

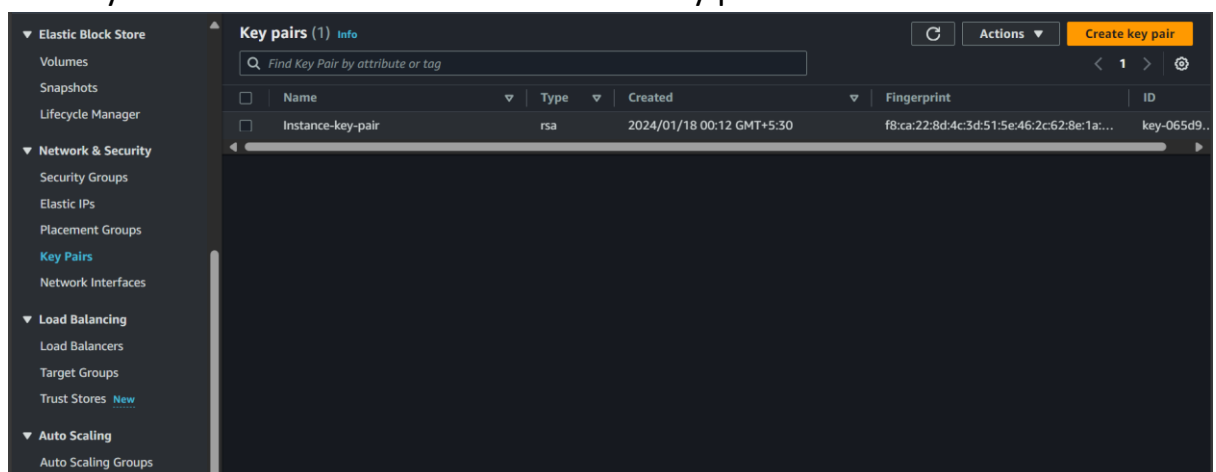
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Step:1 - Creation of KeyPair.

1. Login in to AWS management console by using our credentials.
2. Search the service **EC2**.
3. As we could see below after clicking on **EC2** service, there is dashboard showing for **EC2**. We will scroll down and from the left panel will click on the Key Pairs. And then will click on Create key pair.



4. We have given the name to the key pair is **VPCE-Tutorial-KeyPair**. We will select .pem format. And now will click on Create key pair.

EC2 > Key pairs > Create key pair

Create key pair Info

Key pair
A key pair, consisting of a private key and a public key, is a set of security credentials that you use to prove your identity when connecting to an instance.

Name

The name can include up to 255 ASCII characters. It can't include leading or trailing spaces.

Key pair type Info
☒ RSA ☐ ED25519

Private key file format
☒ .pem
For use with OpenSSH
☐ .ppk
For use with PuTTY

Tags - *optional*
 No tags associated with the resource.

You can add up to 50 more tags.

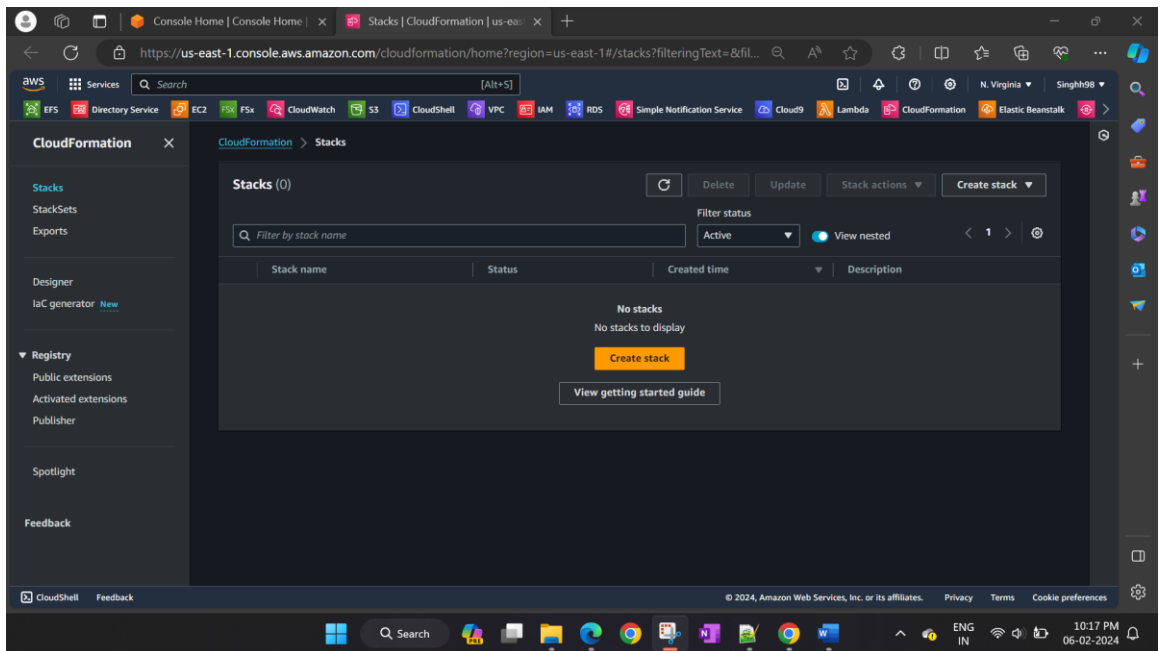
5. Now we could see in the below snip that the KeyPair is created successfully.

Key pairs (2) Info

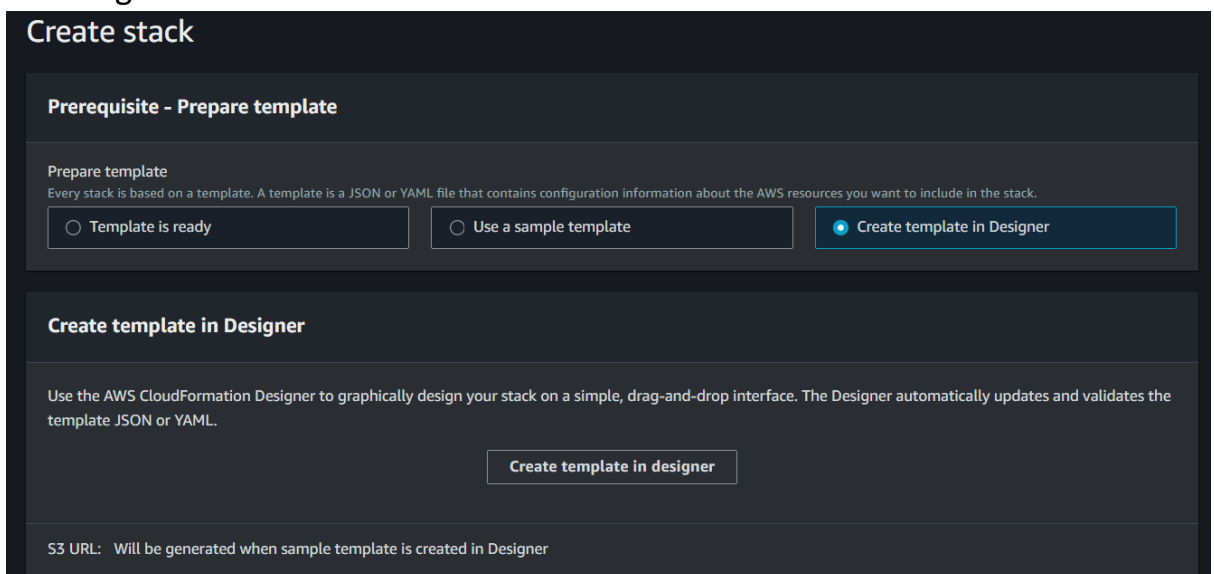
<input type="checkbox"/>	Name	Type	Created	Fingerprint
<input type="checkbox"/>	VPCE-Tutorial-KeyPair	rsa	2024/02/21 19:47 GMT+5:30	1c:bd:62:be:9e:87:5c

Step:2 - Creation of CloudFormation Stack.

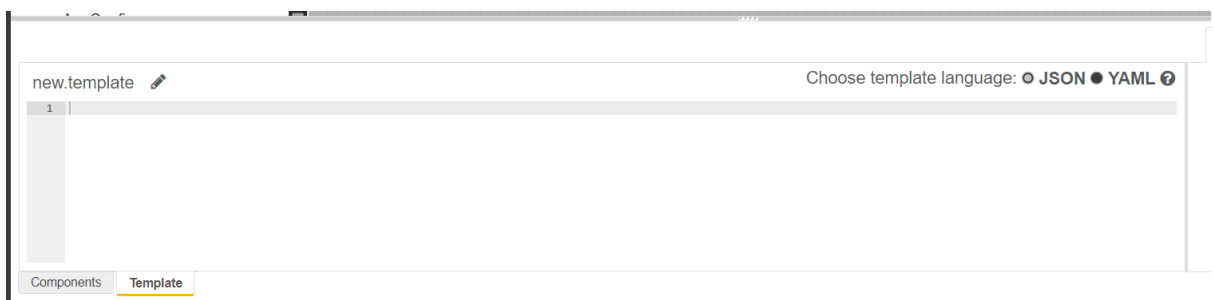
1. From the Search bar we will search the service **CloudFormation**.
2. As we could see below after clicking on **CloudFormation** service, there is dashboard showing for **CloudFormation**. We will click on **Create stack**.



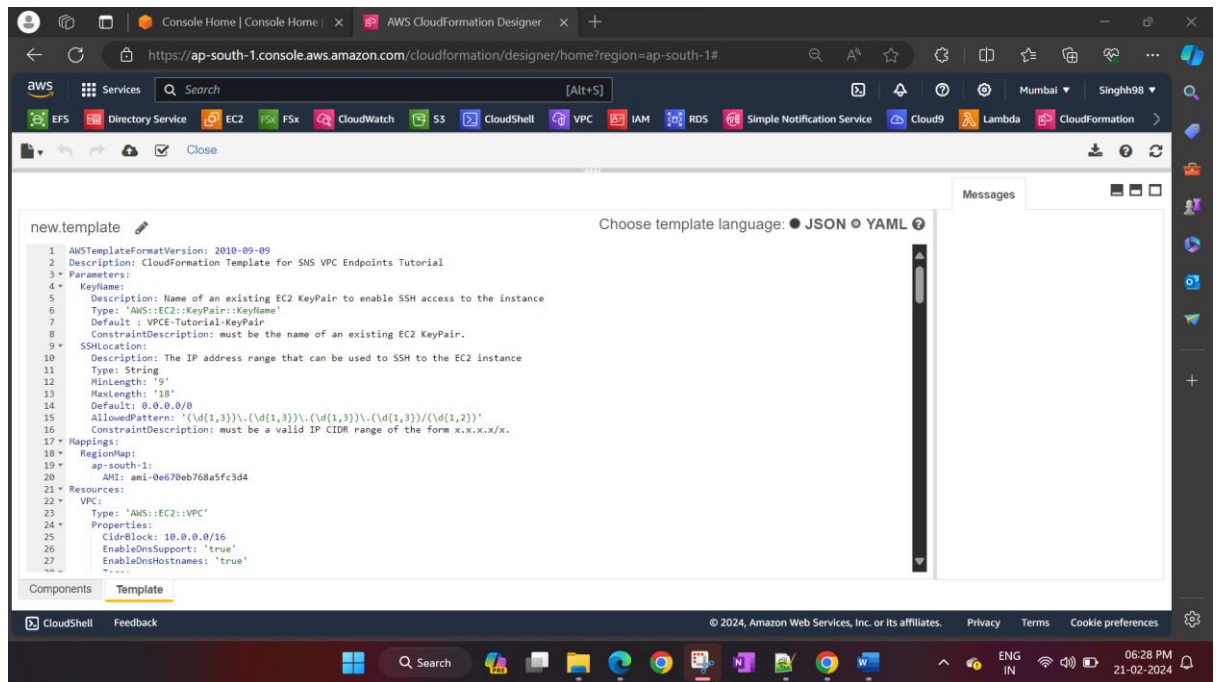
3. After that we will select & then click on the Create template in designer.



4. After that we will click on the Template, and will delete the existing code there.



5. Now will paste the code which we have prepared for the launch of the mentioned resources in the assignment.

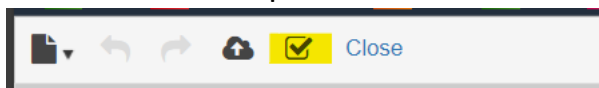


6. Attaching the file here for complete code.

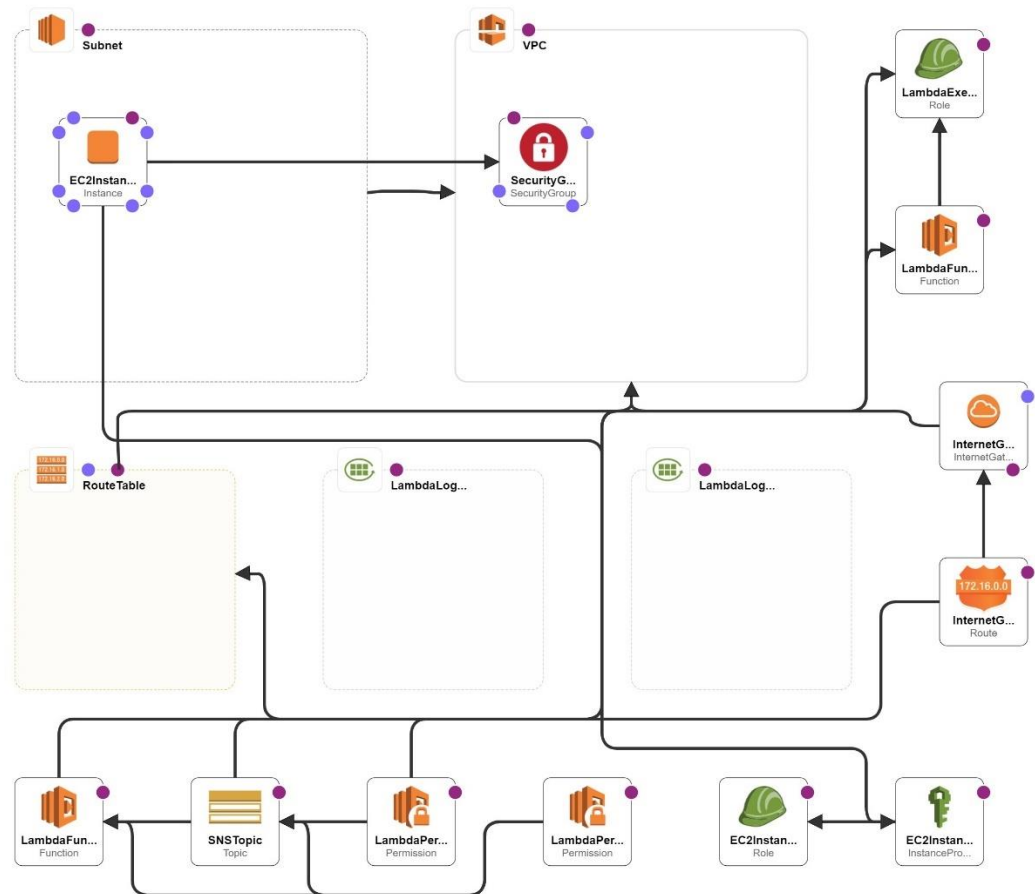


CF-Template.yml

7. After that we will click on the highlighted icon in the below snip to check the template is valid.

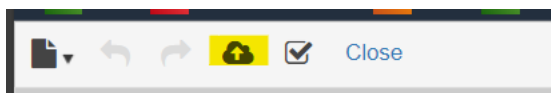


8. Also, when we write the code, the diagram in the designer is also generated for the given template. We can click on the download icon in the right top corner. And we will get the below image.



9.

10. Now we will click on the highlighted icon in the below snip to load this as template for creation of stack.



11. Now we could see that the template is ready, we will click on Next.

Create stack

Prerequisite - Prepare template

Prepare template
Every stack is based on a template. A template is a JSON or YAML file that contains configuration information about the AWS resources you want to include in the stack.

☒ Template is ready
 ☐ Use a sample template
 ☐ Create template in Designer

Specify template

A template is a JSON or YAML file that describes your stack's resources and properties.

Template source
Selecting a template generates an Amazon S3 URL where it will be stored.

☒ Amazon S3 URL
Provide an Amazon S3 URL to your template.
 ☐ Upload a template file
Upload your template directly to the console.
 ☐ Sync from Git - new
Sync a template from your Git repository.

Amazon S3 URL

Amazon S3 template URL

S3 URL: <https://s3.ap-south-1.amazonaws.com/cf-templates-1iufibewmi0u2-ap-south-1/2024052jWK-new.template7afb5netwsb> [View in Designer](#)

Cancel [Next](#)

12. We have given name to the stack is **Hari-Project-Stack**.

[CloudFormation](#) > [Stacks](#) > [Create stack](#)

Step 1
[Create stack](#)

Step 2
Specify stack details

Step 3
[Configure stack options](#)

Step 4
[Review and create](#)

Specify stack details

Provide a stack name

Stack name

Stack name can include letters (A-Z and a-z), numbers (0-9), and dashes (-).

13. Parameter is showing the same which we had given in the code. Now we will click on Next.

Parameters

Parameters are defined in your template and allow you to input custom values when you create or update a stack.

KeyName
Name of an existing EC2 KeyPair to enable SSH access to the instance


SSHLocation
The IP address range that can be used to SSH to the EC2 instance

Cancel [Previous](#) [Next](#)

14. Configuration stack options page we will leave default & will click on Next.

15. On Review and create page will check all the things and will click on Submit if all fine.

Capabilities



The following resource(s) require capabilities: [AWS::IAM::Role]

This template contains Identity and Access Management (IAM) resources. Check that you want to create each of these resources and that they have the minimum required permissions. In addition, they have custom names. Check that the custom names are unique within your AWS account. [Learn more](#)

☒ I acknowledge that AWS CloudFormation might create IAM resources with custom names.

Create change set

Cancel

Previous

Submit

16. Now we could see that the Stack is in progress state and started creating.

CloudFormation > Stacks > Hari-Project-Stack

Stacks (1)

Filter status

Filter by stack name

Active

View nested

< 1 >

Stacks

Hari-Project-Stack

2024-02-21 18:37:07 UTC+0530

CREATE_IN_PROGRESS

Hari-Project-Stack

Delete Update Stack actions Create stack

< Stack info Events Resources Outputs Parameters Template >

Events (1)

Detect root cause

Search events

Timestamp Logical ID Status Status reason

2024-02-21 18:37:07 UTC+0530

Hari-Project-Stack

CREATE_IN_PROGRESS

User Initi

17. In the Event section we could see all steps for creation of stack.

Hari-Project-Stack

Delete Update Stack actions Create stack

< Stack info Events Resources Outputs Parameters Template Change sets >

Events (30)

Detect root cause

Search events

Timestamp Logical ID Status Status reason

2024-02-21 18:37:31 UTC+0530

EC2InstanceProfile

CREATE_IN_PROGRESS

Resource creation Initiated

2024-02-21 18:37:30 UTC+0530

LambdaFunction1

CREATE_IN_PROGRESS

Resource creation Initiated

2024-02-21 18:37:30 UTC+0530

LambdaFunction2

CREATE_IN_PROGRESS

Resource creation Initiated

2024-02-21 18:37:30 UTC+0530

EC2InstanceProfile

CREATE_IN_PROGRESS

-

2024-02-21 18:37:29 UTC+0530

VPCGatewayAttachment

CREATE_COMPLETE

-

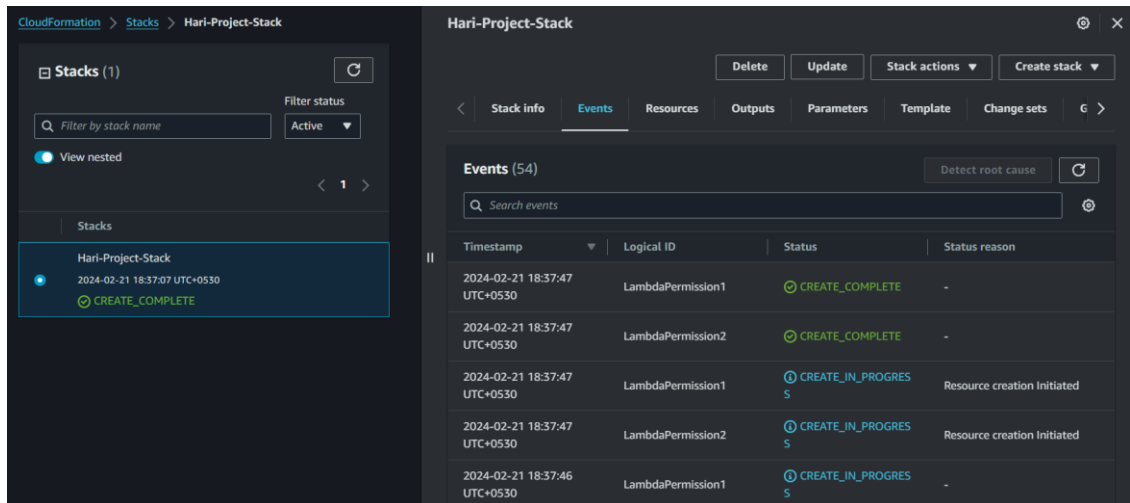
2024-02-21 18:37:29 UTC+0530

EC2InstanceRole

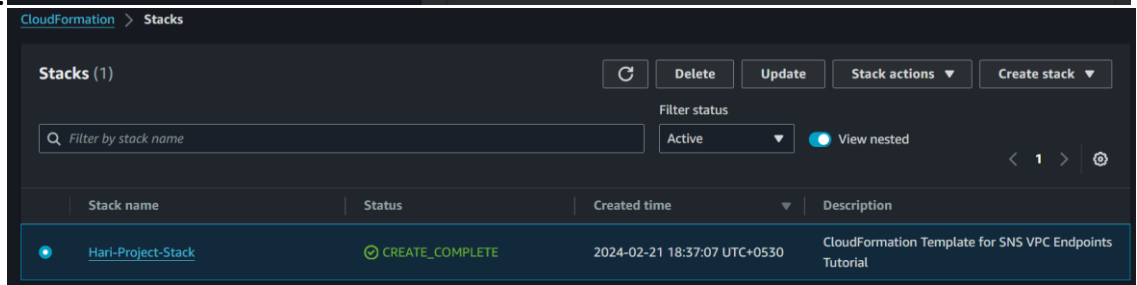
CREATE_COMPLETE

-

18. Now we could see that the stack creation has been completed.

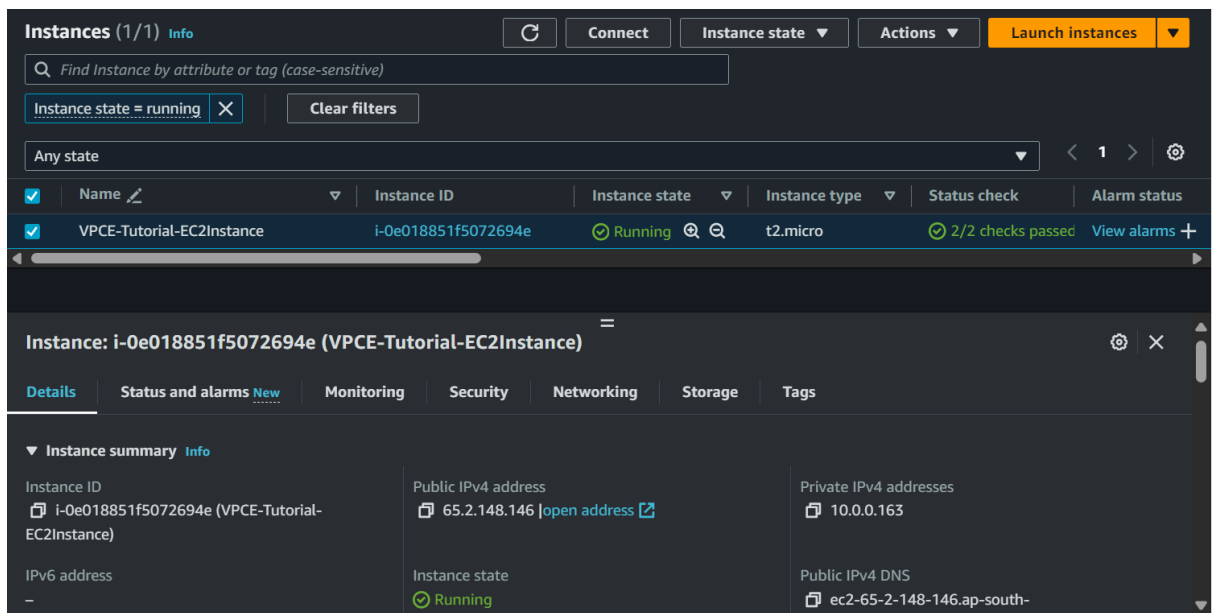


19.



Step:3 - Verifying resources created under stack.

1. The Instance VPCE-Tutorial-EC2Instance has been created.



2. VPC has been created.

Your VPCs (1/2) [Info](#)

Search

Name	VPC ID	State	IPv4 CIDR	IPv6 CIDR
<input checked="" type="checkbox"/> VPCE-Tutorial-VPC	vpc-09be31eadd7aa3f07	Available	10.0.0.0/16	-

vpc-09be31eadd7aa3f07 / VPCE-Tutorial-VPC

[Details](#) [Resource map](#) [CIDRs](#) [Flow logs](#) [Tags](#) [Integrations](#)

Details

VPC ID vpc-09be31eadd7aa3f07	State Available	DNS hostnames Enabled	DNS resolution Enabled
Tenancy Default	DHCP option set dopt-04c64d6a108253d3c	Main route table rtb-05027922494266ff8	Main network ACL acl-0d9d2cfc11169ecd0
Default VPC No	IPv4 CIDR 10.0.0.0/16	IPv6 pool -	IPv6 CIDR (Network border group) -

3. The subnet has been created.

Subnets (1/4) [Info](#)

Find resources by attribute or tag

Name	Subnet ID	State	VPC	IPv4 CIDR
<input checked="" type="checkbox"/> VPCE-Tutorial-Subnet	subnet-06cf7178a690539ba	Available	vpc-09be31eadd7aa3f07 VPC...	10.0.0.0/24

subnet-06cf7178a690539ba / VPCE-Tutorial-Subnet

[Details](#) [Flow logs](#) [Route table](#) [Network ACL](#) [CIDR reservations](#) [Sharing](#) [Tags](#)

Details

Subnet ID subnet-06cf7178a690539ba	Subnet ARN arn:aws:ec2:ap-south-1:101304436132:subnet/subnet-06cf7178a690539ba	State Available	IPv4 CIDR 10.0.0.0/24
Available IPv4 addresses 250	Availability Zone ap-south-1a	Availability Zone ID aps1-az1	Network ACL acl-0d9d2cfc11169ecd0
Network border group -	IPv6 CIDR -	Route table rtb-02c3a69a7f3bc08e1 VPCE-Tutorial-RouteTable	
	VPC		

4. Internet-Gateway has been created.

Internet gateways (2) [Info](#)

Search

Name	Internet gateway ID	State	VPC ID
<input type="checkbox"/> VPCE-Tutorial-InternetGateway	igw-0f571357bede6355a	Attached	vpc-09be31eadd7aa3f07 VPCE-Tutori...

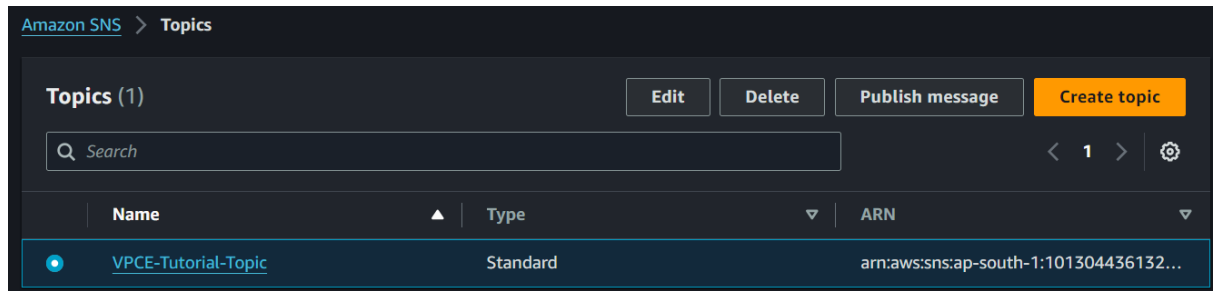
5. Route table has been created.

Route tables (3) [Info](#)

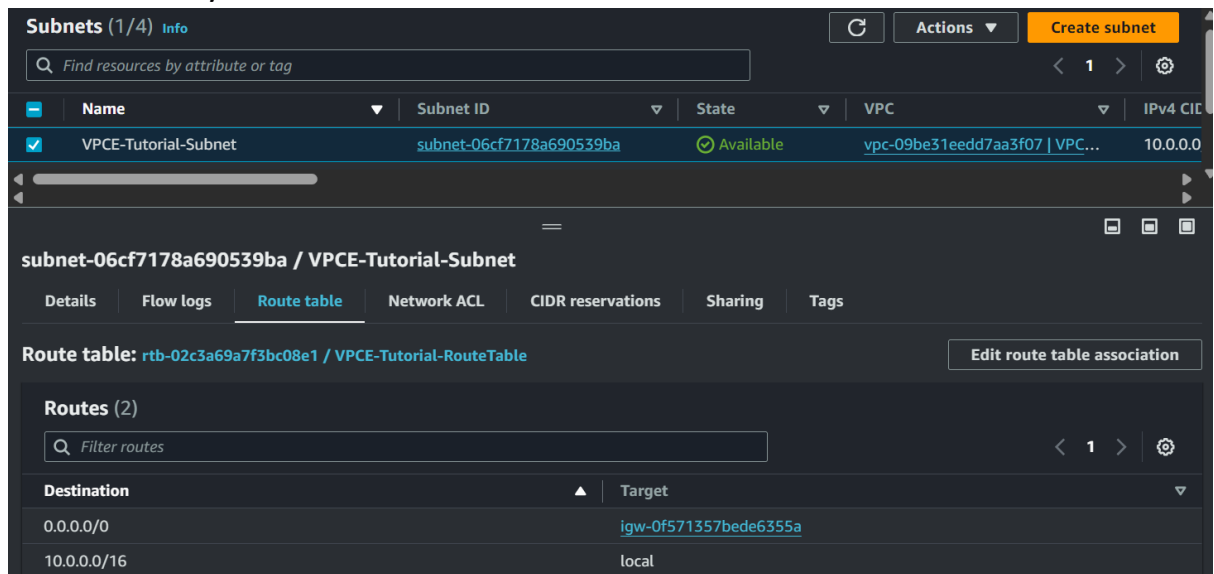
Find resources by attribute or tag

Name	Route table ID	Explicit subnet associ...	Edge associations	Main
<input type="checkbox"/> VPCE-Tutorial-RouteTable	rtb-02c3a69a7f3bc08e1	subnet-06cf7178a69053...	-	No
<input type="checkbox"/> -	rtb-05027922494266ff8	-	-	Yes

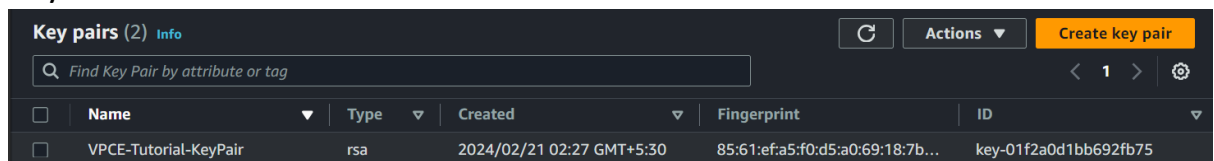
6. SNS Topic has been created.



7. Inter-Gateway is attached with the Subnet.

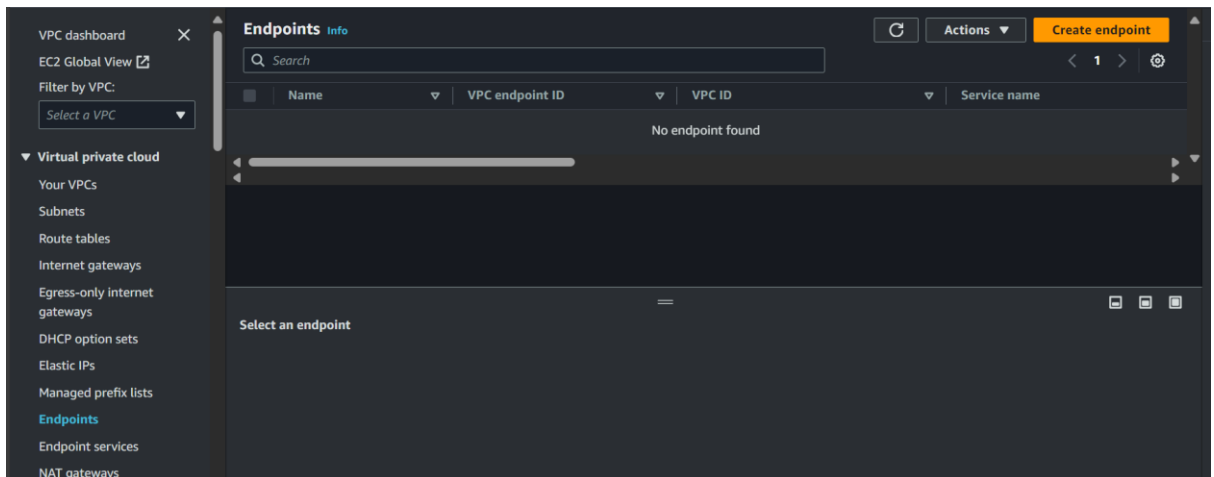


8. Key Pair is available for the connection which is used in the code.

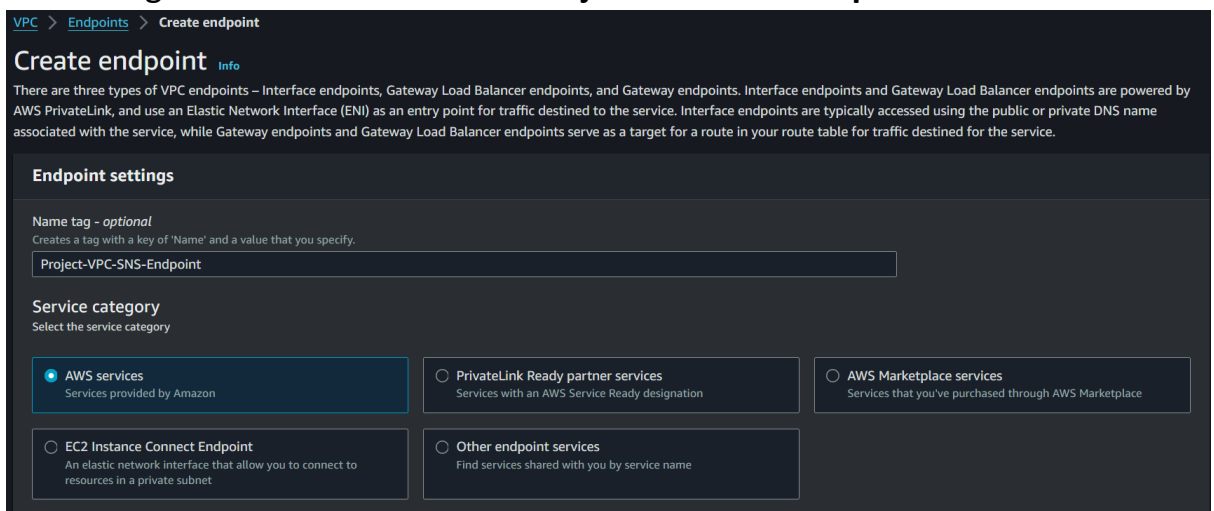


Step:4 - Create an Amazon VPC Endpoint for Amazon SNS.

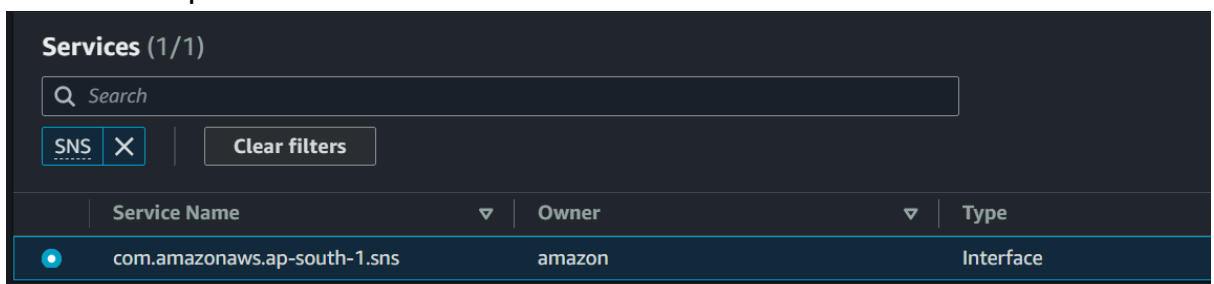
1. From the Search bar we will search the service VPC.
2. As we could see below after clicking on VPC service, there is dashboard showing for VPC. In the navigation menu on the left, choose **Endpoints**. We will click on Create endpoint.



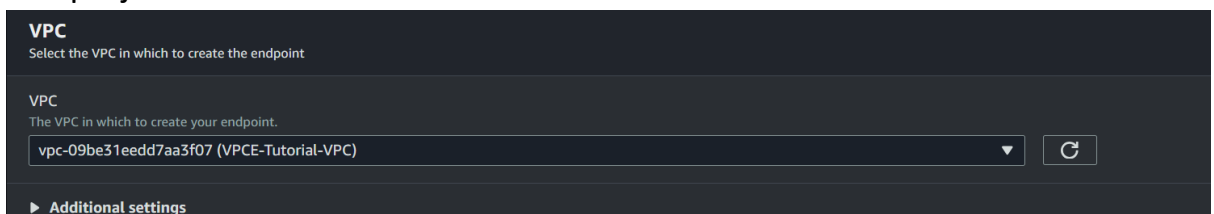
- We have given name to the VPC is **Project-VPC-SNS-Endpoint**.



- We will select the service **com.amazonaws.ap-south-1.sns** from the services dropdown.



- VPC we will select the above one which is created under the stack for this project.



- We will enable the DNS name.

▼ **Additional settings**

DNS name

☒ **Enable DNS name** [Info](#)

Associates a private hosted zone with the VPC that contains a record set that enables you to leverage Amazon's private network connectivity to the service while making requests to the service's default public endpoint DNS name. To use this feature, ensure that the attributes 'Enable DNS hostnames' and 'Enable DNS support' are enabled for your VPC.

DNS record IP type

☒ IPv4

☐ IPv6

☐ Dualstack

☐ Service defined

7. Subnet we will select **VPCE-Tutorial-Subnet** of same region.

Subnets (1/3) [Info](#)

<input checked="" type="checkbox"/>	Availability Zone ▼	Subnet ID ▼	Designate IP addresses	IPv4 address ▼	IPv6 address ▼
<input checked="" type="checkbox"/>	ap-south-1a (aps1-az1)	subnet-06cf7178a690...	<input type="checkbox"/>		
<input type="checkbox"/>	ap-south-1b (aps1-az3)	ⓘ No subnet available	<input type="checkbox"/>		
<input type="checkbox"/>	ap-south-1c (aps1-az2)	ⓘ No subnet available	<input type="checkbox"/>		

IP address type

☒ IPv4

☐ IPv6

☐ Dualstack

8. Security group we will select which is created under the stack for this project.

Security groups (1/2) [Info](#)

<input checked="" type="checkbox"/>	Group ID ▼	Group name ▼	VPC ID ▼	Description ▼
<input checked="" type="checkbox"/>	sg-018a935b86a7215dd	Tutorial Security Group	vpc-09be31eadd7aa3f07	Security group for SNS VPC endpoint tu...
<input type="checkbox"/>	sg-007d764bb723ca58b	default	vpc-09be31eadd7aa3f07	default VPC security group

sg-018a935b86a7215dd ✕

9. Now will scroll down, and will give the tags and will click on Create endpoint.

Tags

Key

✕

Value - optional

✕

You can add 49 more tags.

10. We could see in the below snip that the endpoint has created successfully.

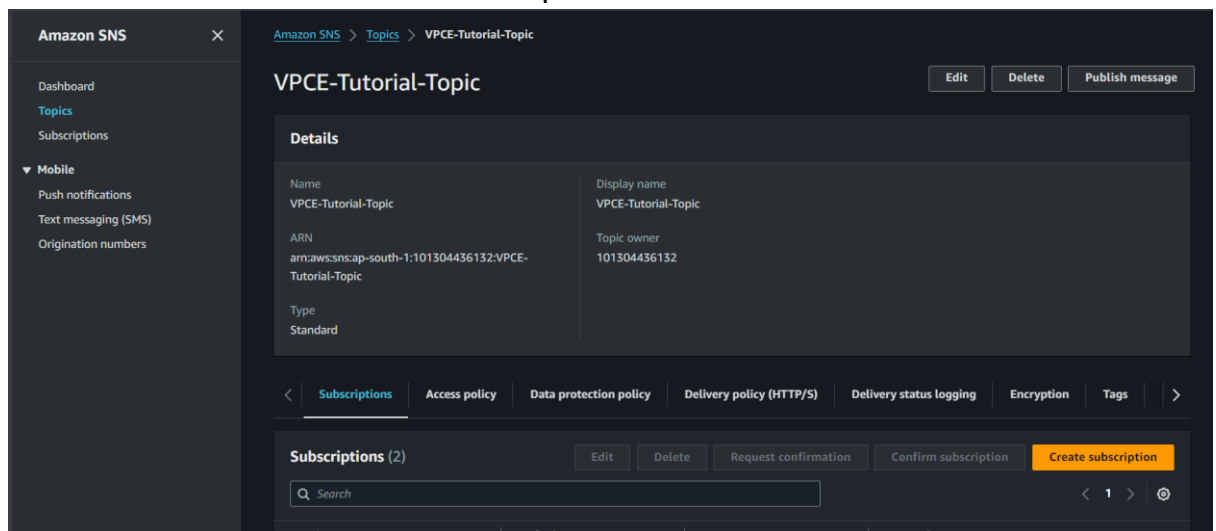
✔ **Successfully created VPC endpoint** [vpce-088345b493fb10986](#) ✕

Endpoints (1/1) [Info](#)

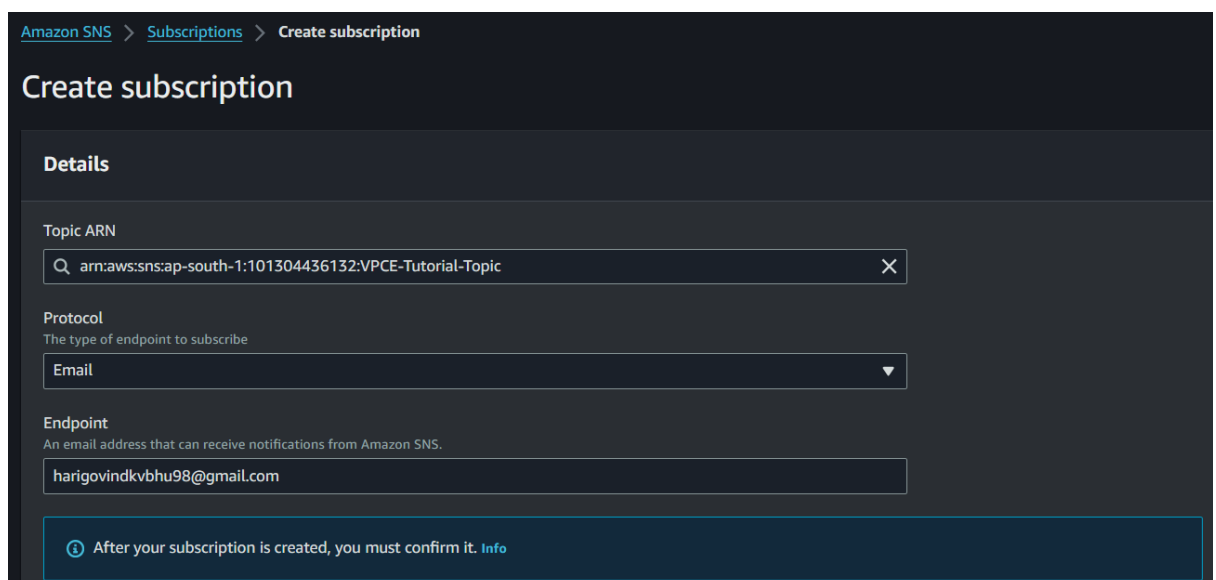
<input checked="" type="checkbox"/>	Name ▼	VPC endpoint ID ▼	VPC ID ▼	Service name
<input checked="" type="checkbox"/>	Project-VPC-SNS-Endpo...	vpce-088345b493fb10986	vpc-09be31eadd7aa3f07 VPCE-Tutori...	com.amazonaws.ap-south-1.sns

Step:5 - Subscribing Amazon SNS.

1. From the Search bar we will search the service SNS.
2. And from the left panel we will click on the Topics and could see the sns topic **VPCE-Tutorial-Topic** which is created under the stack. Now will click on the sns topic.
3. Now will click on the Create subscription.



4. Then in Topic ARN we will take the arn of the sns topic, in protocol we will select the Email and will give the email address on which we want the notification.



5. Now will scroll down and will click on the Create subscription.

▶ **Subscription filter policy - optional** Info
This policy filters the messages that a subscriber receives.

▶ **Redrive policy (dead-letter queue) - optional** Info
Send undeliverable messages to a dead-letter queue.

Cancel
Create subscription

- Now with a highlighted popup we could see that subscription has been created successfully, but the status is pending confirmation.

✔ **Subscription to VPCE-Tutorial-Topic created successfully.**
The ARN of the subscription is `arn:aws:sns:ap-south-1:101304436132:VPCE-Tutorial-Topic:e1df8963-2498-4abd-9282-d8670afa2d0b`.

Amazon SNS > Topics > VPCE-Tutorial-Topic > Subscription: e1df8963-2498-4abd-9282-d8670afa2d0b

Subscription: e1df8963-2498-4abd-9282-d8670afa2d0b
Edit
Delete

Details

ARN arn:aws:sns:ap-south-1:101304436132:VPCE-Tutorial-Topic:e1df8963-2498-4abd-9282-d8670afa2d0b	Status ⌚ Pending confirmation
Endpoint harigovindkvbhu98@gmail.com	Protocol EMAIL
Topic VPCE-Tutorial-Topic	
Subscription Principal arn:aws:iam::101304436132:root	

- Now will login to the mail which is given for the subscription, and will confirm the link which we got on the mail.

AWS Notification - Subscription Confirmation ➤ Inbox x

VPCE-Tutorial-Topic <no-reply@sns.amazonaws.com>
to me ▼

Thu, Feb 22, 9:28 PM (3 hours ago) ☆

You have chosen to subscribe to the topic:
arn:aws:sns:us-east-1:101304436132:VPCE-Tutorial-Topic

To confirm this subscription, click or visit the link below (If this was in error no action is necessary):
[Confirm subscription](#)

-



Subscription confirmed!

You have successfully subscribed.

Your subscription's id is:

arn:aws:sns:ap-south-1:101304436132:VPCE-Tutorial-Topic:e1df8963-2498-4abd-9282-d8670afa2d0b

If it was not your intention to subscribe, [click here to unsubscribe](#).

9. Now we will reload the sns topic page and could see that the Status has been confirmed.

Amazon SNS > Topics > VPCE-Tutorial-Topic > Subscription: e1df8963-2498-4abd-9282-d8670afa2d0b

Subscription: e1df8963-2498-4abd-9282-d8670afa2d0b

Details

ARN arn:aws:sns:ap-south-1:101304436132:VPCE-Tutorial-Topic:e1df8963-2498-4abd-9282-d8670afa2d0b	Status ✔ Confirmed
Endpoint harigovindkvbhu98@gmail.com	Protocol EMAIL
Topic VPCE-Tutorial-Topic	

Step:6 - Checking lack of EC2 instance internet connectivity.

1. From the Search bar we will search the service EC2.
2. And from the left panel we will click on Instances and could see the instance **VPCE-Tutorial-EC2Instance** which is created under the stack.
Now will select the instance and will click on Connect.

EC2 Dashboard ×

EC2 Global View

Events

▼ Instances

Instances

Instance Types

Instances (1/1) Info

Find Instance by attribute or tag (case-sensitive)

Any state

Connect

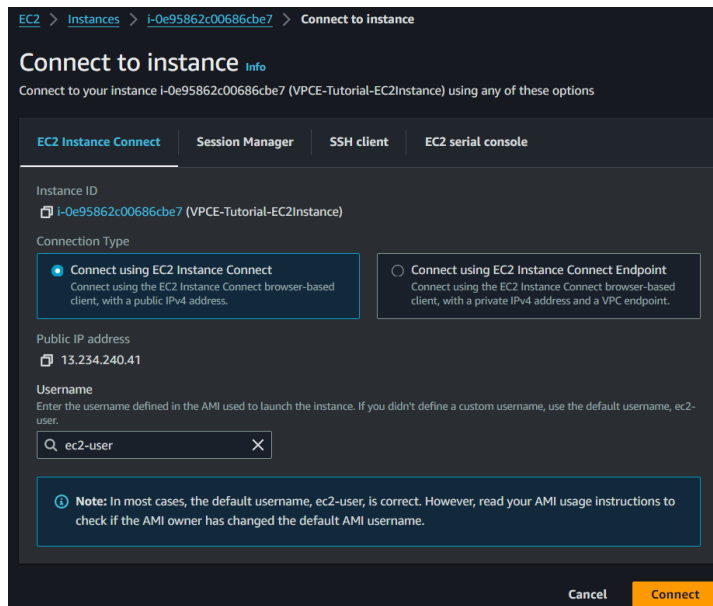
Instance state ▼

Actions ▼

Launch instances ▼

<input checked="" type="checkbox"/>	Name ↗	Instance ID	Instance state ▼	Instance type ▼	Status check	Alarm status
<input checked="" type="checkbox"/>	VPCE-Tutorial-EC2Instance	i-0e95862c00686cbe7	Running	t2.micro	2/2 checks passed	View alarms +

3. Now we will again click on Connect.



- Now we will ping the google.com and could see that it is not pinging that means the instance has lack of internet connectivity.

```

#_
~\_ #####_ Amazon Linux 2
~~ \_#####\
~~ \_####| AL2 End of Life is 2025-06-30.
~~ \_#/
~~ V~' '->
~~~
~~~ /
~~~ /
~~~ /
~~~ /m/'
A newer version of Amazon Linux is available!
Amazon Linux 2023, GA and supported until 2028-03-15.
https://aws.amazon.com/linux/amazon-linux-2023/

[ec2-user@ip-10-0-0-151 ~]$ ping google.com
PING google.com (172.217.160.174) 56(84) bytes of data.

```

Step:7 - Sending messages from EC2 to Amazon SNS.

- Now we will connect to the EC2 instance and will give the below command:
- aws sns publish --region ap-south-1 --topic-arn arn:aws:sns:ap-south-1:101304436132:VPCE-Tutorial-Topic --message "Hello Hari checking the flow of message".**


```
Last login: Thu Feb 22 19:33:41 2024 from ec2-13-233-177-4.ap-south-1.compute.amazonaws.com

#
##### Amazon Linux 2
#####
##### AL2 End of Life is 2025-06-30.
#####
##### A newer version of Amazon Linux is available!
##### Amazon Linux 2023, GA and supported until 2028-03-15.
##### https://aws.amazon.com/linux/amazon-linux-2023/

[ec2-user@ip-10-0-0-151 ~]$ aws sns publish --region ap-south-1 --topic-arn arn:aws:sns:ap-south-1:101304436132:VPCE-Tutorial-Topic --m
o Hari checking the flow of message"
{
  "MessageId": "f5e2b3ab-c4e9-57ca-9c1f-edfa6116c397"
}
[ec2-user@ip-10-0-0-151 ~]$
```

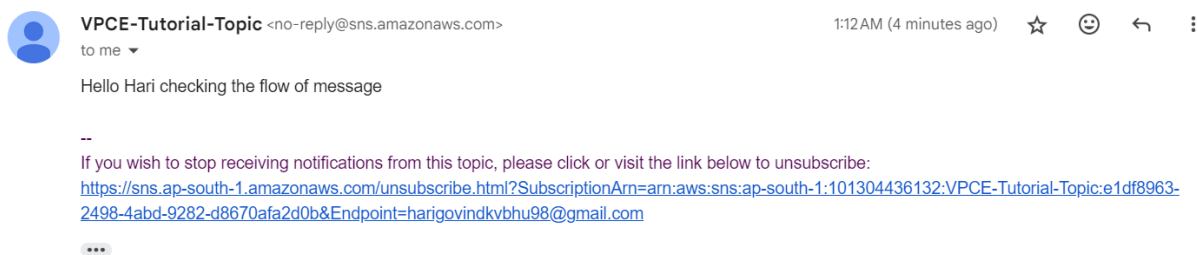
i-0e95862c00686cbe7 (VPCE-Tutorial-EC2Instance) ×

PublicIPs: 13.234.240.41 PrivateIPs: 10.0.0.151

3. Now we could see in the above snip that the messageId has been generated and it has been sent through sns.

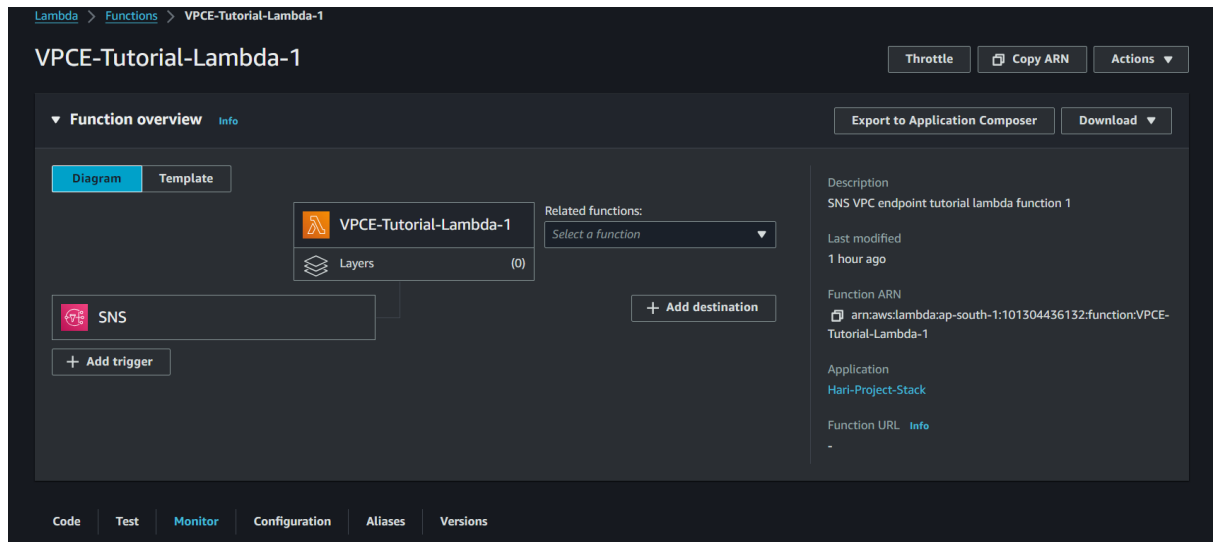
Step:8 - Checking messages on subscribed email.

1. Now will login to the email and could see in the below snip that the message has been received successfully.

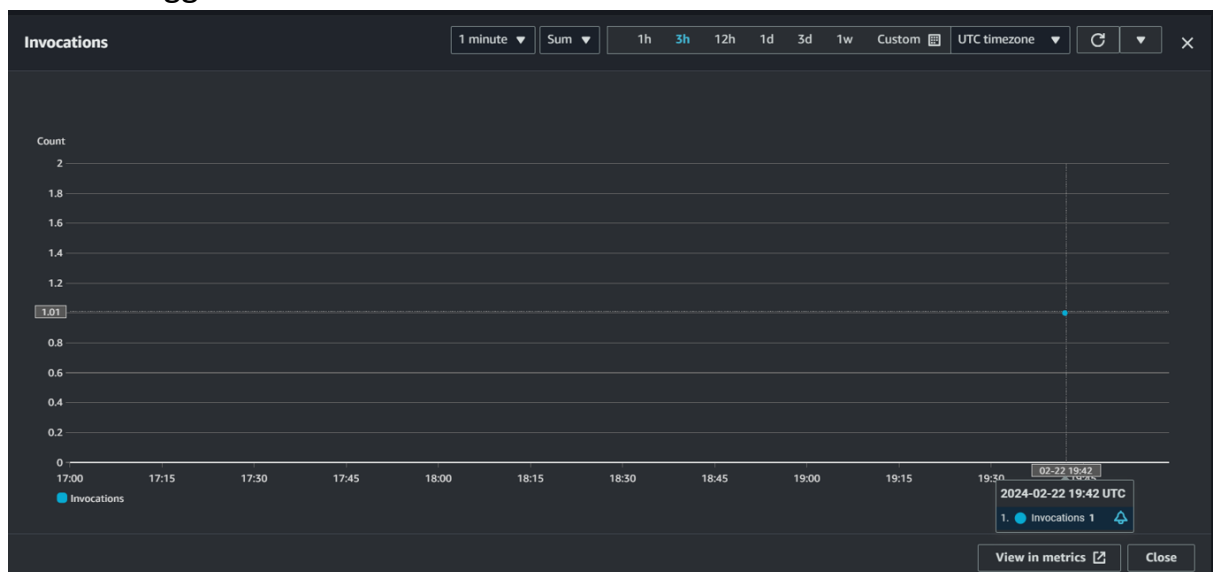


Step:9 - To verify that the Lambda functions were invoked.

1. From the Search bar we will search the service Lambda.
2. And from the left panel we will click on Functions and could see the functions that has been created.
3. Now will click on the function **VPCE-Tutorial-Lambda-1**.
4. And will go to the monitoring section.

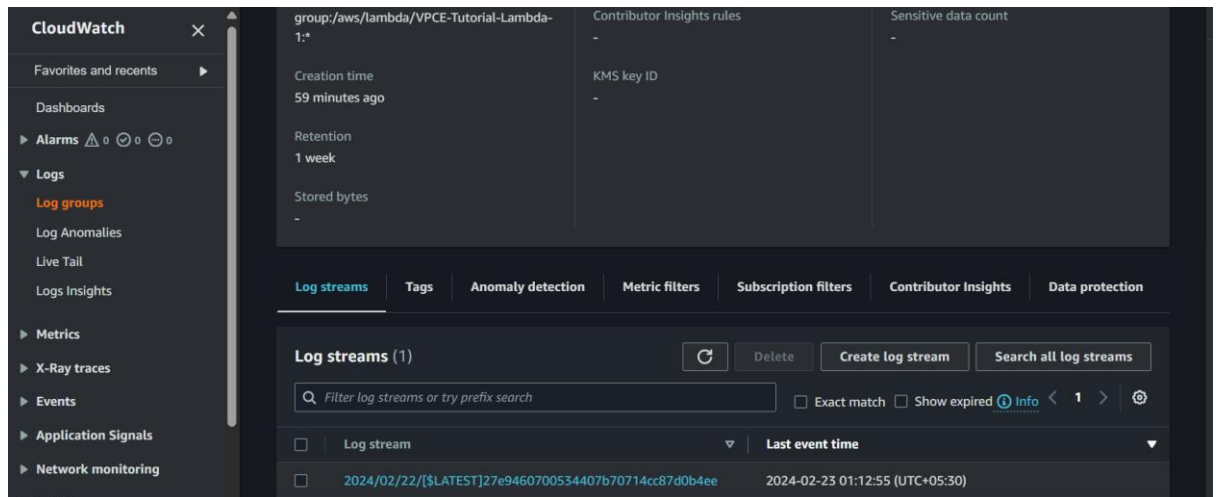


5. In Monitoring section, we will check the count of invocation graph.
6. We will Check the Invocation count graph. This graph shows the number of times that the Lambda function has been run.
7. As of now we have published one message only so the count could see as one. Now we will maximize the graph of the Invocations and will hover the arrow on the count and could see that the timing of the lambda trigger.

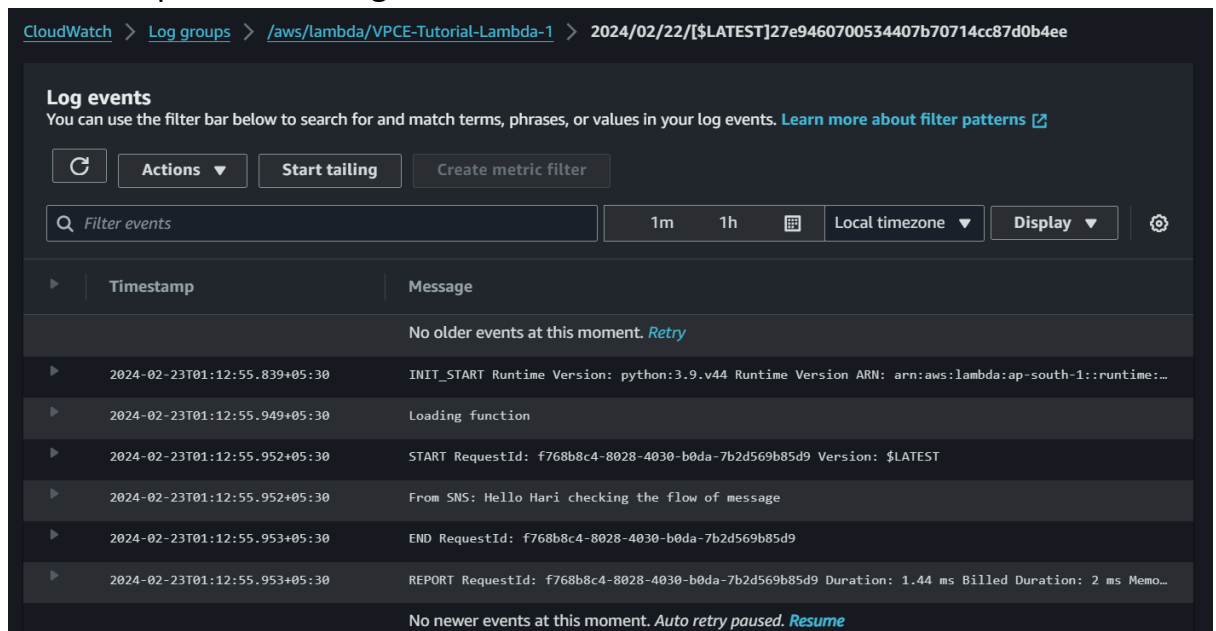


Step:10 - To verify that the CloudWatch logs were updated.

1. From the Search bar we will search the service CloudWatch.
2. And from the left panel we will click on Logs → Log groups → /aws/lambda/VPCE-Tutorial-Lambda-1.
3. Then we will scroll down and will click on the log stream that has been generated. Like in this case it is 2024/02/22/[\$LATEST]27e9460700534407b70714cc87d0b4ee.



4. Now we could see the CloudWatch logs that has been generated with the same publish message.



***** THE END *****