpose, you will have to follow the Steps given below –



## Step 1

Go to AWS Services and select Lambda as shown below –



## Step 2

Click **Lambda** and follow the process for adding **Name**. Choose the **Runtime**, **Role** etc. and create the function. The Lambda function that we have created is shown in the screenshot below –





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.

### Basic information

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

lambdawiths3bucket

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.

Node.js 14.x

**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

▼ 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.

lambdawiths3service

[View the lambdawiths3service role](#) on the IAM console.

### Step 3

Now let us add the S3 trigger.





Lambda > Functions > lambdawiths3bucket

lambdawiths3bucket

Throttle Copy ARN Actions

Function overview info

Code Test Monitor Configuration Aliases Versions

General configuration

Triggers

Permissions

Destinations

Environment variables

Tags

VPC

Triggers (0)

Find triggers

Enable Disable Fix errors Delete Add trigger

No triggers

No triggers are configured.

Add trigger

#### Step 4

Choose the trigger from above and add the details as shown below –

### Add trigger

#### Trigger configuration

S3  
aws storage

**Bucket**  
Please select the S3 bucket that serves as the event source. The bucket must be in the same region as the function.

lambdawiths3

**Event type**  
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

**Prefix - optional**  
Enter a single optional prefix to limit the notifications to objects with keys that start with matching characters.

e.g. images/

**Suffix - optional**  
Enter a single optional suffix to limit the notifications to objects with keys that end with matching characters.

.jpg

Lambda will add the necessary permissions for Amazon S3 to invoke your Lambda function from this trigger. [Learn more](#) about the Lambda permissions model.

**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.

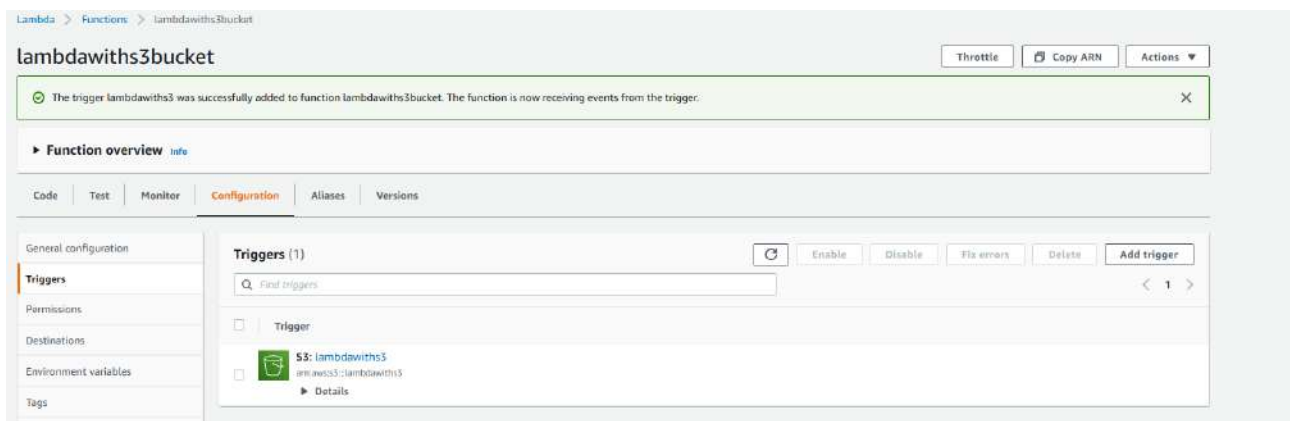
Cancel Add



You can add Prefix and File pattern which are used to filter the files added. For Example, to trigger lambda only for .jpg images. as we need to trigger Lambda for all jpg image files uploaded. Click Add button to add the trigger.

## Step 5

You can find the the trigger display for the Lambda function as shown below –



## Step 6

Let's add the details for the aws lambda function. Here, we will use the online editor to add our code and use nodejs as the runtime environment.

To trigger S3 with AWS Lambda, we will have to use S3 event in the code as shown below –



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Lambda > Functions > lambdawiths3bucket

### lambdawiths3bucket

Throttle Copy ARN Actions

The trigger lambdawiths3 was successfully added to function lambdawiths3bucket. The function is now receiving events from the trigger.

Function overview

Code Test Monitor Configuration Aliases Versions

#### Code source

Upload from

```
1 exports.handler = function(event, context, callback) {
2   console.log("Incoming Event: ", event);
3   const bucket = event.Records[0].s3.bucket.name;
4   const filename = decodeURIComponent(event.Records[0].s3.object.key.replace(/\+/g, ' '));
5   const message = 'An Image has been added - ${bucket} -> ${filename}';
6   console.log(message);
7   callback(null, message);
8 };
```

8:3 JavaScript Spaces: 4

#### Code properties

Package size 304.0 byte	SHA256 hash vTJFvT0sQYdBf6CtseZoBcLT6Hd0A48LniMm4gpvgDw	Last modified August 3, 2021, 11:36 AM GMT+5:30
----------------------------	--	--

#### Runtime settings

Runtime: Node.js 14.x Handler: index.handler

## Step 7:

let us save the changes and test the lambda function with S3upload.



## Step 8:

Now, save the Lambda function. Open S3 from Amazon services and open the bucket we created earlier namely lambdawiths3.

Upload the image in it as shown below –

Click **Add files** to add files. You can also drag and drop the files. Now, click **Upload** button.

## 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 folders**.

**Files and folders** (1 Total, 44.0 KB)

Remove Add files Add folder

All files and folders in this table will be uploaded.

Find by name

<input type="checkbox"/>	Name	Folder	Type	Size
<input type="checkbox"/>	apsit_logo.jpg	-	image/jpeg	44.0 KB

Thus, we have uploaded one image in our S3 bucket.

## Step 9

To see the trigger details, go to AWS service and select CloudWatch. Open the logs for the Lambda AWS Lambda function gets triggered when file is uploaded in S3 bucket and the details are logged in Cloudwatch as shown below –

CloudWatch > Log groups > /aws/lambda/lambdawiths3bucket > 2021/08/03/[SLATEST]0f56a60d46ca40078172fc11de9d735f

### Log events

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](#)

Filter events Clear 1m

Timestamp	Message
No older events at this moment. <a href="#">Retry</a>	
2021-08-03T12:01:00.060+05:30	START RequestId: ae43508a-8eb7-4b08-8fa1-841814d597c1 Version: \$LATEST
2021-08-03T12:01:00.096+05:30	2021-08-03T06:31:00.997Z ae43508a-8eb7-4b08-8fa1-841814d597c1 INFO Incoming Event: { Records: [ { eventVersion: '2.1', eventSource: 'aws:s3', awsRegion: 'ap-south-1',
2021-08-03T12:01:00.098+05:30	2021-08-03T06:31:00.998Z ae43508a-8eb7-4b08-8fa1-841814d597c1 INFO An Image has been added - lambdawiths3 -> apsit_logo.jpg
2021-08-03T06:31:00.693Z	ae43508a-8eb7-4b08-8fa1-841814d597c1 INFO An Image has been added - lambdawiths3 -> apsit_logo.jpg
2021-08-03T12:01:00.119+05:30	END RequestId: ae43508a-8eb7-4b08-8fa1-841814d597c1
2021-08-03T12:01:00.119+05:30	REPORT RequestId: ae43508a-8eb7-4b08-8fa1-841814d597c1 Duration: 49.46 ms Billed Duration: 50 ms Memory Size: 128 MB Max Memory Used: 65 MB Init Duration: 155.37 ms
No newer events at this moment. <a href="#">Auto retry paused</a> . <a href="#">Resume</a>	



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An image has been Added -> apsit\_logo.jpg you can see in cloudwatch logs.

## OUTPUT:

Amazon S3 > Buckets > Create bucket

### Create bucket [Info](#)

Buckets are containers for data stored in S3. [Learn more](#)

#### General configuration

Bucket name  
  
Bucket name must be unique within the global namespace and follow the bucket naming rules. [See rules for bucket naming](#)

AWS Region

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)**  
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.

Successfully created bucket "exp-12"  
To upload files and folders, or to configure additional bucket settings, choose [View details](#).

Amazon S3 > Buckets

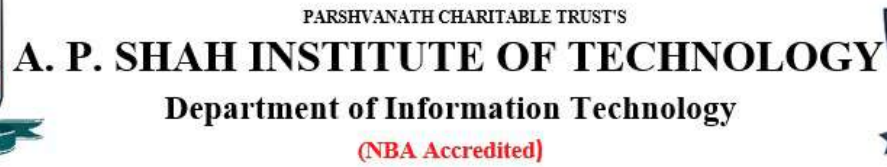
[View Storage Lens dashboard](#)

#### Buckets (1) [Info](#)

Buckets are containers for data stored in S3. [Learn more](#)

Name	AWS Region	Access	Creation date
exp-12	US East (N. Virginia) us-east-1	Bucket and objects not public	October 6, 2023, 14:32:26 (UTC+05:30)









15  
16

Step 2: Add permissions Edit

Permissions policy summary

Policy name	Type	Attached as
<a href="#">AmazonS3FullAccess</a>	AWS managed	Permissions policy
<a href="#">AWSLambda_FullAccess</a>	AWS managed	Permissions policy
<a href="#">CloudWatchFullAccess</a>	AWS managed	Permissions policy

Step 3: Add tags

## Name, review, and create

Role details

Role name

Enter a meaningful name to identify this role.

Sample

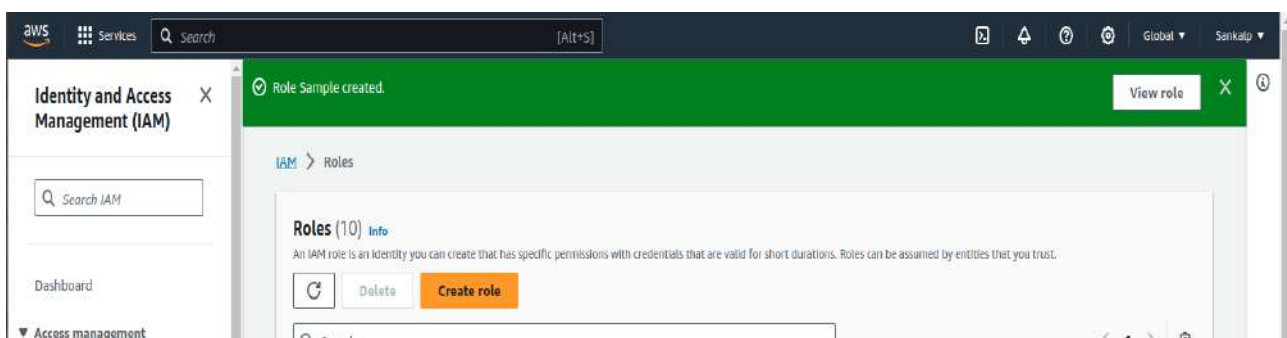
Maximum 64 characters. Use alphanumeric and '+=, @, \_' characters.

Description

Add a short explanation for this role.

Allows Lambda functions to call AWS services on your behalf.

Maximum 1000 characters. Use alphanumeric and '+=, @, \_' characters.





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#### Function name

Enter a name that describes the purpose of your function.

exp12

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.

Node.js 18.x

#### 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.

Sample

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

The screenshot shows the AWS Lambda console interface. At the top, a green banner states: "Successfully created the function exp12. You can now change its code and configuration. To invoke your function with a test event, choose 'Test'." Below this, the breadcrumb navigation is "Lambda > Functions > exp12". The function name "exp12" is prominently displayed, along with buttons for "Throttle", "Copy ARN", and "Actions". The "Function overview" section is expanded, showing a card for the function "exp12" with a "Layers" section indicating "(0)". Below the card are buttons for "+ Add trigger" and "+ Add destination". To the right, a details panel shows the "Description" as "-", "Last modified" as "5 seconds ago", "Function ARN" as "arn:aws:lambda:us-east-1:258978217732:function:exp12", and "Function URL" with a link to "Info".



[Lambda](#) > Add trigger

## Add trigger

### Trigger configuration [Info](#)

 **S3**  
aws asynchronous storage

#### Bucket

Please select the S3 bucket that serves as the event source. The bucket must be in the same region as the function.

X

↻

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 X

#### Prefix - optional

Enter a single optional prefix to limit the notifications to objects with keys that start with matching characters.

e.g. Images/

#### Suffix - optional

Enter a single optional suffix to limit the notifications to objects with keys that end with matching characters.

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.

Lambda will add the necessary permissions for AWS S3 to invoke your Lambda function from this trigger. [Learn more](#) about the Lambda permissions model.

Cancel

Add



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Lambda > Functions > exp12


## exp12


Throttle Copy ARN Actions

✓ The trigger exp-12 was successfully added to function exp12. The function is now receiving events from the trigger.

▼ Function overview Info

 exp12

 Layers [0]

 S3

+ Add trigger

+ Add destination

Description

Last modified  
3 minutes ago

Function ARN  
arn:aws:lambda:us-east-1:258978217732:function:exp12

Function URL Info

Code Test Monitor Configuration Aliases Versions

## Code source Info

Upload from

File Edit Find View Go Tools Window Test Deploy Changes not deployed

Go to Anything (Ctrl-P)

index.mjs Environment Var

```
1 export.handler = function(event, context, callback) {
2   console.log('Incoming Events: ', event);
3   const bucket = event.Records[0].s3.bucket.name;
4   const filename = decodeURIComponent(event.Records[0].s3.object.key.replace(/^\//, ''));
5   const message = `An Image has been added - ${bucket} -> ${filename}`;
6   console.log(message);
7   callback(null, message);
8 }
```



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Services  [Alt+S]

Global Sensitive

**Upload succeeded**  
View details below.

### Upload: status Close

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

#### Summary

Destination s3://exp-12	Succeeded 1 file, 10.0 KB (100.00%)	Failed 0 files, 0 B (0%)
----------------------------	--	-----------------------------

Files and folders

Configuration

#### Files and folders (1 Total, 10.0 KB)

< 1 >

Name	Folder	Type	Size	Status	Error
download.png	-	Image/jpeg	10.0 KB	Succeeded	-



## Configure test event



A test event is a JSON object that mocks the structure of requests emitted by AWS services to invoke a Lambda function. Use it to see the function's invocation result.

To invoke your function without saving an event, modify the event, then choose Test. Lambda uses the modified event to invoke your function, but does not overwrite the original event until you choose Save changes.

### Test event action

☐ Create new event

☒ Edit saved event

### Event name

exp12



Delete

### Event JSON

Format JSON

```
1 {  
2   "key1": "value1",  
3   "key2": "value2",  
4   "key3": "value3"  
5 }
```

Cancel

Invoke

Save





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Log streams (1)

Filter log streams or try prefix search

Exact match Show expired Info

Log stream	Last event time
2023/10/06/[\$LATEST]58354c08fc1c46b0a8a80e772fbd073e	2023-10-06 14:58:14 (UTC+05:30)

Log events

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](#)

Actions Start tailing Create metric filter

Filter events

Clear 1m 30m 1h 12h Custom Local Display

Timestamp	Message
No older events at this moment. <a href="#">Retry</a>	
2023-10-06T14:58:14.261+05:30	INIT_START Runtime Version: nodejs:18.v13 Runtime Version ARN: arn:aws:lambda:us-east-1::runtime:0229ff5ced939264456...
2023-10-06T14:58:14.433+05:30	START RequestId: 2eaacbb-ac84-4c57-a10f-bc50d9b83c9 Version: \$LATEST
2023-10-06T14:58:14.438+05:30	END RequestId: 2eaacbb-ac84-4c57-a10f-bc50d9b83c9
2023-10-06T14:58:14.438+05:30	REPORT RequestId: 2eaacbb-ac84-4c57-a10f-bc50d9b83c9 Duration: 4.42 ms Billed Duration: 5 ms Memory Size: 128 MB M...
2023-10-06T14:59:58.711+05:30	START RequestId: a14962f9-dd06-44c6-9cfb-7fc26971d19c Version: \$LATEST
2023-10-06T14:59:58.718+05:30	END RequestId: a14962f9-dd06-44c6-9cfb-7fc26971d19c
2023-10-06T14:59:58.718+05:30	REPORT RequestId: a14962f9-dd06-44c6-9cfb-7fc26971d19c Duration: 1.38 ms Billed Duration: 2 ms Memory Size: 128 MB M...
No newer events at this moment. Auto retry paused. <a href="#">Resume</a>	

**Conclusion:** Hence we have studied and implemented to create a Lambda function which will log “An Image has been added” once you add an object to a specific bucket in S3.