AWS CPU Utilization Alert Project

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1. Overview

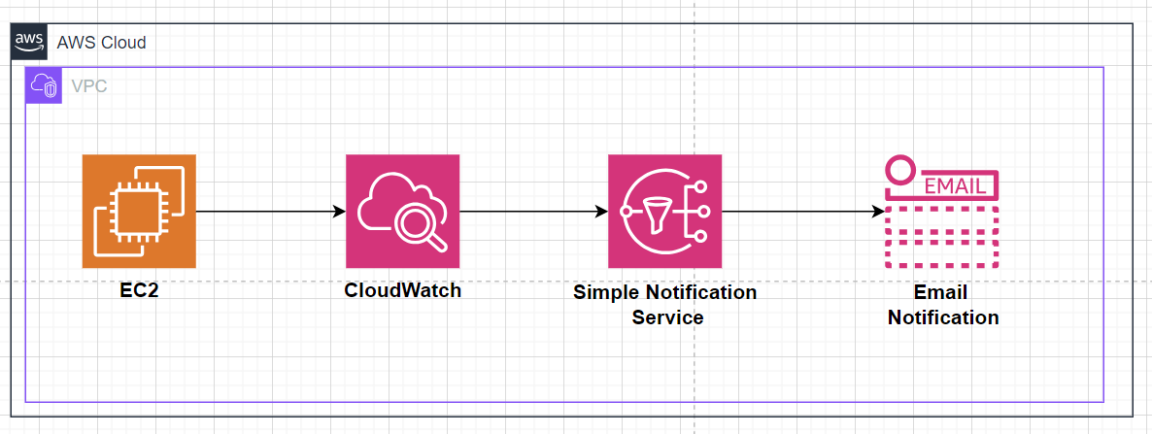
This project demonstrates how to set up an alert mechanism on AWS to monitor CPU utilization and send email notifications using AWS CloudWatch and SNS when CPU usage crosses a certain threshold. This setup ensures timely notifications to the team in case of any resource strain, allowing for immediate action.

2. Prerequisites

Before starting, ensure you have the following prerequisites:
- AWS Account
- IAM Role with permissions for EC2, CloudWatch, and SNS
- AWS CLI installed (optional for local configuration)
- Email ID to receive notifications

3. Architecture

The architecture is straightforward, involving an EC2 instance, CloudWatch for monitoring, and SNS for sending email notifications when a threshold is breached. The flow is as follows:
1. CPU Utilization crosses the threshold.
2. CloudWatch Alarm triggers an SNS Topic.
3. SNS sends an email notification to the subscribed email addresses.

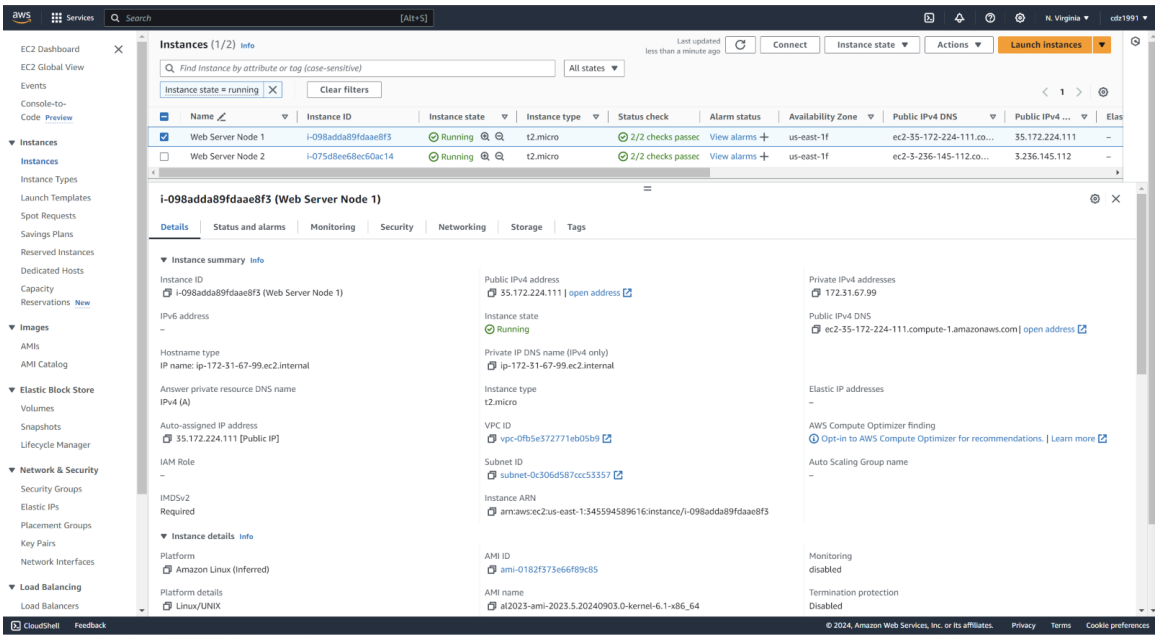


1. Steps to Create the Project

Step1: Set up EC2 Instance

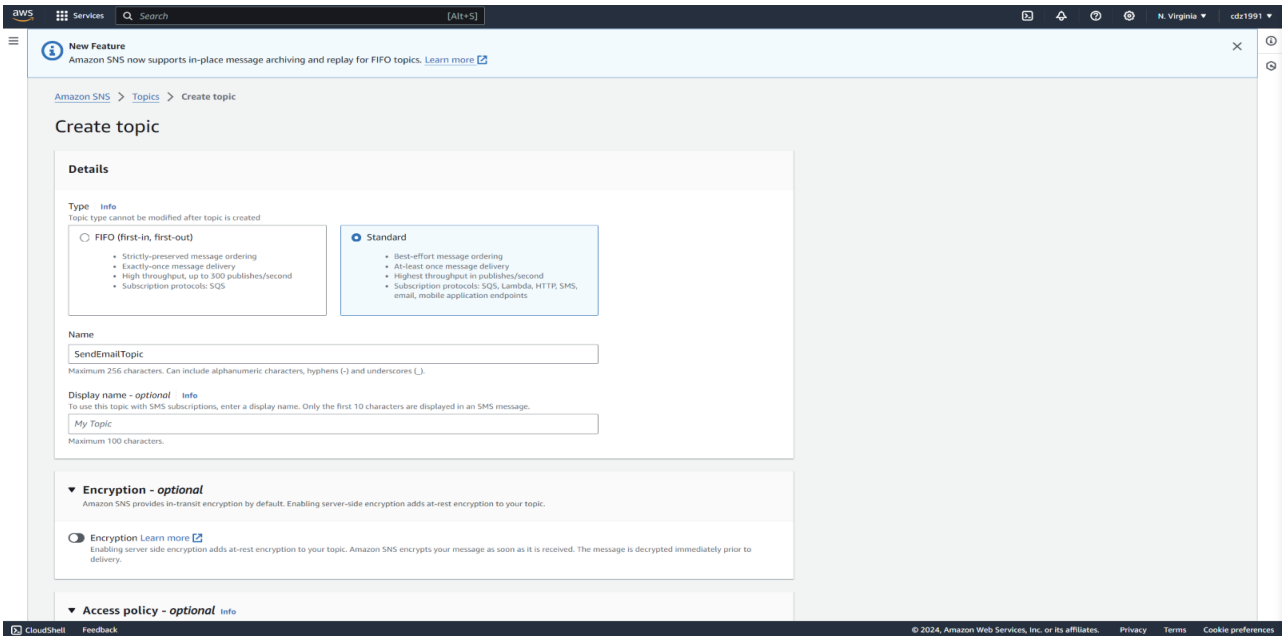
EC2 instance creation parameters:

1. Enter name of the instance: Web Server Node 1, Web Server Node 2
2. Instance Type: t2 Micros
3. Key Pair: existing
4. VPC: existing
5. Create or Select existing Security Group: Existing Security Group with HTTP
6. Click on Launch Instance

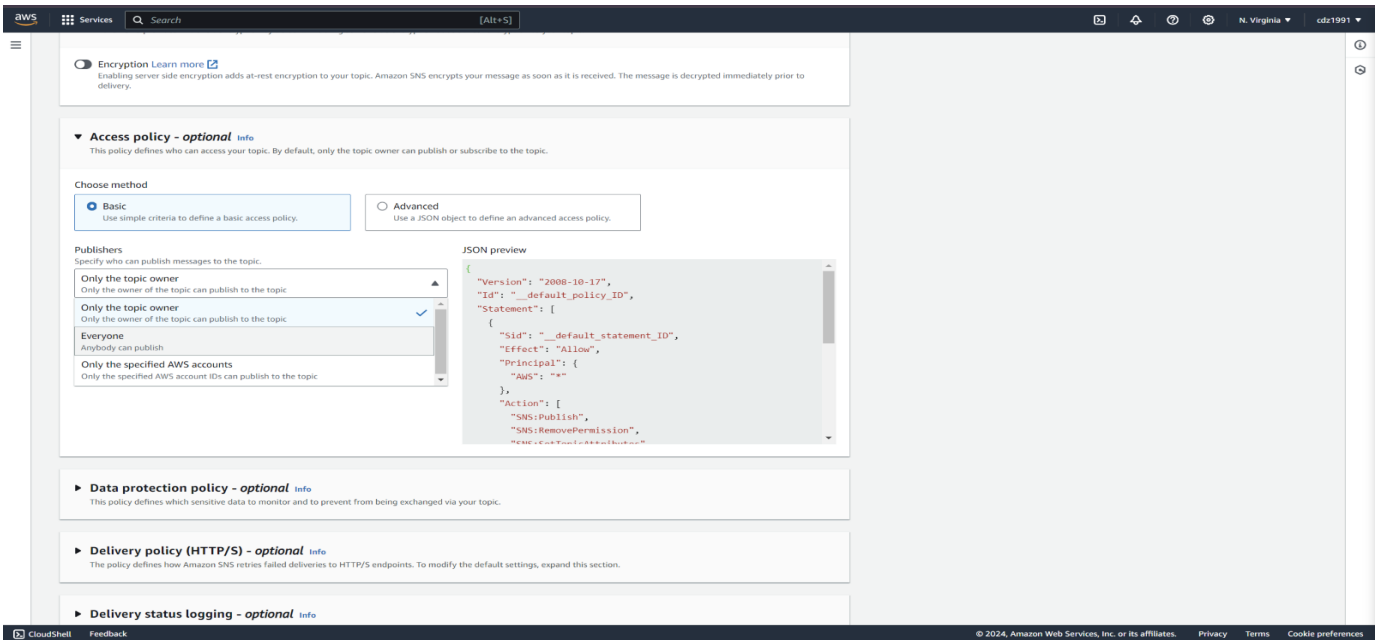


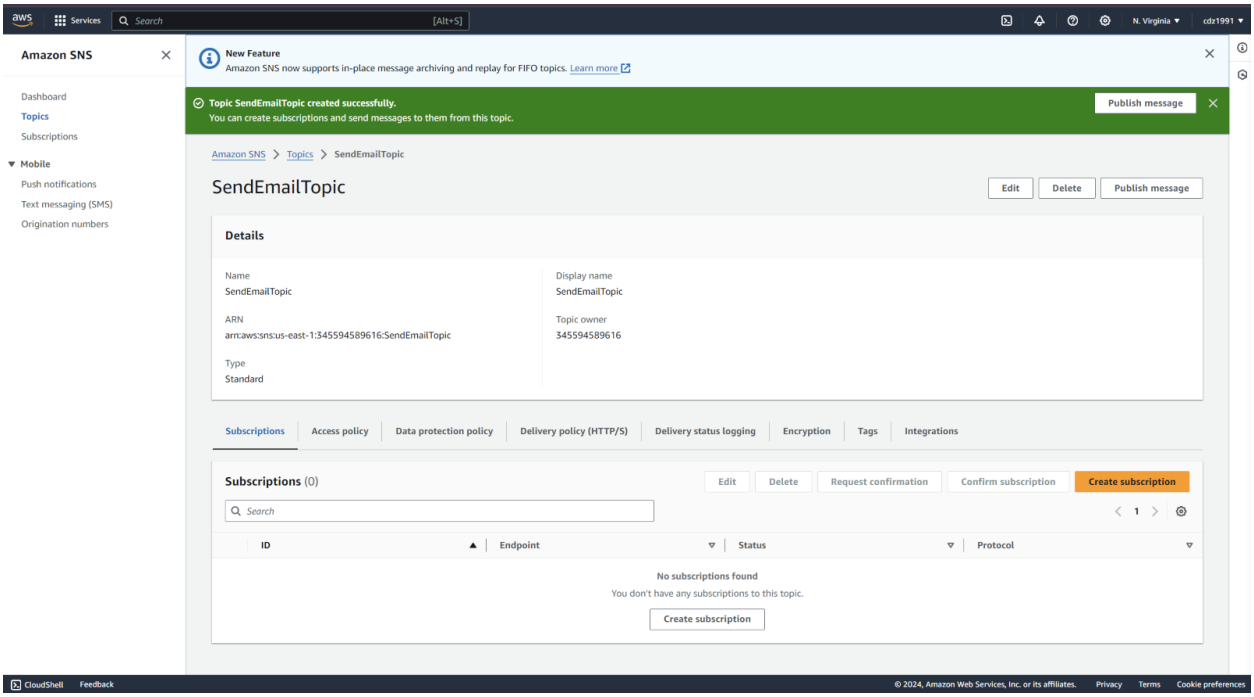
Step 2 : Send Email Notification Using SNS:

1. Go to SNS (Simple Notification Service) in the AWS Management Console.
2. Create a new SNS topic (**SendEmailTopic**).



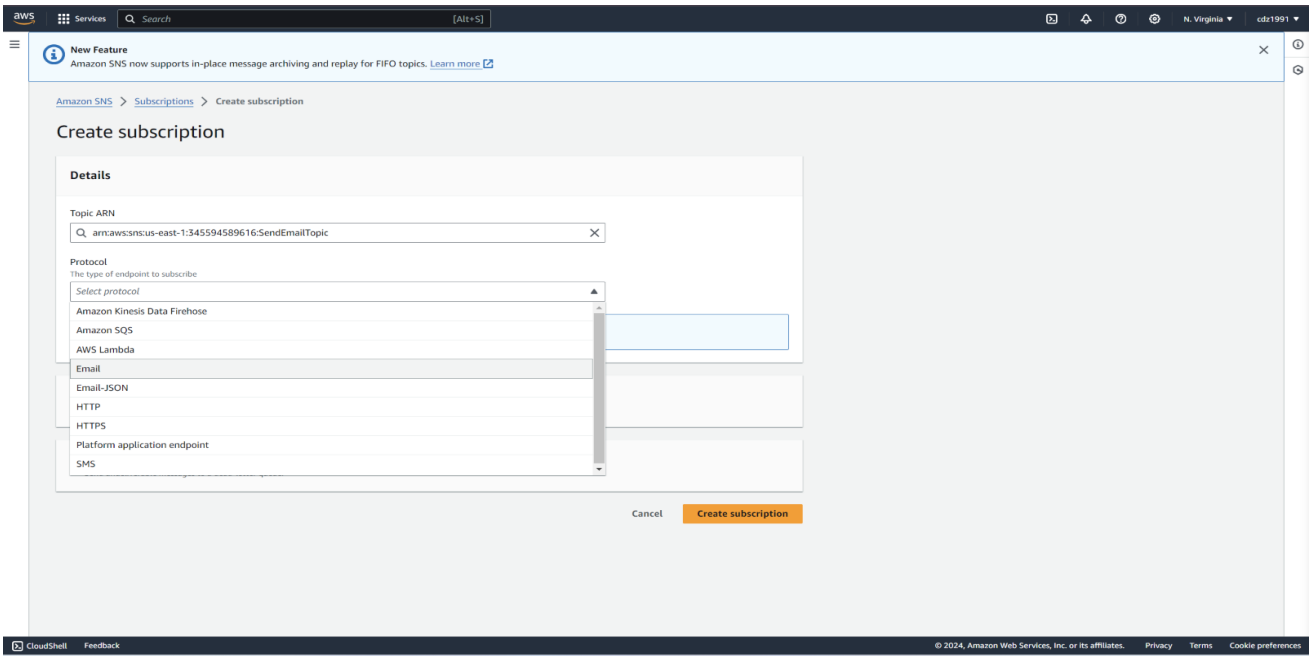
Under Access Policy > Publishers > Select: **Everyone** and Click on create Topic



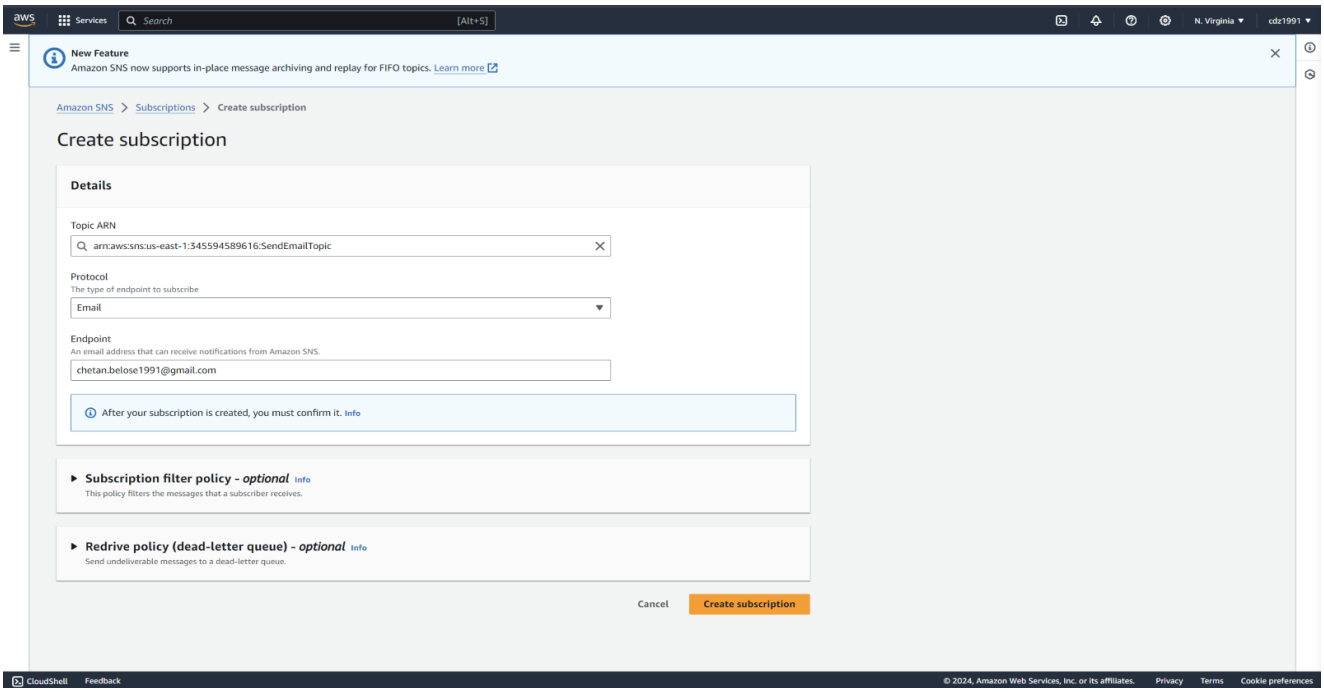


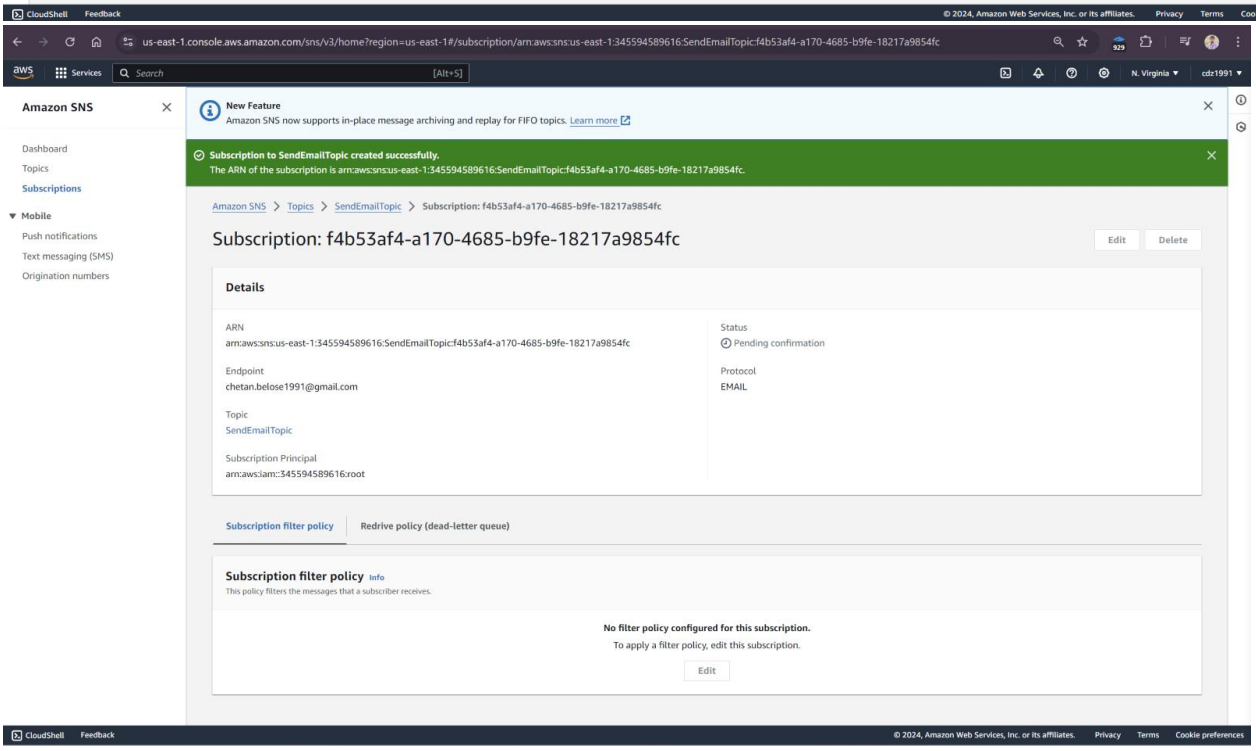
3. Subscribe your email address to the topic

Select Email Protocol to send Email Notifications

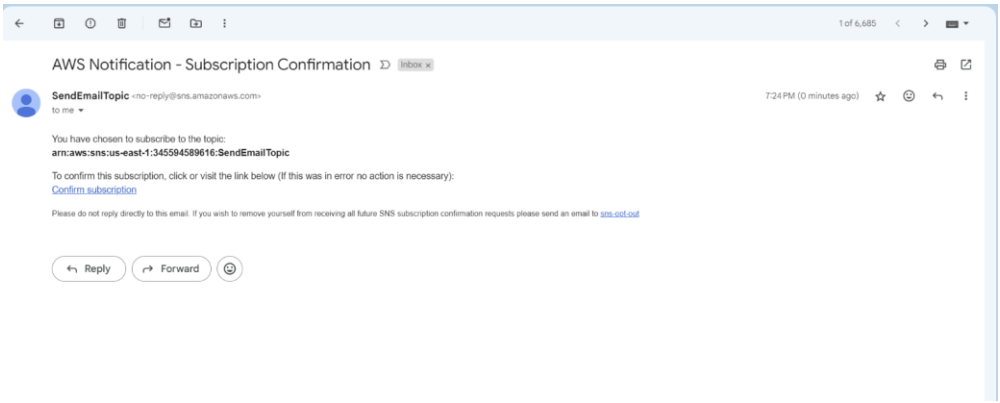


Entered your Email ID to receive Email Alert Notifications.

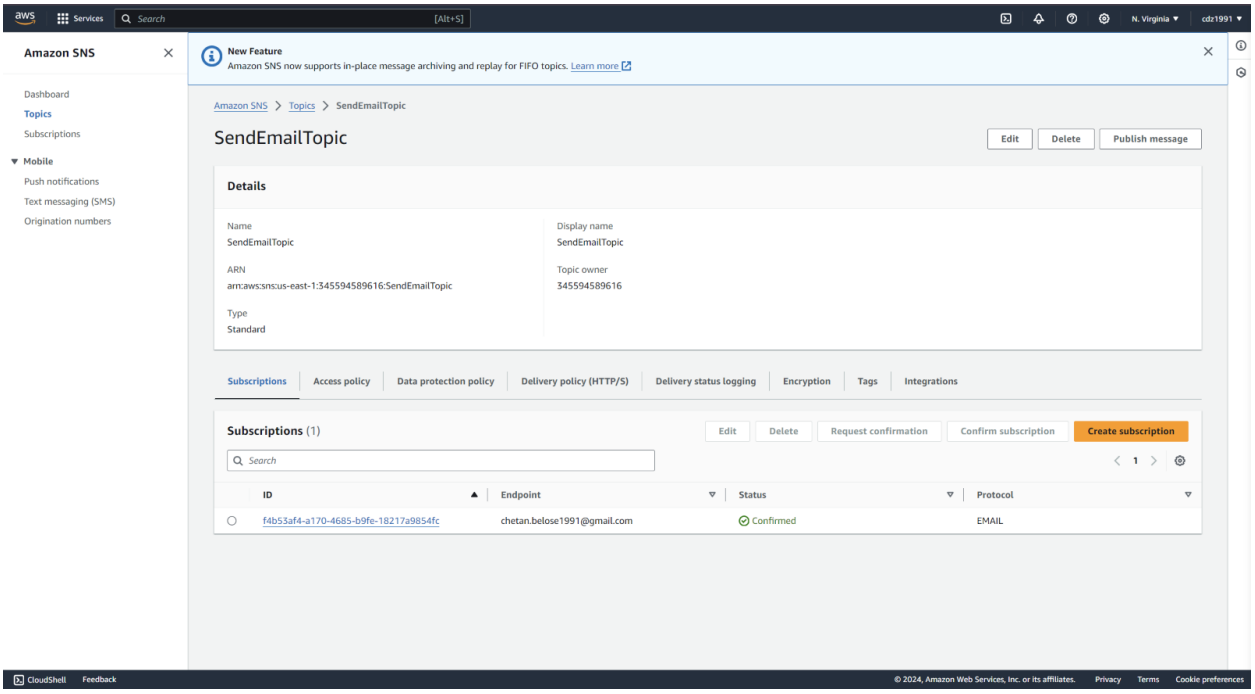




You will receive Email Notification to Confirm the Subscription. Once you click on confirm subscription then your email ID will get added into Subscription list.

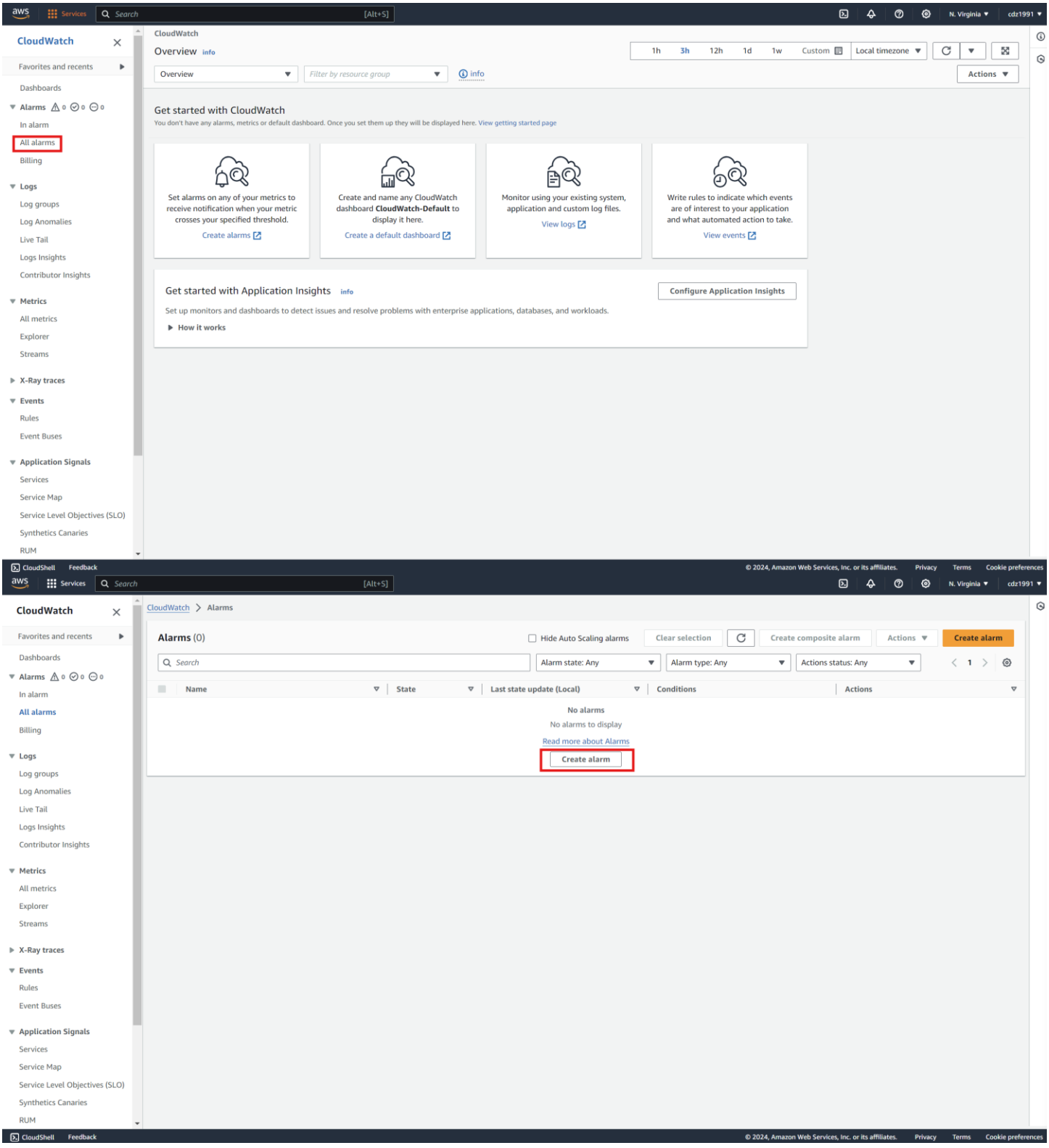


4. Link the CloudWatch Alarm to the SNS topic for alert generation.



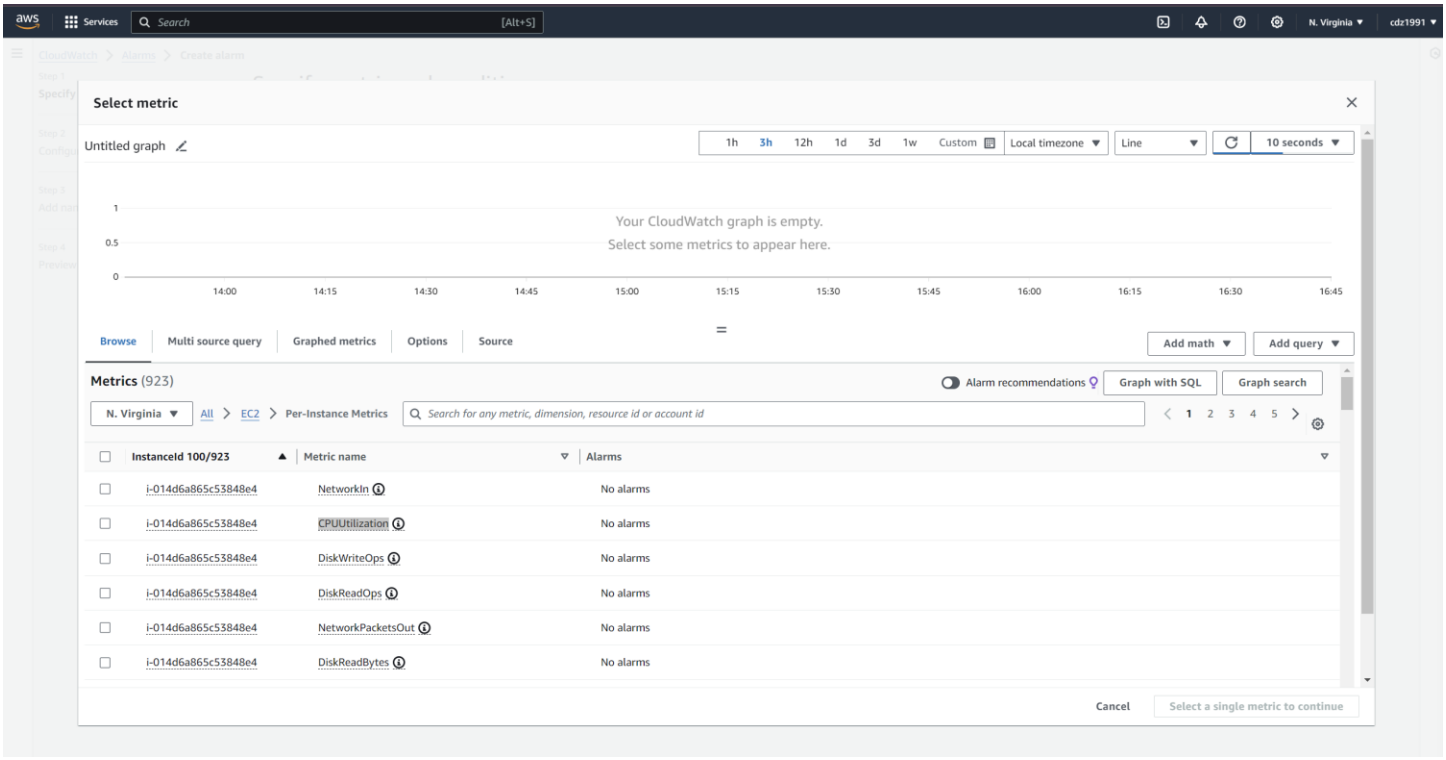
Step 3: Set Up AWS CloudWatch Alarms:

1. Open AWS CloudWatch in the AWS Management Console.
2. Navigate to 'Alarms' and click 'Create Alarm'.

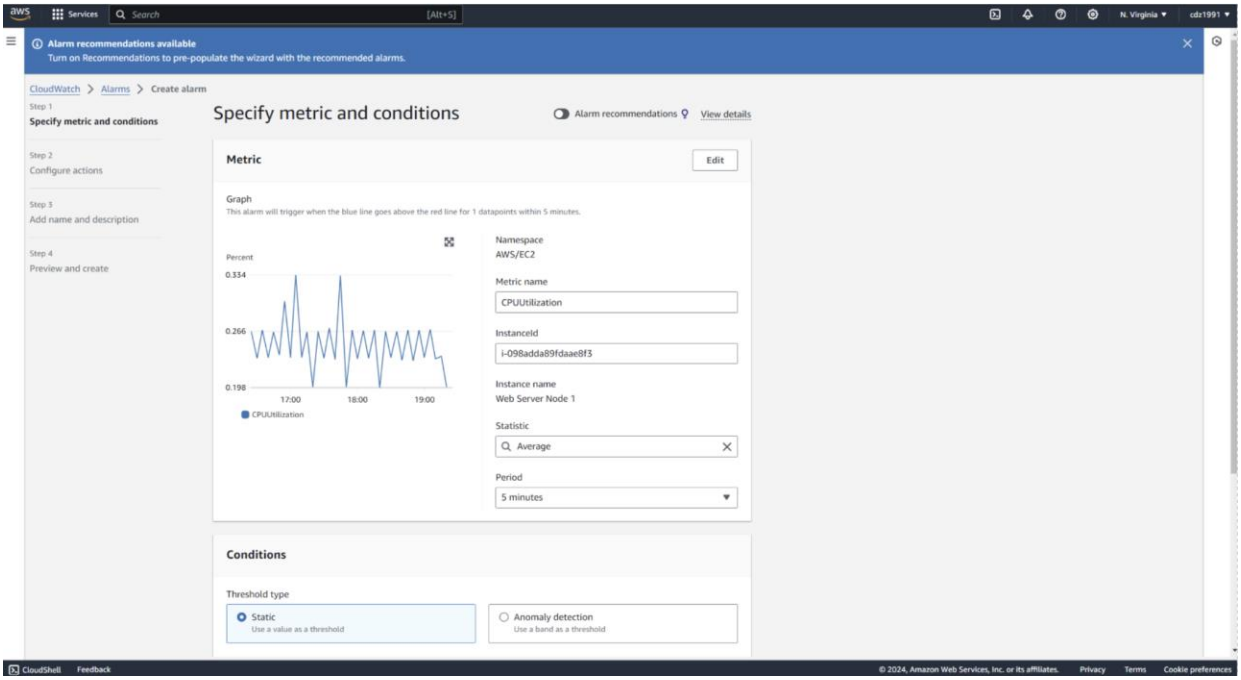


3. Select the EC2 instance you want to monitor for CPU Utilization.

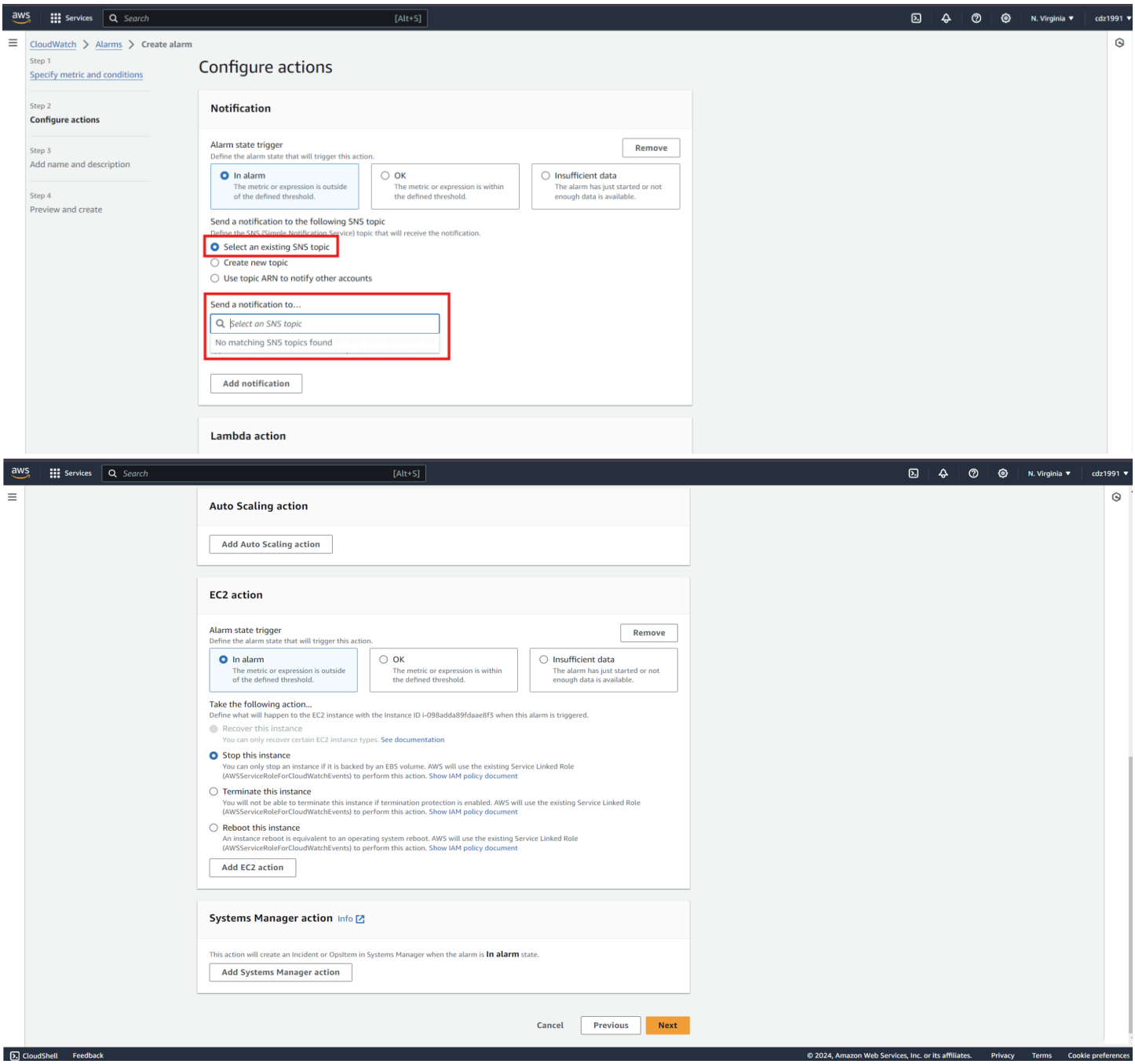
4. Click on **Select metric > Select EC2 > Pre-Instance Metrics > CPU Utilization**



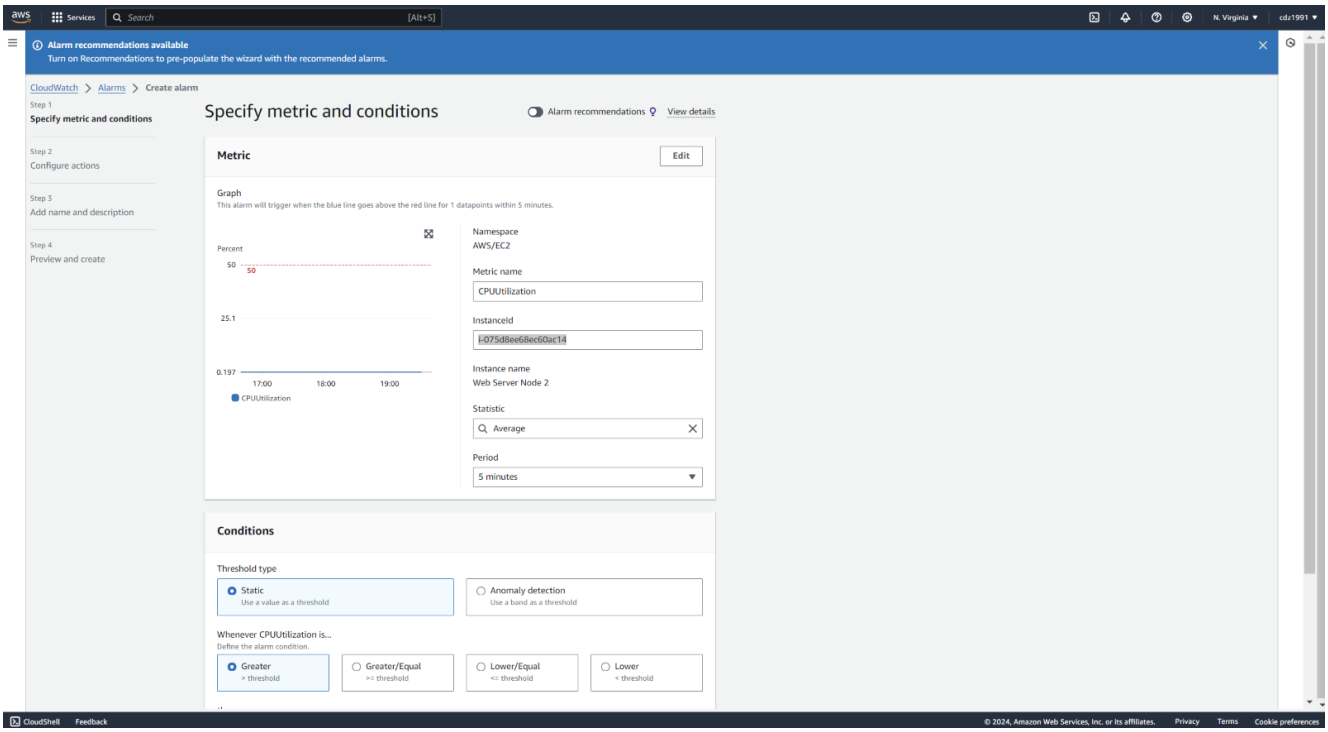
4. Set the CPU Utilization threshold 50% to trigger the alarm.

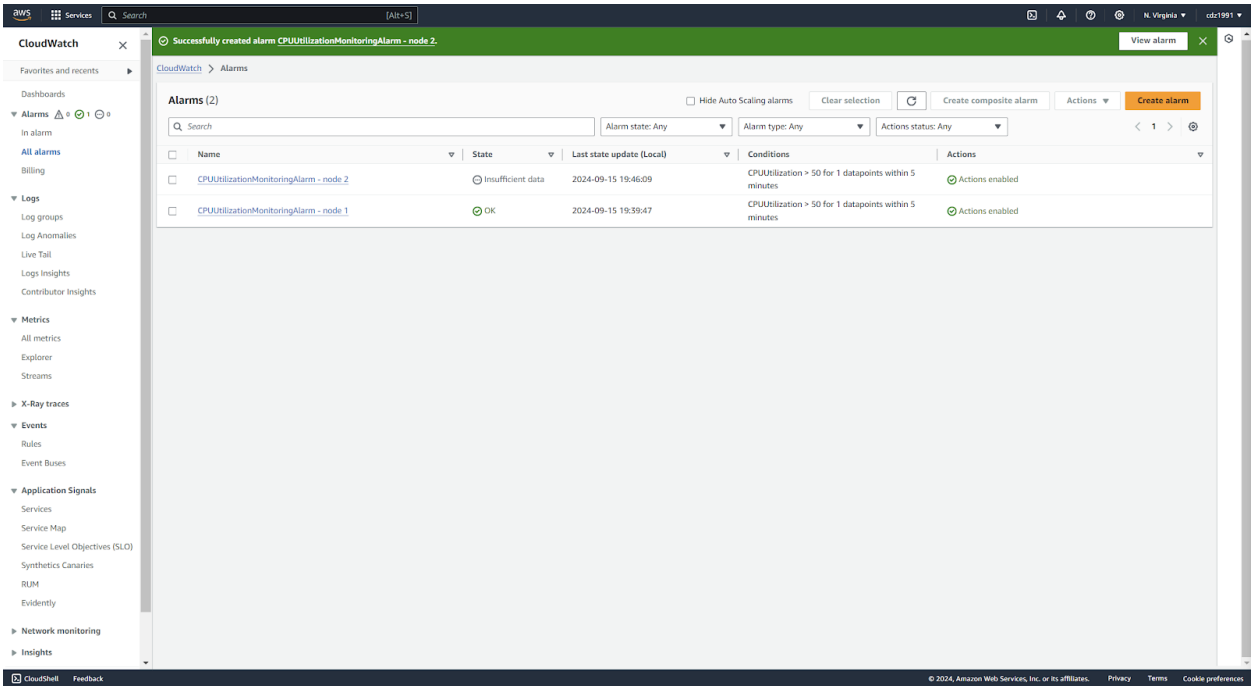


5. Select Existing SNS Topic (**SendEmailTopic**) and send notification to



6. Create Alarm > Enter Instance ID > Set CPU Utilization Condition > Greater Than 50% for Both Instances

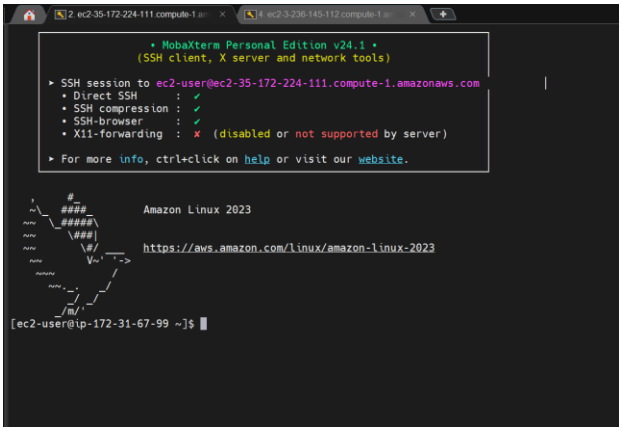


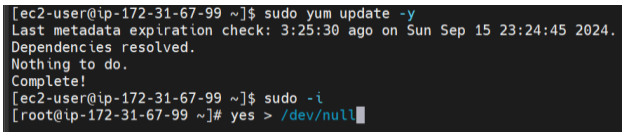


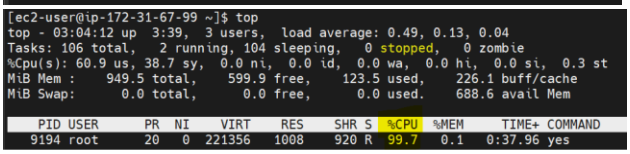
7. Below Commands are used to apply load on Web Server Node 1 and Web Server Node 2 instances.
   sudo yum update –y -> Update all packages and dependencies on Linux Server.

sudo –i -> switch to root user

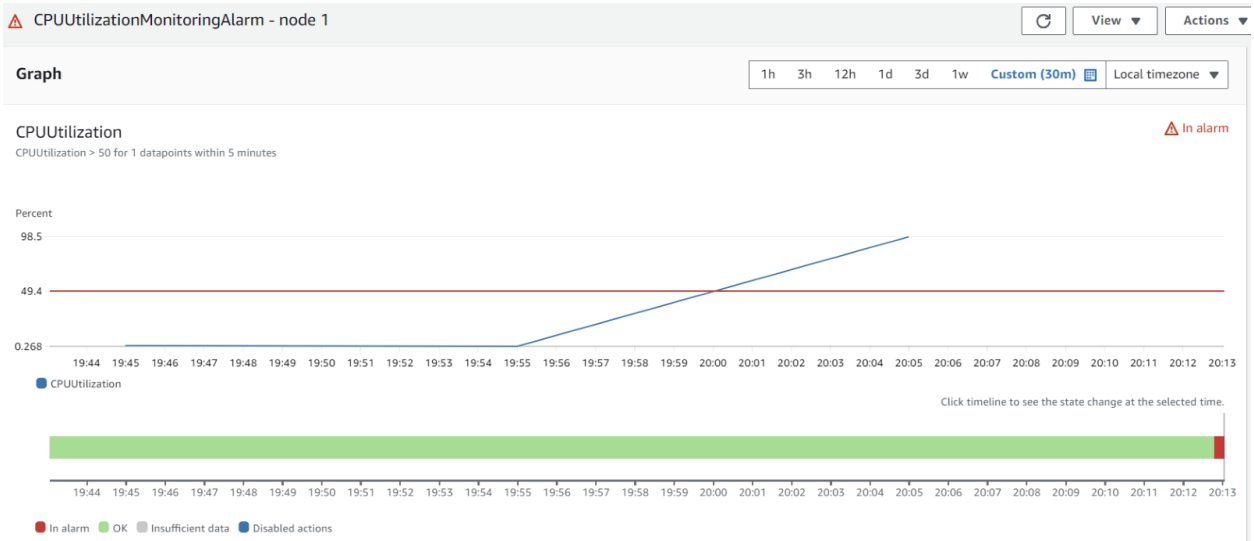
yes > /dev/null -> Used to apply Load on Server



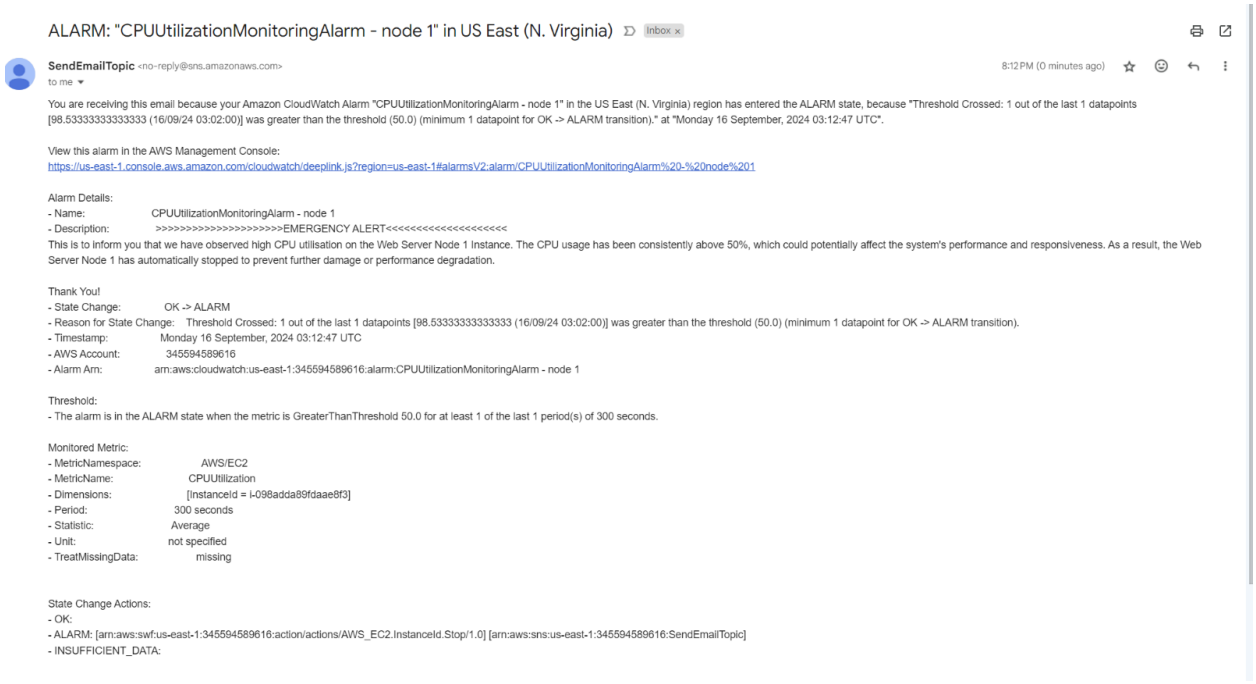




8. After Executing Linux Command monitor CPU Utilization in CloudWatch Alarm section.



9. Once CPU Utilization Crosses the define limit it will trigger email and will receive below email notification from SNS.



ALARM: "CPUUtilizationMonitoringAlarm - node 1" in US East (N. Virginia) Inbox ×

SendEmailTopic <no-reply@sns.amazonaws.com> 8:12 PM (0 minutes ago)
to me

You are receiving this email because your Amazon CloudWatch Alarm "CPUUtilizationMonitoringAlarm - node 1" in the US East (N. Virginia) region has entered the ALARM state, because "Threshold Crossed: 1 out of the last 1 datapoints [98.53333333333333 (16/09/24 03:02:00)] was greater than the threshold (50.0) (minimum 1 datapoint for OK -> ALARM transition)." at "Monday 16 September, 2024 03:12:47 UTC".

View this alarm in the AWS Management Console:
https://us-east-1.console.aws.amazon.com/cloudwatch/deeplink.js?region=us-east-1#alarmsV2:alarm/CPUUtilizationMonitoringAlarm%20-%20node%201

Alarm Details:
- Name: CPUUtilizationMonitoringAlarm - node 1
- Description: >>>>>>>>>>>>>>>>>>>>>>>EMERGENCY ALERT<<<<<<<<<<<<<<<<<<<<<
This is to inform you that we have observed high CPU utilisation on the Web Server Node 1 Instance. The CPU usage has been consistently above 50%, which could potentially affect the system's performance and responsiveness. As a result, the Web Server Node 1 has automatically stopped to prevent further damage or performance degradation.

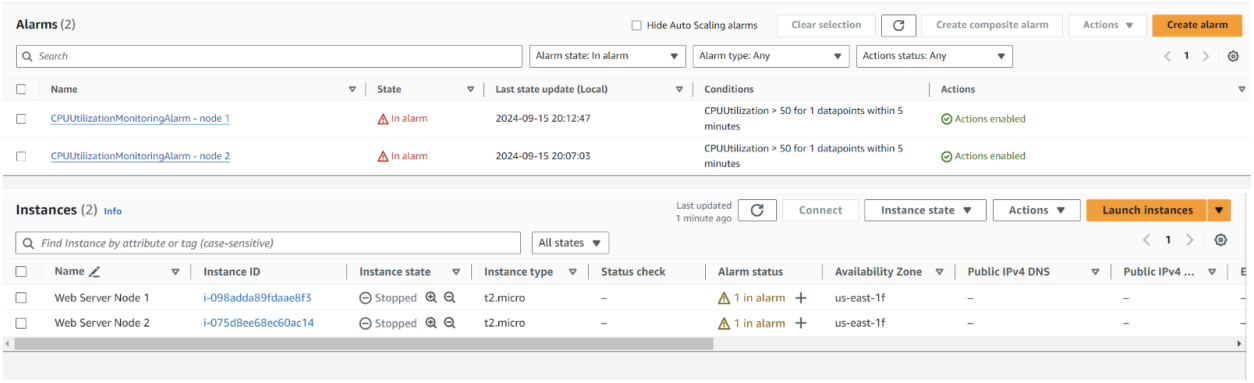
Thank You!
- State Change: OK -> ALARM
- Reason for State Change: Threshold Crossed: 1 out of the last 1 datapoints [98.53333333333333 (16/09/24 03:02:00)] was greater than the threshold (50.0) (minimum 1 datapoint for OK -> ALARM transition).
- Timestamp: Monday 16 September, 2024 03:12:47 UTC
- AWS Account: 345594589616
- Alarm Arn: arn:aws:cloudwatch:us-east-1:345594589616:alarm:CPUUtilizationMonitoringAlarm - node 1

Threshold:
- The alarm is in the ALARM state when the metric is GreaterThanThreshold 50.0 for at least 1 of the last 1 period(s) of 300 seconds.

Monitored Metric:
- MetricNamespace: AWS/EC2
- MetricName: CPUUtilization
- Dimensions: [InstanceId = i-098adda89fdaae8f3]
- Period: 300 seconds
- Statistic: Average
- Unit: not specified
- TreatMissingData: missing

State Change Actions:
- OK:
- ALARM: [arn:aws:swf:us-east-1:345594589616:action/actions/AWS_EC2.InstanceId.Stop/1.0] [arn:aws:sns:us-east-1:345594589616:SendEmailTopic]
- INSUFFICIENT_DATA:

10. Once CPU Utilization crosses the define threshold limit then it will change the Alarm state to “In Alarm” and Both the Instances will stop.



Alarms (2) — Hide Auto Scaling alarms | Clear selection | Create composite alarm | Actions | Create alarm

Search | Alarm state: In alarm | Alarm type: Any | Actions status: Any

Name	State	Last state update (Local)	Conditions	Actions
CPUUtilizationMonitoringAlarm - node 1	In alarm	2024-09-15 20:12:47	CPUUtilization > 50 for 1 datapoints within 5 minutes	Actions enabled
CPUUtilizationMonitoringAlarm - node 2	In alarm	2024-09-15 20:07:03	CPUUtilization > 50 for 1 datapoints within 5 minutes	Actions enabled

Instances (2) Info — Last updated 1 minute ago | Connect | Instance state | Actions | Launch instances

Find Instance by attribute or tag (case-sensitive) | All states

Name	Instance ID	Instance state	Instance type	Status check	Alarm status	Availability Zone	Public IPv4 DNS	Public IPv4 ...
Web Server Node 1	i-098adda89fdaae8f3	Stopped	t2.micro	–	1 in alarm	us-east-1f	–	–
Web Server Node 2	i-075d8ee68ec60ac14	Stopped	t2.micro	–	1 in alarm	us-east-1f	–	–

5. AWS Services Used

- Amazon EC2: For hosting the instance to monitor.
- AWS CloudWatch: For monitoring CPU utilization and triggering alarms.
- AWS SNS: For sending email notifications when the alarm is triggered.

6. Future Enhancements

In the future, this project can be enhanced by implementing:

- Auto-scaling based on CPU utilization to dynamically adjust resources.
- Monitor CPU Utilization of EC 2 instances using auto scaling and trigger Alarm using CloudWatch and SNS notification.

7. Conclusion

This project demonstrates how to set up a CPU Utilization Alert System using AWS services like CloudWatch and SNS. It helps maintain resource efficiency and timely notifications to prevent system overloads or failures. With future enhancements, this setup can be extended to scale automatically and provide deeper insights into system performance.