Automate Sending Emails at a Specific Time with AWS Lambda,

CloudWatch and SES

Identity and Access Management (IAM)

IAM web service allows us to securely control access to AWS resources. Here we can check which users are authenticated and what permissions they have to use the resources. IAM does not require region selection.

AWS Lambda

AWS Lambda is one of the serverless services. In these services, we only write the code we want to run and make the necessary resource settings. We do not have to deal with issues such as which server the code is running on, the administration, maintenance and security of the server. Lambda codes run in containers. In this way, it can be easily scaled.

CloudWatch

CloudWatch; It provides data and actionable insights so you can monitor your applications, respond to system-wide performance changes, optimize resource usage, and have a unified view of operational status. CloudWatch collects monitoring and operational data in the form of logs, metrics, and events, providing a unified view of AWS resources, applications, and services running on AWS and on-premises servers. Using CloudWatch, you can detect anomalous behavior in your environments, set up alarms, visualize images and metrics side-by-side, take automated actions, troubleshoot issues, and discover insights to keep your applications running smoothly.

AWS EventBridge

AWS EventBridge is a serverless event bridge that makes it easy to provide real-time access to data changes in AWS services and SaaS applications without writing code. CloudWatch Events builds and extends on Amazon EventBridge. It uses the same service API and endpoint, and the same service infrastructure. Nothing changes for existing CloudWatch Events customers.

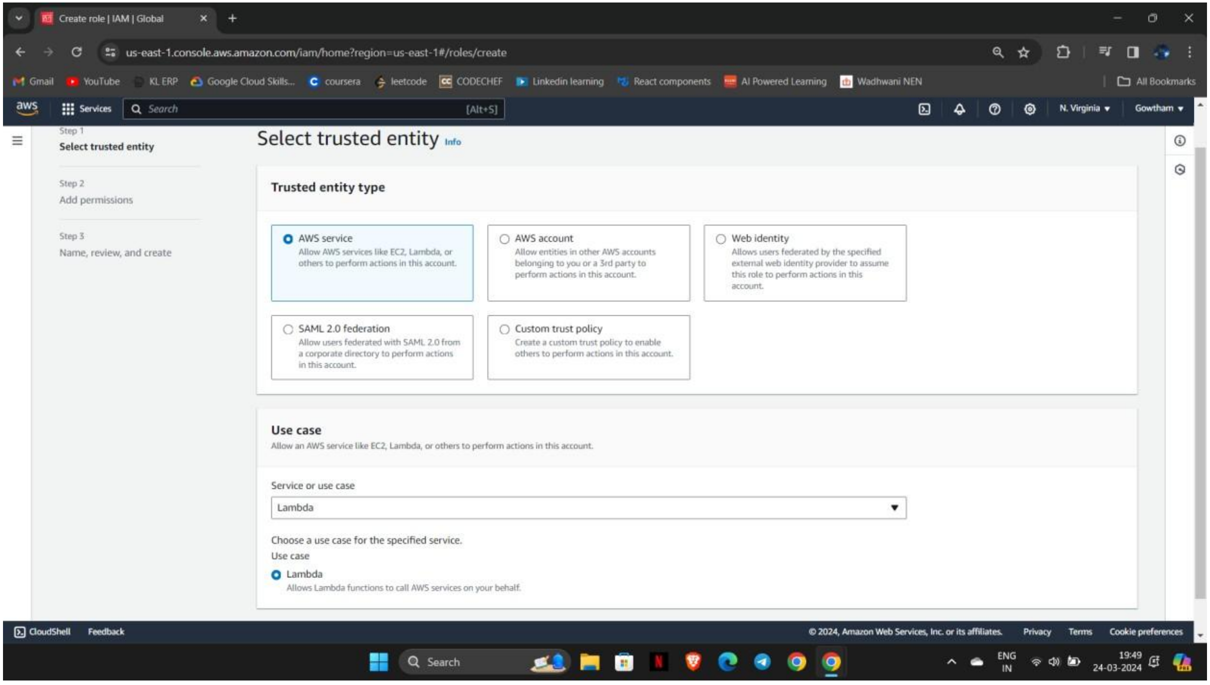
AWS Simple E-mail Service

Amazon SES is an easy, reliable, low-cost, pay-as-you-go cloudbased email service designed to help app developers and digital media professionals send notification emails. It is a service that provides solutions for businesses of all sizes that communicate with their customers via email, without dealing with infrastructure problems such as Mail Server management, Network configuration, and most importantly, Spam and IP reputation problems. All new SES accounts start in a sandbox, where you can test the capabilities of Amazon SES. When your account is in the sandbox, you can only send email to your verified sender identities, with a typical limit set to 200 emails per day. A verified sender identity is either an email addresses or domain that you verified ownership of. If you want to send an e-mail to your e-mail list with SES, you must open a request to Amazon to exit the sandbox. In this tutorial, we will perform our operations from the sandbox.

Steps:

1. Setting up IAM roles

First, we should set up IAM roles for security. Open the AWS console and write IAM to the searching area. On the screen that opens click roles and 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 ▾

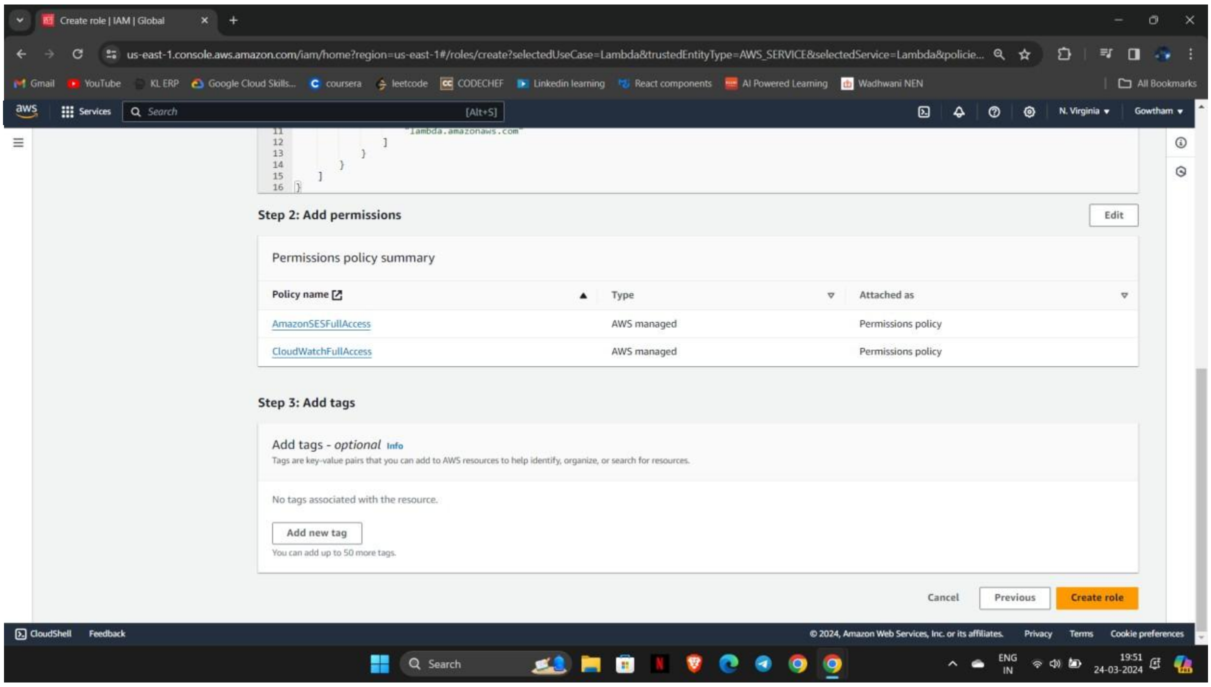
Choose a use case for the specified service.
Use case
● Lambda
Allows Lambda functions to call AWS services on your behalf.

Then we need to add the permissions of the services that the user will use. These are:

1. CloudWatchFullAccess

2. AmazonSESFullAccess

Add these permissions and click next. Specify a name to use this role in other services.



Create role | IAM | Global
us-east-1.console.aws.amazon.com/iam/home?region=us-east-1#/roles/create?selectedUseCase=Lambda&trustedEntityType=AWS_SERVICE&selectedService=Lambda&policie...
Gmail
YouTube
KL ERP
Google Cloud Skills...
coursera
leetcode
CODECHEF
Linkedin learning
React components
AI Powered Learning
Wadhwani NEN
All Bookmarks
Services
Search
[Alt+S]
N. Virginia
Gowtham

```
                    "lambda.amazonaws.com"
                ]
            }
        }
    ]
}
```

Step 2: Add permissions

Permissions policy summary

Policy name	Type	Attached as
AmazonSESFullAccess	AWS managed	Permissions policy
CloudWatchFullAccess	AWS managed	Permissions policy

Step 3: Add tags

Add tags - *optional* Info

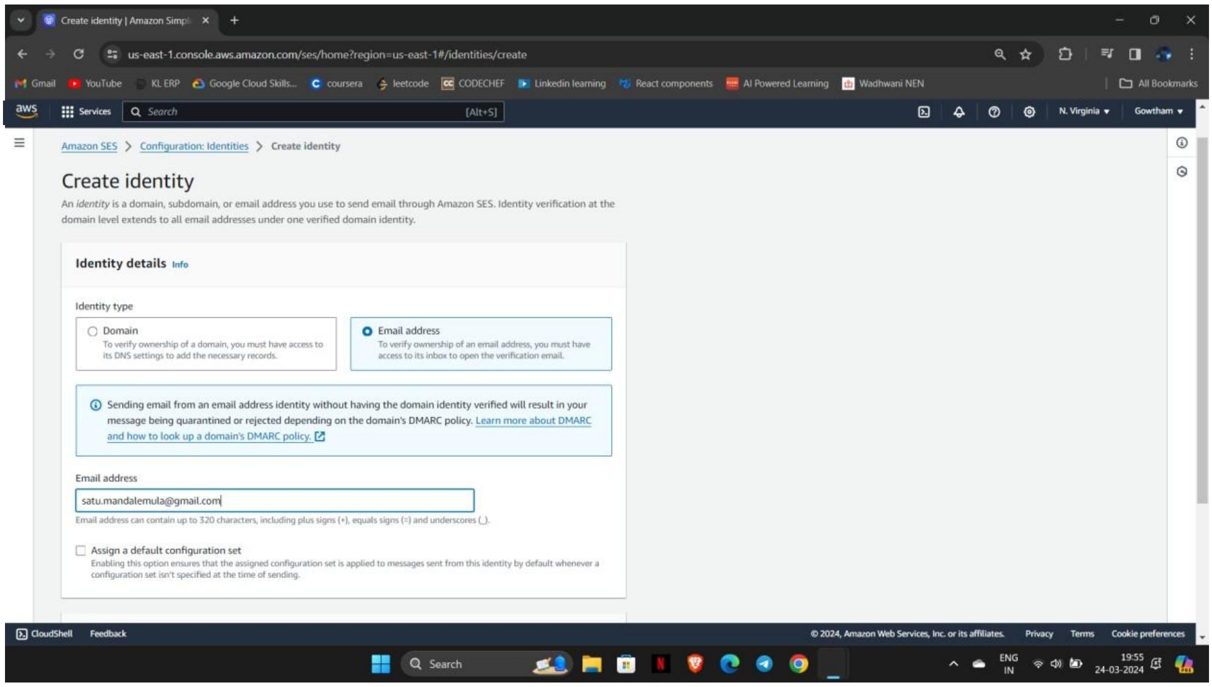
Tags are key-value pairs that you can add to AWS resources to help identify, organize, or search for resources.

No tags associated with the resource.

You can add up to 50 more tags.

2. Amazon SES

Before configuring the other steps, you must ensure that they are all in the same region. My transactions will be in the us-central-1 region.



Amazon SES > Configuration: Identities > Create identity

Create identity

An *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.

Sending email from an email address identity without having the domain identity verified will result in your message being quarantined or rejected depending on the domain's DMARC policy. Learn more about DMARC and how to look up a domain's DMARC policy.

Email address

satu.mandalemula@gmail.com

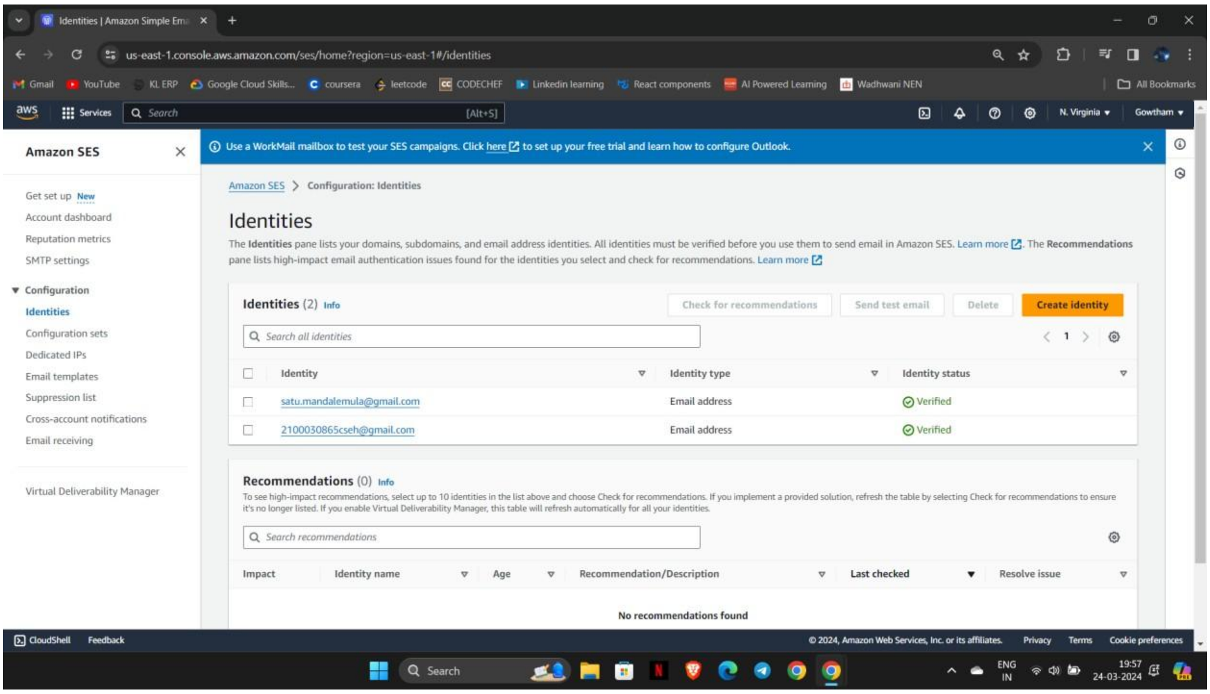
Email address can contain up to 320 characters, including plus signs (+), equals signs (=) and underscores (_).

□ 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.

we have to do the mail verification process. I have defined two mails.

Now press the Create Identity button to define the other.

You will receive a verification mail. After verifying your e-mail address, the status section will be verified.



Use a WorkMail mailbox to test your SES campaigns. Click here to set up your free trial and learn how to configure Outlook.

Amazon SES > Configuration: Identities

Identities

The **Identities** pane lists your domains, subdomains, and email address identities. All identities must be verified before you use them to send email in Amazon SES. Learn more. The **Recommendations** pane lists high-impact email authentication issues found for the identities you select and check for recommendations. Learn more

Identities (2) Info

□	Identity	Identity type	Identity status
□	satu.mandalemula@gmail.com	Email address	✓ Verified
□	2100030865cseh@gmail.com	Email address	✓ Verified

Recommendations (0) Info

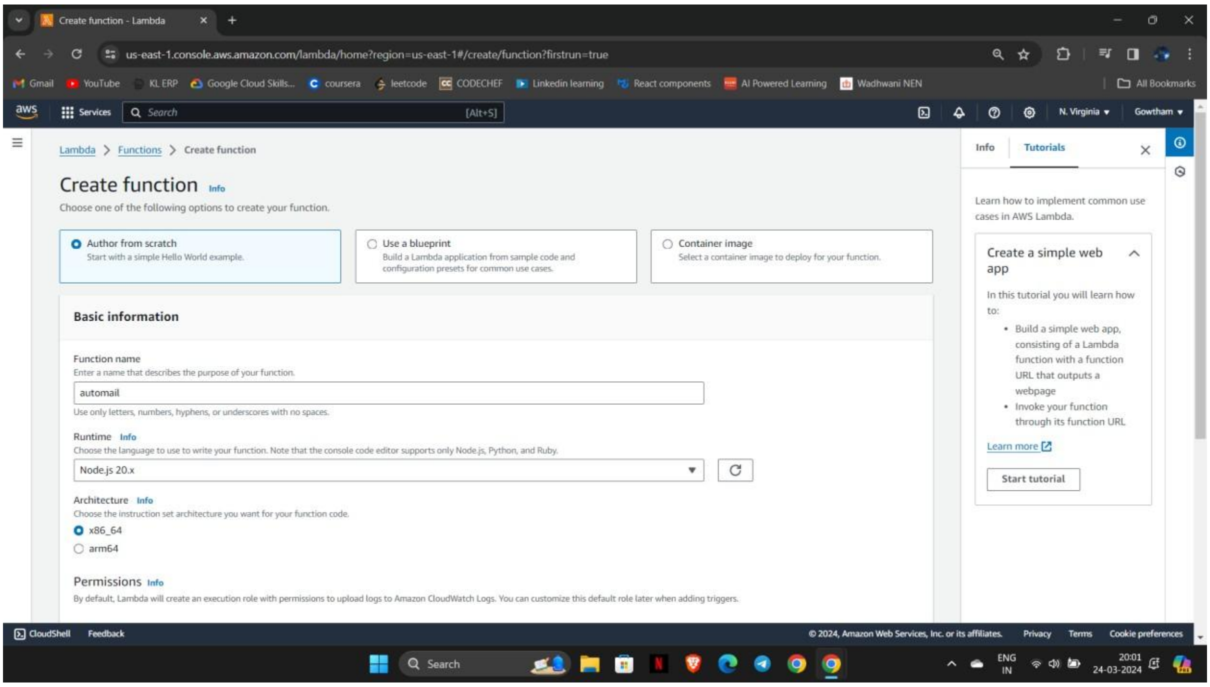
To see high-impact recommendations, select up to 10 identities in the list above and choose Check for recommendations. If you implement a provided solution, refresh the table by selecting Check for recommendations to ensure it's no longer listed. If you enable Virtual Deliverability Manager, this table will refresh automatically for all your identities.

Impact	Identity name	Age	Recommendation/Description	Last checked	Resolve issue

No recommendations found

3. Writing Lambda Function

On the Amazon console write Lamda to search area and click Create Function button. Enter a name that describes the purpose of your function and choose the language to use to write your function. We will use node.js.



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.
automail
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 20.x

Architecture Info
Choose the instruction set architecture you want for your function code.
● x86_64
○ arm64

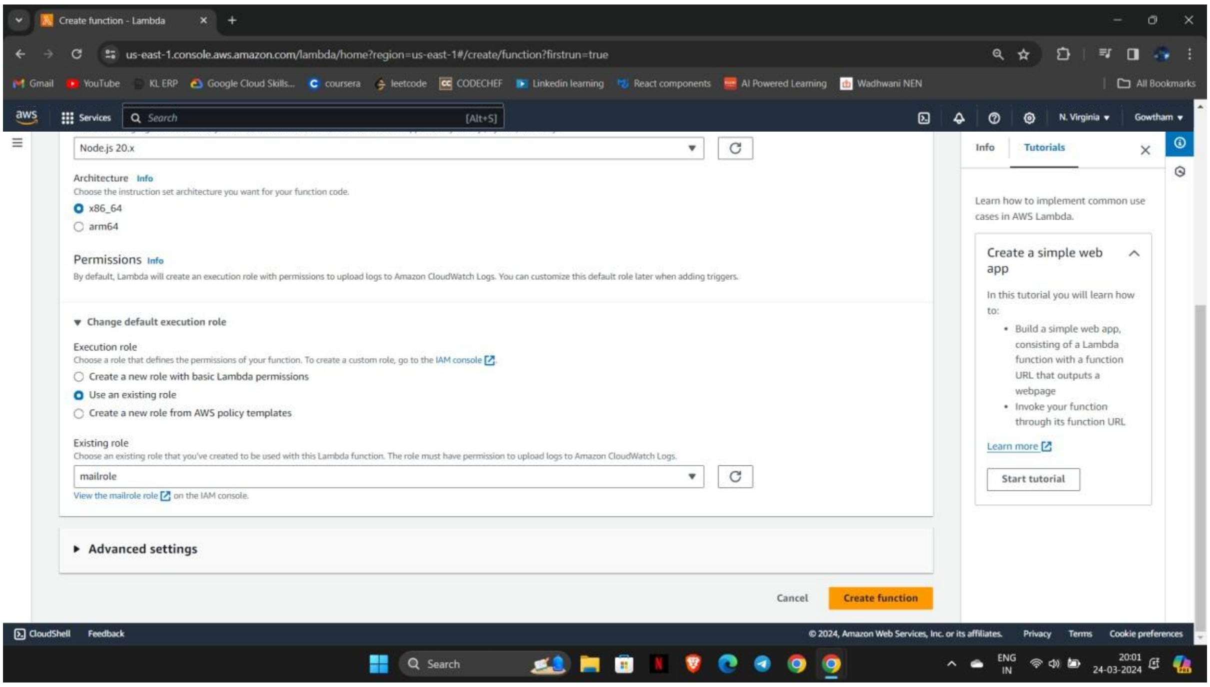
Permissions Info
By default, Lambda will create an execution role with permissions to upload logs to Amazon CloudWatch Logs. You can customize this default role later when adding triggers.

Learn how to implement common use cases in AWS Lambda.

Create a simple web app

In this tutorial you will learn how to:
- Build a simple web app, consisting of a Lambda function with a function URL that outputs a webpage
- Invoke your function through its function URL

At the bottom of the page, in the Change Default Execution Role section, we click “use an existing role” and select the name of the created role to use the role we just created and we create the Lambda service.



Node.js 20.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

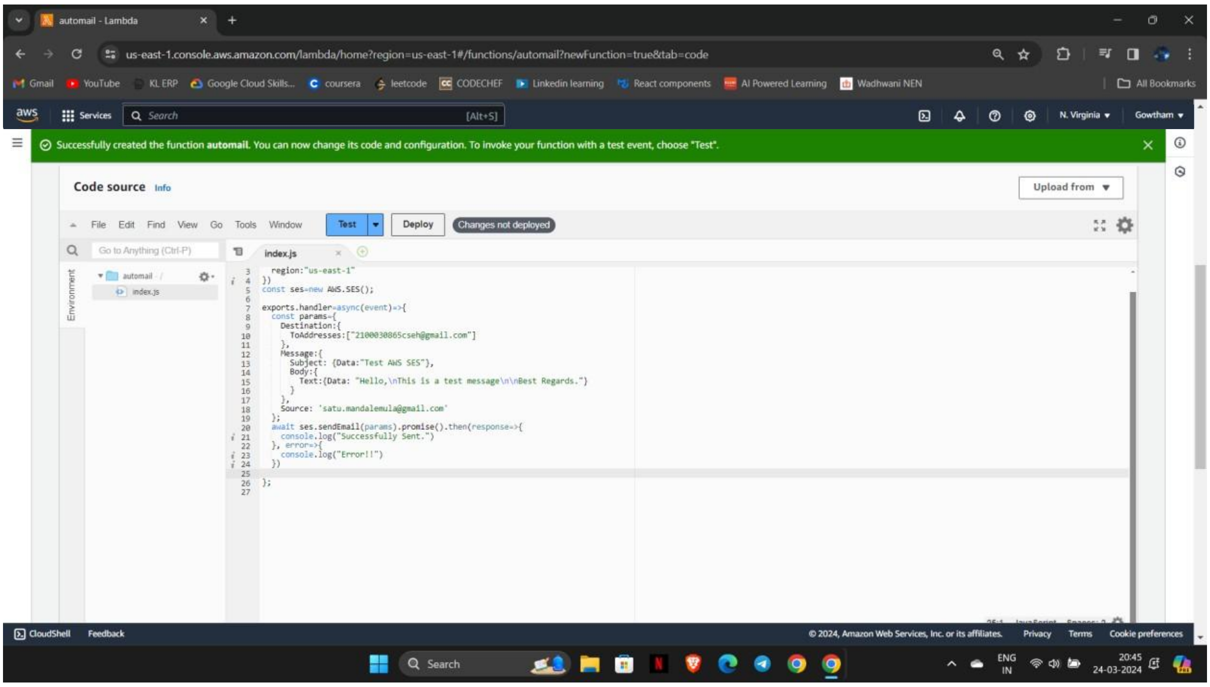
Choose an existing role that you've created to be used with this Lambda function. The role must have permission to upload logs to Amazon CloudWatch Logs.

mailrole

View the mailrole role on the IAM console.

▶ Advanced settings
Cancel
Create function
Info
Tutorials
Learn how to implement common use cases in AWS Lambda.
Create a simple web app
In this tutorial you will learn how to:
Build a simple web app, consisting of a Lambda function with a function URL that outputs a webpage
Invoke your function through its function URL
Learn more
Start tutorial

At the bottom of the opening page, there is a code section. We will write the code here then deploy and test it.



Successfully created the function **automail**. You can now change its code and configuration. To invoke your function with a test event, choose "Test".

```
  region:"us-east-1"
})
const ses=new AWS.SES();

exports.handler=async(event)=>{
  const params={
    Destination:{
      ToAddresses:["2100030865cseh@gmail.com"]
    },
    Message:{
      Subject: {Data:"Test AWS SES"},
      Body:{
        Text:{Data: "Hello,\nThis is a test message\n\nBest Regards."}
      }
    },
    Source: 'satu.mandalemula@gmail.com'
  };
  await ses.sendEmail(params).promise().then(response=>{
    console.log("Successfully Sent.")
  }, error=>{
    console.log("Error!!")
  })

};
```

In the code above;

- importing aws sdk

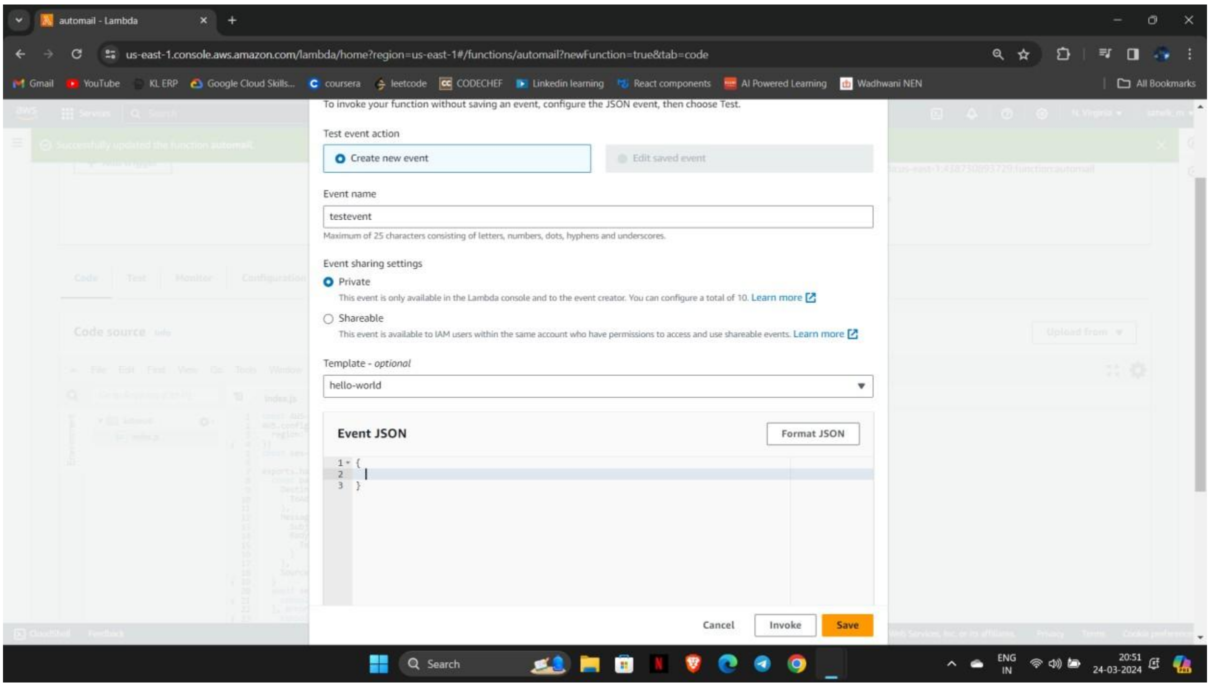
- Setting up region (change this part according to your region)

- Creating an object from AWS.SES()

- In the params variable, we specify mail features. These are destination, message, and source. If you want, you can add multiple e-mail addresses to the “ToAddresses” list.

- Lastly we create an arrow function and we log whether the mail is sent successfully or not.

If you have done these steps click the deploy button to deploy your code. Then click test. On the opening page write a test name, delete sample key values, and click Create.



To invoke your function without saving an event, configure the JSON event, then choose Test.

Test event action

● Create new event ○ Edit saved event

Event name

testevent

Maximum of 25 characters consisting of letters, numbers, dots, hyphens and underscores.

Event sharing settings

● Private

This event is only available in the Lambda console and to the event creator. You can configure a total of 10. Learn more

○ Shareable

This event is available to IAM users within the same account who have permissions to access and use shareable events. Learn more

Template - *optional*

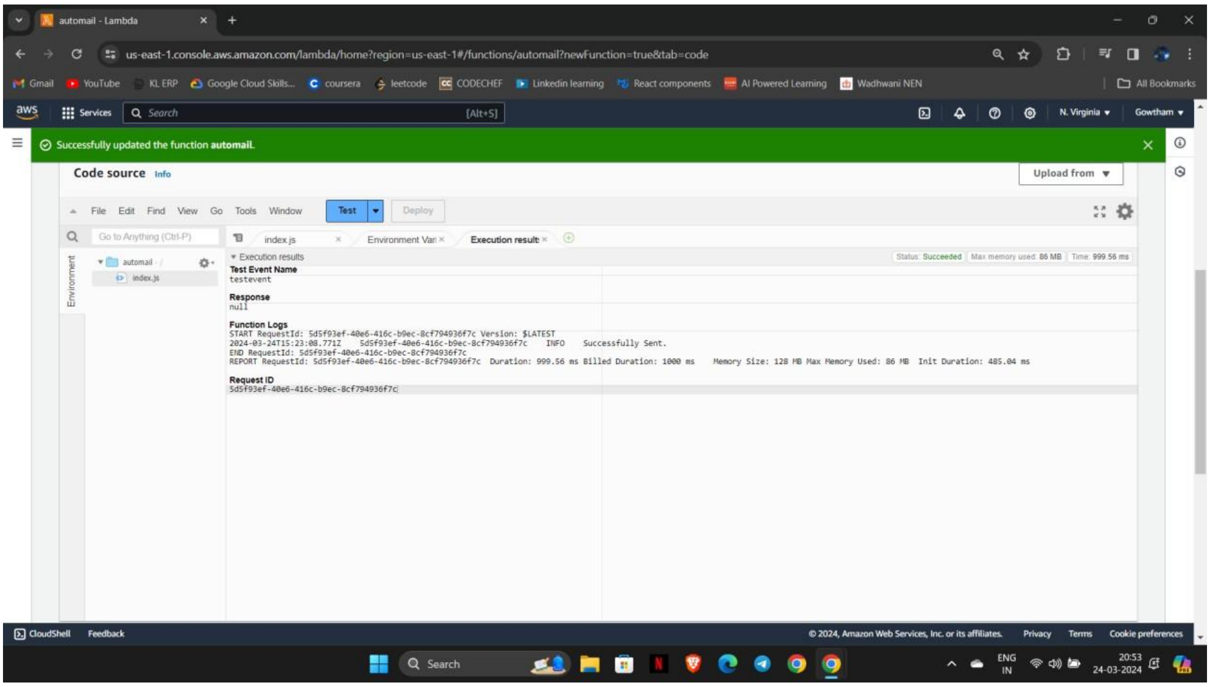
hello-world

Event JSON

```
{

}
```

After that click the test button again to run your test. You should see the “Successfully sent” message in the execution result page. If you look at the destination mailbox, you can see the test mail.



automail - Lambda
us-east-1.console.aws.amazon.com/lambda/home?region=us-east-1#/functions/automail?newFunction=true&tab=code
Successfully updated the function automail.
Code source
Upload from
Test
Deploy
index.js
Environment Vari
Execution result
automail
CloudShell
Feedback

Execution results

Status: Succeeded | Max memory used: 86 MB | Time: 999.56 ms

Test Event Name
```
testevent
```

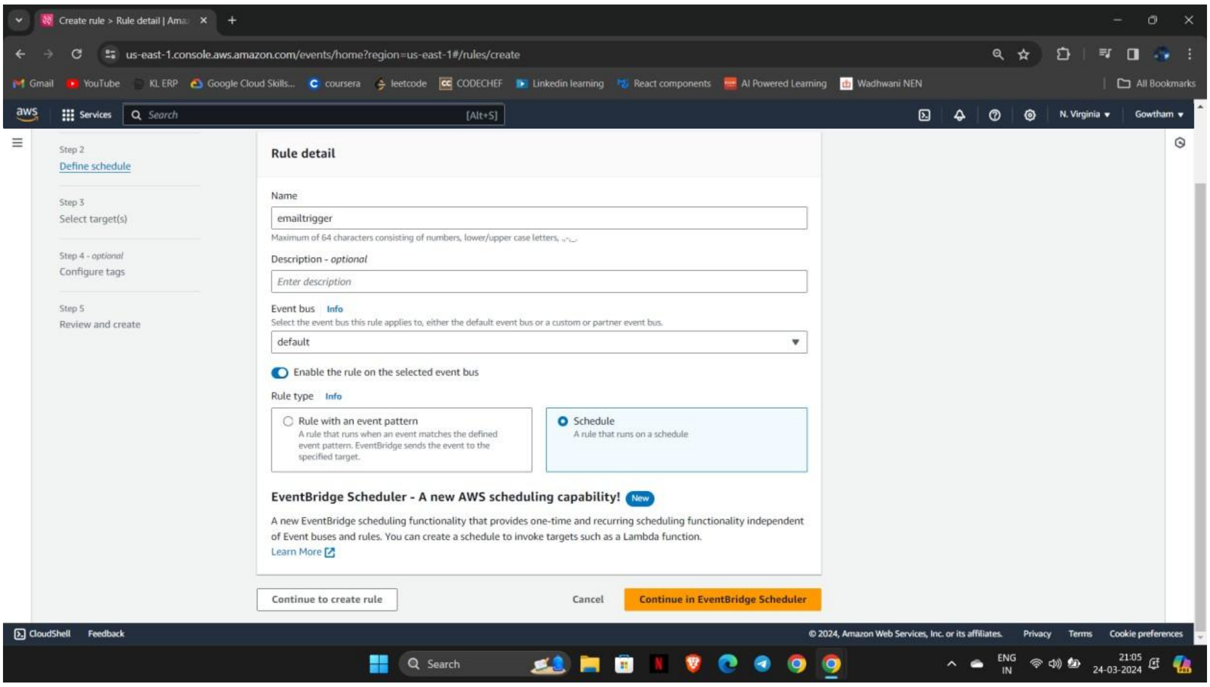
Response
```
null
```

Function Logs
```
START RequestId: 5d5f93ef-40e6-416c-b9ec-8cf794936f7c Version: $LATEST
2024-03-24T15:23:08.771Z	5d5f93ef-40e6-416c-b9ec-8cf794936f7c	INFO	Successfully Sent.
END RequestId: 5d5f93ef-40e6-416c-b9ec-8cf794936f7c
REPORT RequestId: 5d5f93ef-40e6-416c-b9ec-8cf794936f7c  Duration: 999.56 ms Billed Duration: 1000 ms	Memory Size: 128 MB Max Memory Used: 86 MB  Init Duration: 485.04 ms
```

Request ID
```
5d5f93ef-40e6-416c-b9ec-8cf794936f7c
```

4. Triggering with CloudWatch

In the Amazon console write CloudWatch to the search area. On the page that opens, click on the rules under the events section in the menu on the left. Then click the “Go to the Amazon EventBridge” button. In this section, we are going to create a rule. Click the “Create rule” button on the opening page. Set up a rule name.



Step 2
Define schedule

Step 3
Select target(s)

Step 4 - *optional*
Configure tags

Step 5
Review and create

Rule detail

Name: emailtrigger

Maximum of 64 characters consisting of numbers, lower/upper case letters, .,-,_.

Description - *optional*: *Enter description*

Event bus Info
Select the event bus this rule applies to, either the default event bus or a custom or partner event bus.
default

Enable the rule on the selected event bus

Rule type Info

○ Rule with an event pattern
A rule that runs when an event matches the defined event pattern. EventBridge sends the event to the specified target.

● Schedule
A rule that runs on a schedule

EventBridge Scheduler - A new AWS scheduling capability! New

A new EventBridge scheduling functionality that provides one-time and recurring scheduling functionality independent of Event buses and rules. You can create a schedule to invoke targets such as a Lambda function.
Learn More

In the Define pattern section, we click on the schedule and select the cron expression.

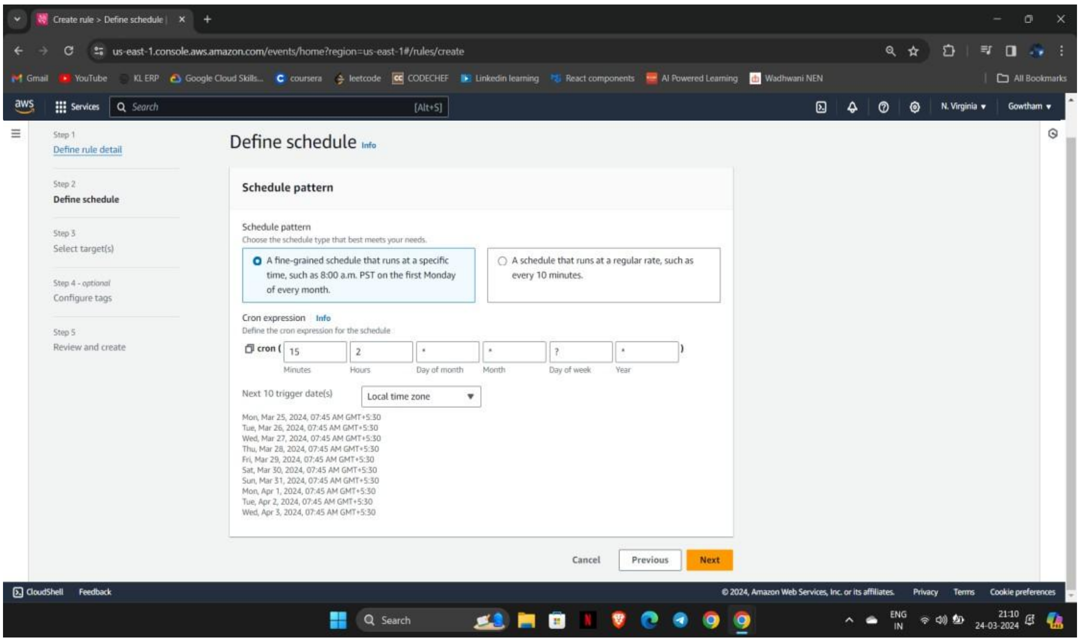
1. First part is minutes

2. Second part is hours

3. Third part is day-of-month. * declares every day.

4. Fourth part is month, * declares every month.
5. Fifth part is day-of-week, ? indicates that it does not matter what day it will be.

6. The last part is the year.



us-east-1.console.aws.amazon.com/events/home?region=us-east-1#/rules/create

Step 1
Define rule detail

Step 2
Define schedule

Step 3
Select target(s)

Step 4 - optional
Configure tags

Step 5
Review and create

Define schedule Info

Schedule pattern

Schedule pattern
Choose the schedule type that best meets your needs.

● A fine-grained schedule that runs at a specific time, such as 8:00 a.m. PST on the first Monday of every month.

○ A schedule that runs at a regular rate, such as every 10 minutes.

Cron expression Info
Define the cron expression for the schedule

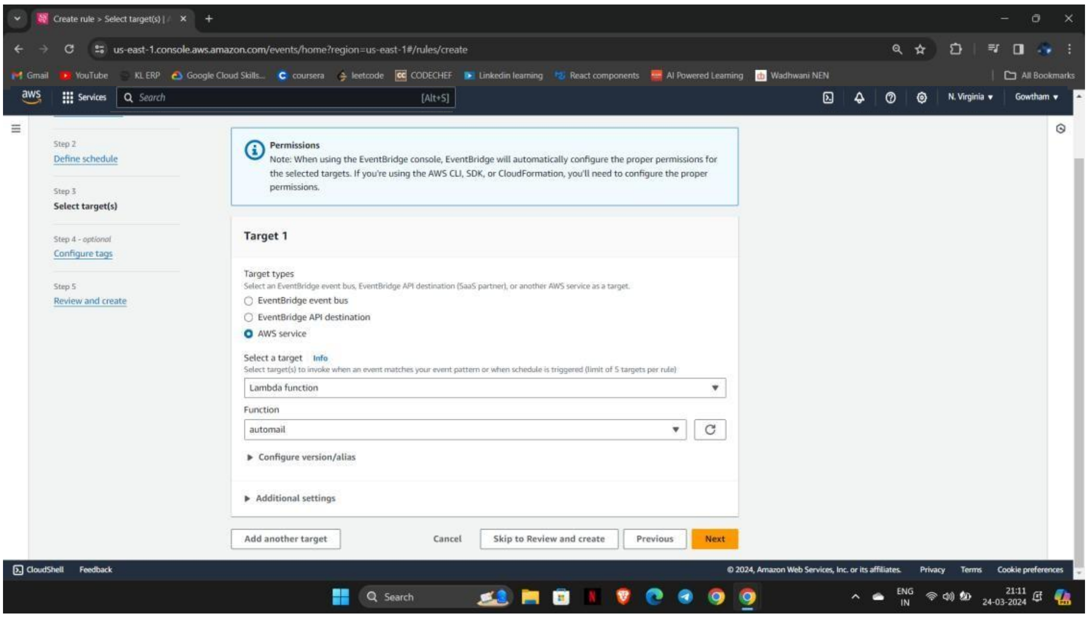
cron (15 | 2 | * | * | ? | *)
Minutes | Hours | Day of month | Month | Day of week | Year

Next 10 trigger date(s) — Local time zone

Mon, Mar 25, 2024, 07:45 AM GMT+5:30
Tue, Mar 26, 2024, 07:45 AM GMT+5:30
Wed, Mar 27, 2024, 07:45 AM GMT+5:30
Thu, Mar 28, 2024, 07:45 AM GMT+5:30
Fri, Mar 29, 2024, 07:45 AM GMT+5:30
Sat, Mar 30, 2024, 07:45 AM GMT+5:30
Sun, Mar 31, 2024, 07:45 AM GMT+5:30
Mon, Apr 1, 2024, 07:45 AM GMT+5:30
Tue, Apr 2, 2024, 07:45 AM GMT+5:30
Wed, Apr 3, 2024, 07:45 AM GMT+5:30

Create rule > Define schedule
Cancel
Previous
Next
CloudShell
Feedback
© 2024, Amazon Web Services, Inc. or its affiliates.
21:10
24-03-2024

Finally, we select the Lambda function we created in the select target section and create the rule.



us-east-1.console.aws.amazon.com/events/home?region=us-east-1#/rules/create

Step 2
Define schedule

Step 3
Select target(s)

Step 4 - optional
Configure tags

Step 5
Review and create

Permissions
Note: When using the EventBridge console, EventBridge will automatically configure the proper permissions for the selected targets. If you're using the AWS CLI, SDK, or CloudFormation, you'll need to configure the proper permissions.

Target 1

Target types
Select an EventBridge event bus, EventBridge API destination (SaaS partner), or another AWS service as a target.
○ EventBridge event bus
○ EventBridge API destination
● AWS service

Select a target Info
Select target(s) to invoke when an event matches your event pattern or when schedule is triggered (limit of 5 targets per rule)
Lambda function

Function
automail

▶ Configure version/alias

▶ Additional settings

Create rule > Select target(s)
Add another target
Cancel
Skip to Review and create
Previous
Next
CloudShell
Feedback
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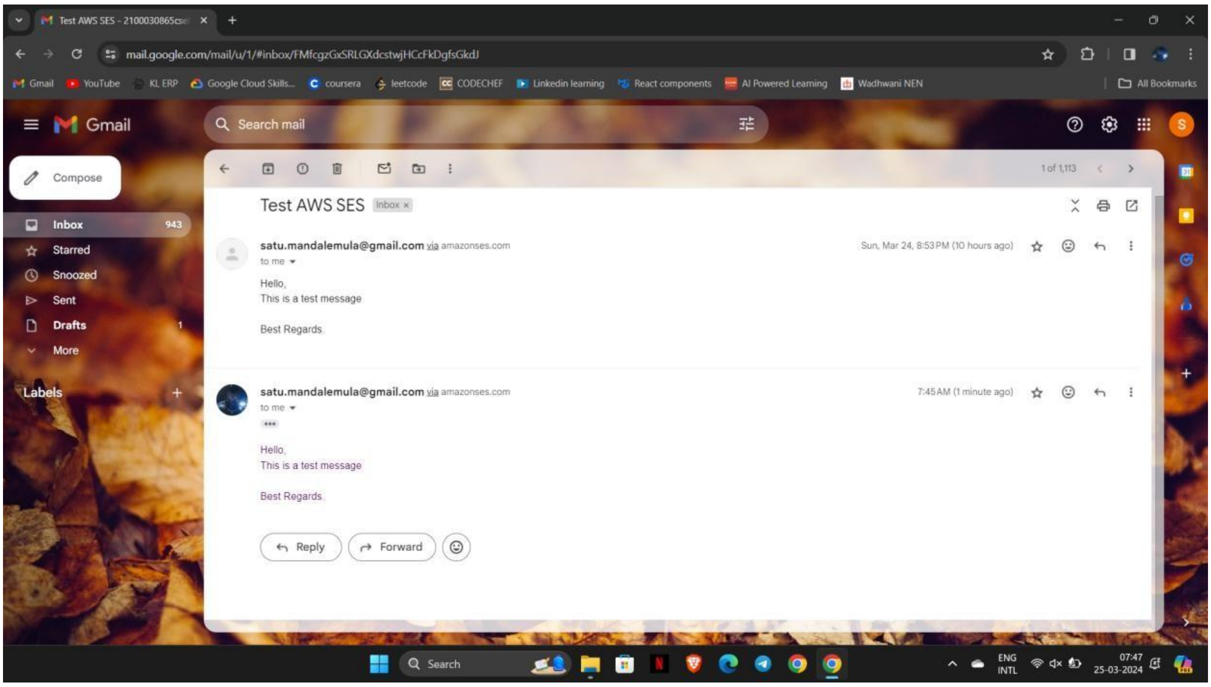
21:11
24-03-2024

Under the created rules, you can see that the rule is running with the enabled mark in the status section.

Result: If you check the destination mailbox when the time you set comes, you can see the mail you sent. Currently, I received two emails at two different times.



Test AWS SES Inbox

satu.mandalemula@gmail.com via amazonses.com
to me
Sun, Mar 24, 8:53 PM (10 hours ago)

Hello,
This is a test message

Best Regards

satu.mandalemula@gmail.com via amazonses.com
to me
7:45 AM (1 minute ago)

Hello,
This is a test message

Best Regards