

# AWS CPU Utilization Alert Project

---

## Table of Contents

1. Overview
2. Prerequisites
3. Architecture
4. Steps to Create the Project
  - Step 1: Set up EC2 Instance
  - Step 2: Set Up AWS CloudWatch Alarms
  - Step 3: Send Email Notification Using SNS
5. AWS Services Used
6. Future Enhancements
7. Conclusion

## 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

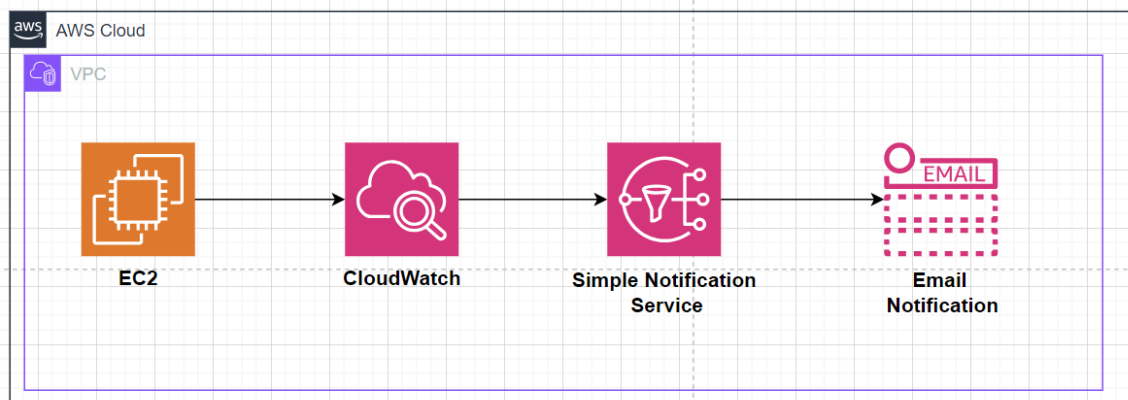
Before starting, ensure you have the following prerequisites:

- 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.

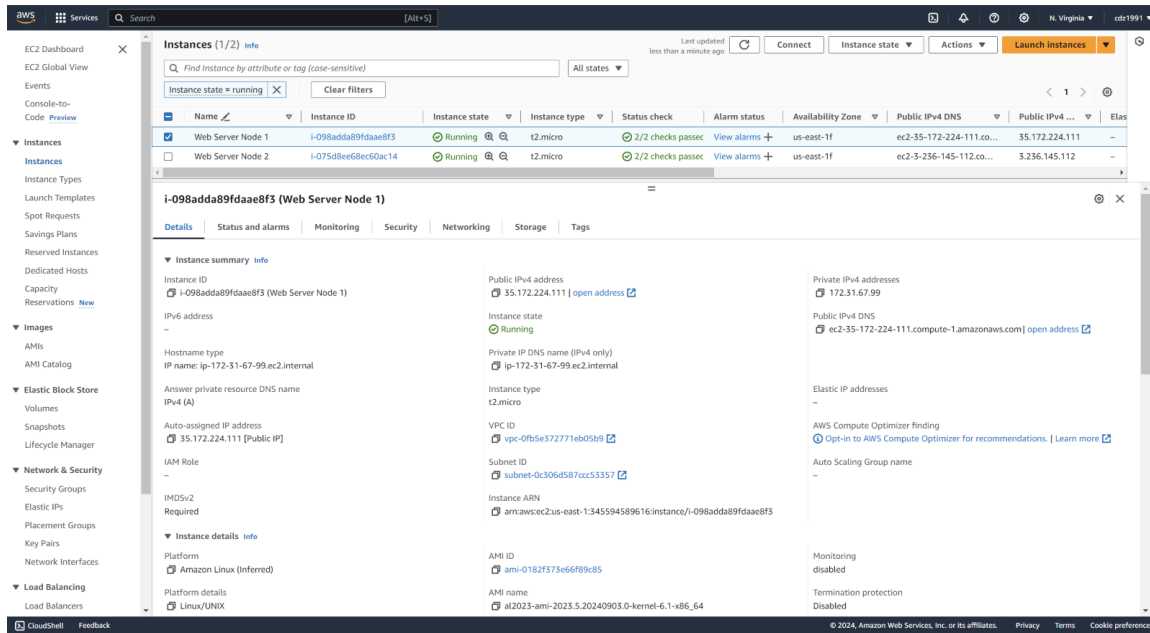


## 1. Steps to Create the Project

### Step1: Set up EC2 Instance

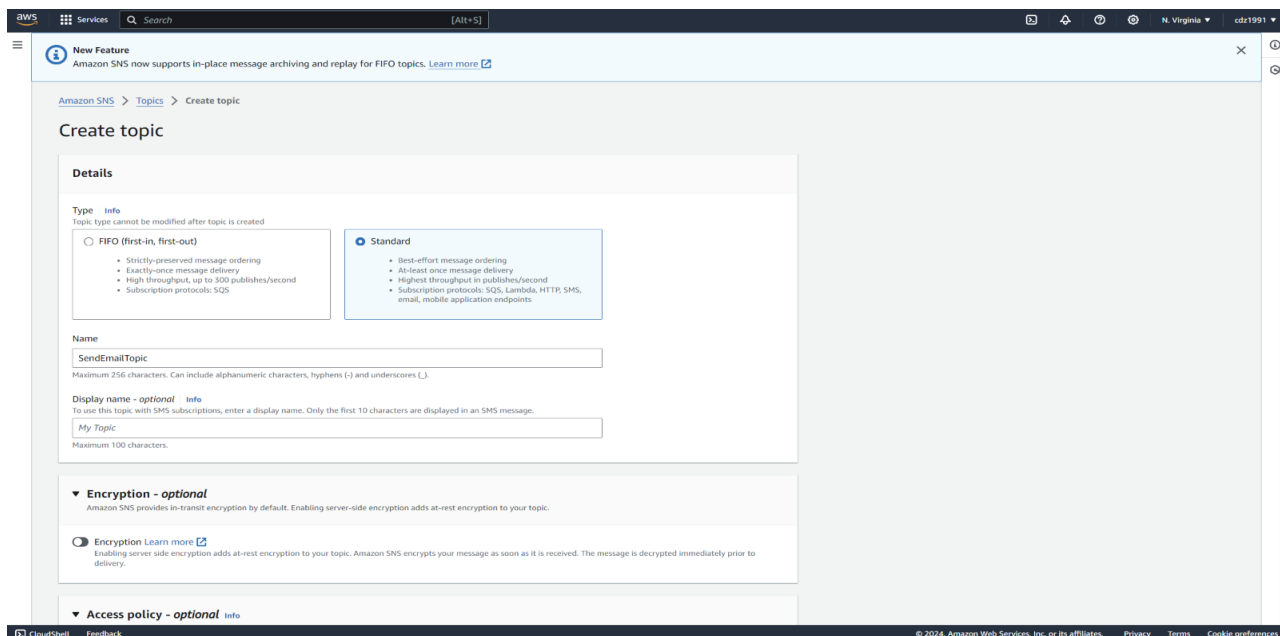
EC2 instance creation parameters:

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**

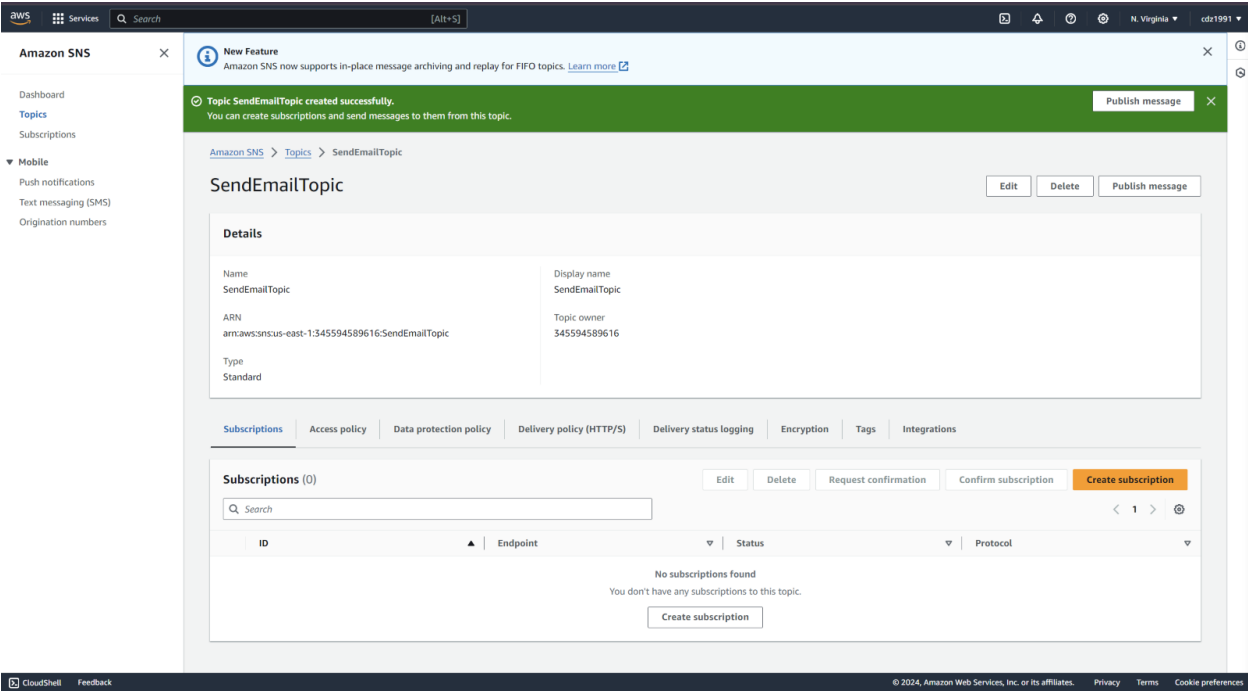
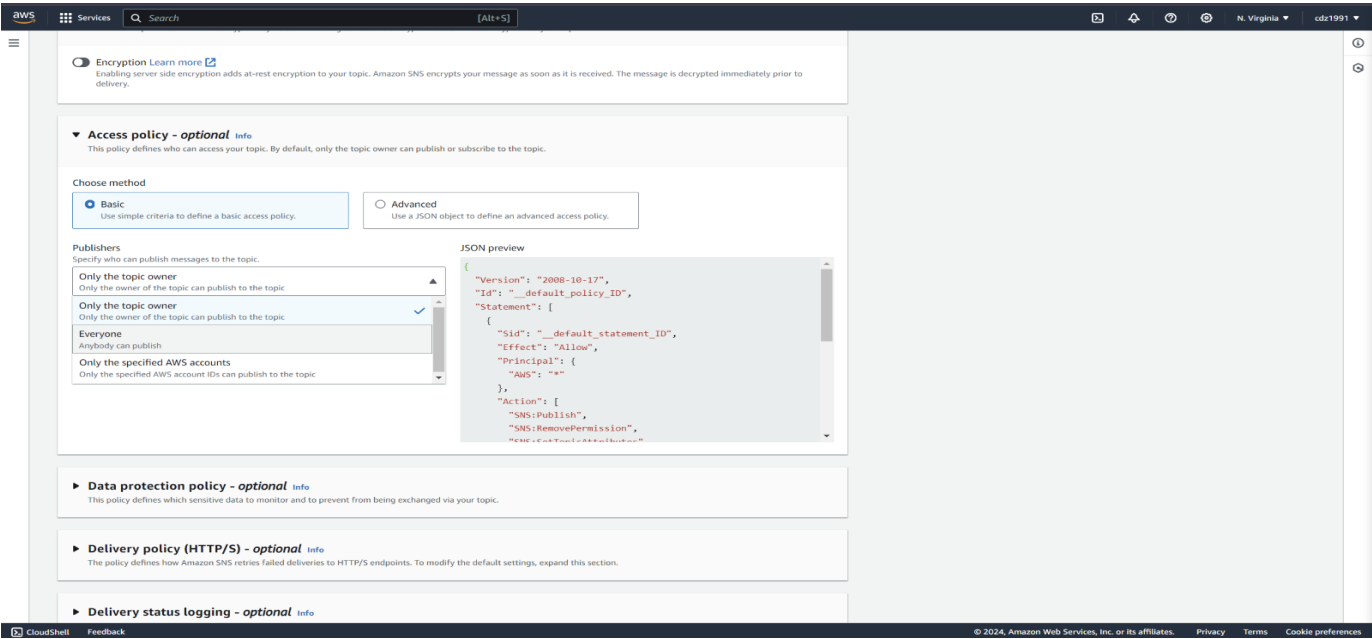


### Step 2 : Send Email Notification Using SNS:

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

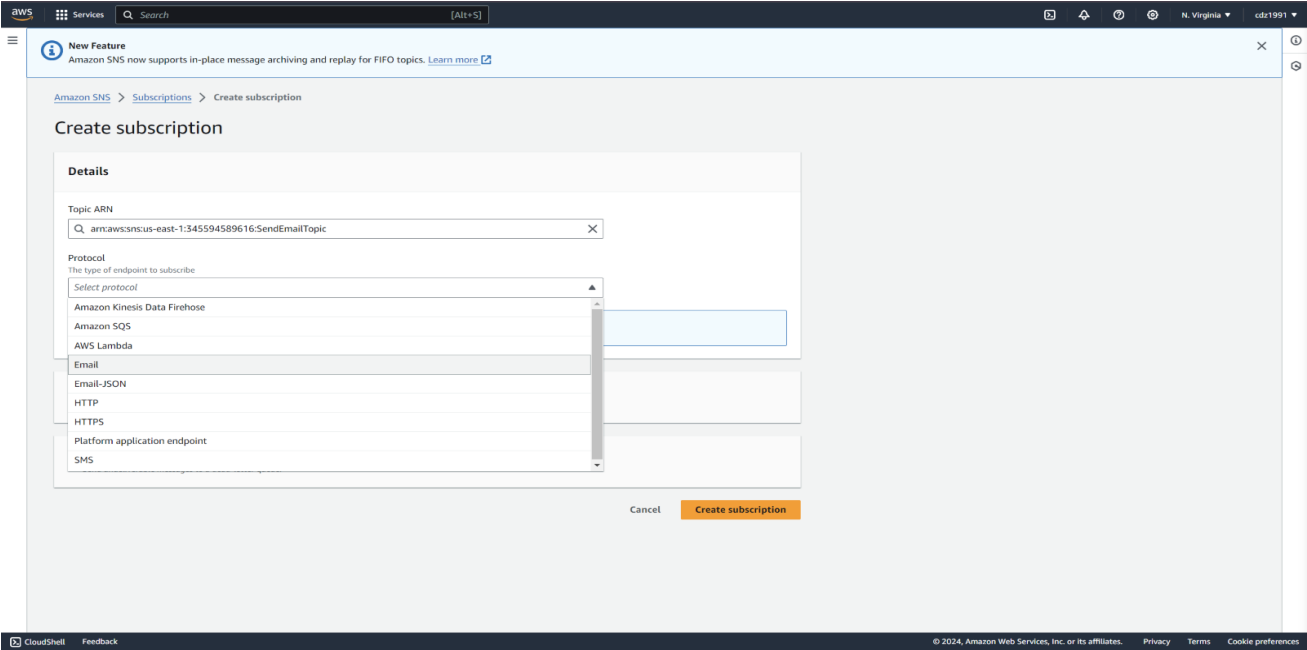


Under Access Policy > Publishers > Select: **Everyone** and Click on create Topic

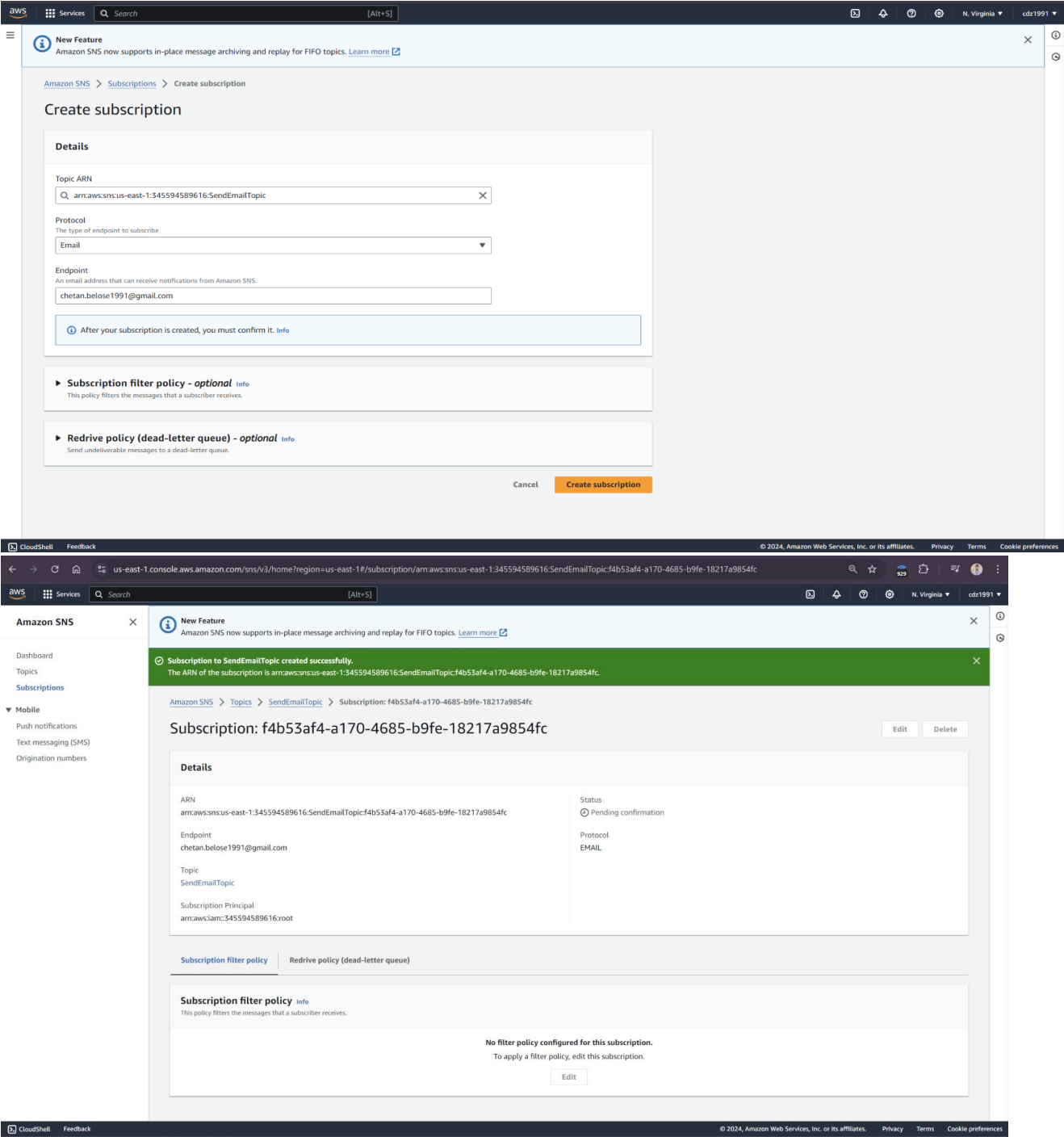


3. Subscribe your email address to the topic

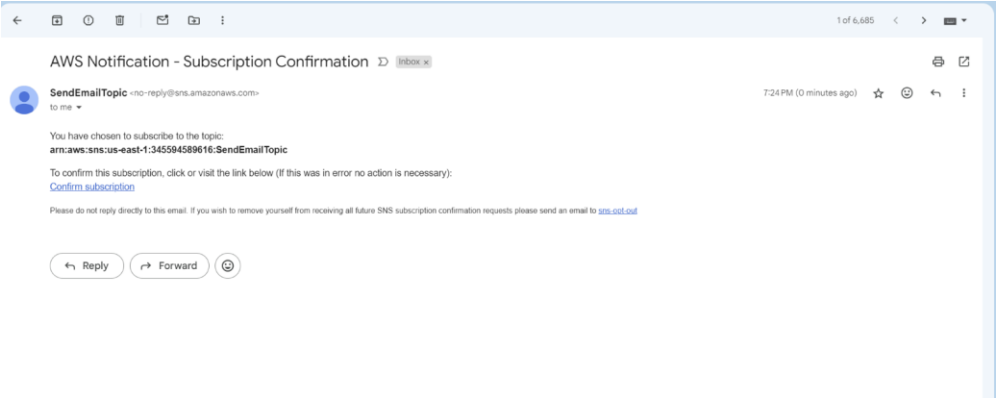
Select Email Protocol to send Email Notifications



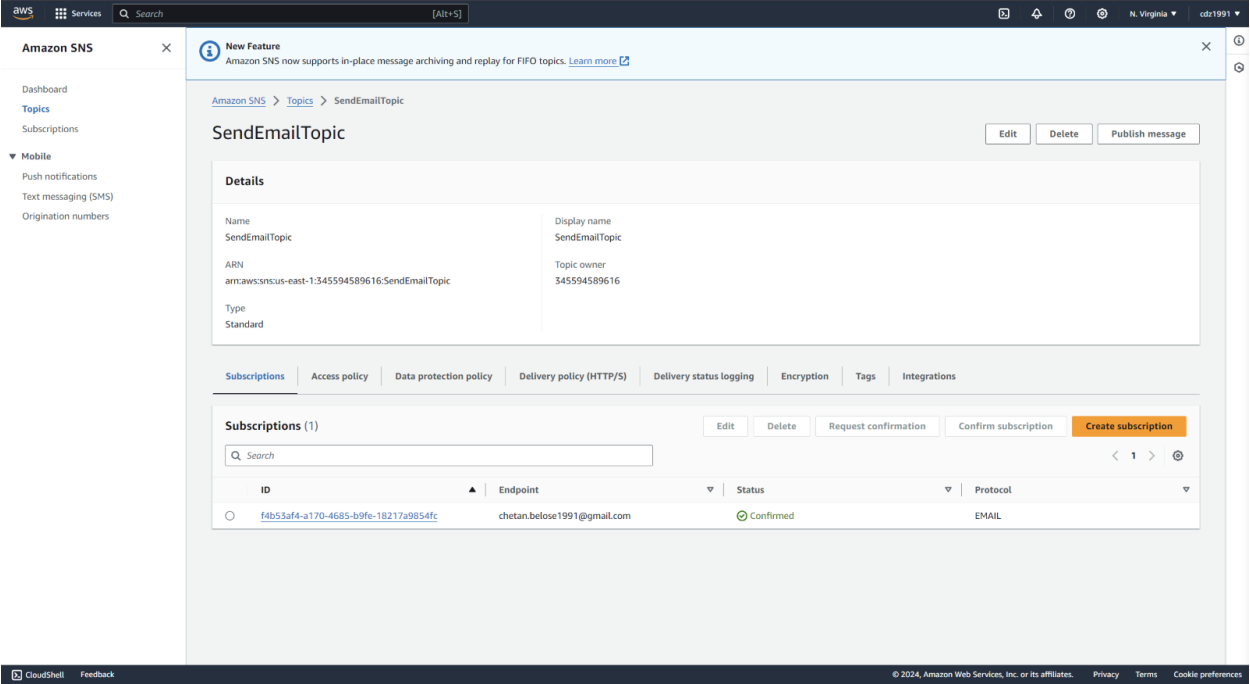
Entered your Email ID to receive Email Alert Notifications.



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'.

The image consists of two screenshots of the AWS CloudWatch console interface.

**Top Screenshot: CloudWatch Overview**

- Header:** AWS logo, Services, Search bar, [Alt+S], Region: N. Virginia, Account: cdr1991.
- Left Sidebar:** CloudWatch, Favorites and recents, Dashboards, Alarms (0), In alarm, **All alarms** (highlighted with a red box), Billing, Logs, Log groups, Log Anomalies, Live Tail, Logs Insights, Contributor Insights, Metrics, All metrics, Explorer, Streams, X-Ray traces, Events, Rules, Event Buses, Application Signals, Services, Service Map, Service Level Objectives (SLO), Synthetics Canaries, RUM.
- Main Content Area:**
  - Overview:** Filter by resource group, info.
  - Get started with CloudWatch:** You don't have any alarms, metrics or default dashboard. Once you set them up they will be displayed here. View getting started page.
  - Four Action Cards:**
    - Create alarms:** Set alarms on any of your metrics to receive notification when your metric crosses your specified threshold.
    - Create a default dashboard:** Create and name any CloudWatch dashboard **CloudWatch-Default** to display it here.
    - View logs:** Monitor using your existing system, application and custom log files.
    - View events:** Write rules to indicate which events are of interest to your application and what automated action to take.
  - Get started with Application Insights:** Set up monitors and dashboards to detect issues and resolve problems with enterprise applications, databases, and workloads. [How it works](#). [Configure Application Insights](#)

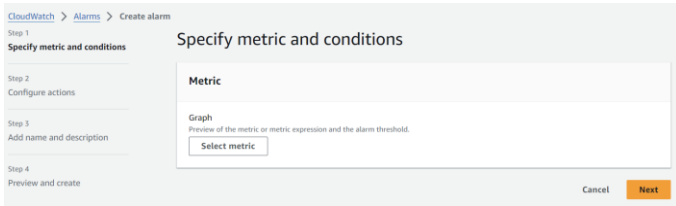
**Bottom Screenshot: CloudWatch Alarms**

- Header:** AWS logo, Services, Search bar, [Alt+S], Region: N. Virginia, Account: cdr1991.
- Left Sidebar:** CloudWatch, Favorites and recents, Dashboards, Alarms (0), In alarm, **All alarms** (highlighted with a red box), Billing, Logs, Log groups, Log Anomalies, Live Tail, Logs Insights, Contributor Insights, Metrics, All metrics, Explorer, Streams, X-Ray traces, Events, Rules, Event Buses, Application Signals, Services, Service Map, Service Level Objectives (SLO), Synthetics Canaries, RUM.
- Main Content Area:**
  - Alarms (0):** Hide Auto Scaling alarms, Clear selection, Create composite alarm, Actions, **Create alarm** (highlighted with a red box).
  - Search and Filters:** Search, Alarm state: Any, Alarm type: Any, Actions status: Any, 1.
  - Table:**

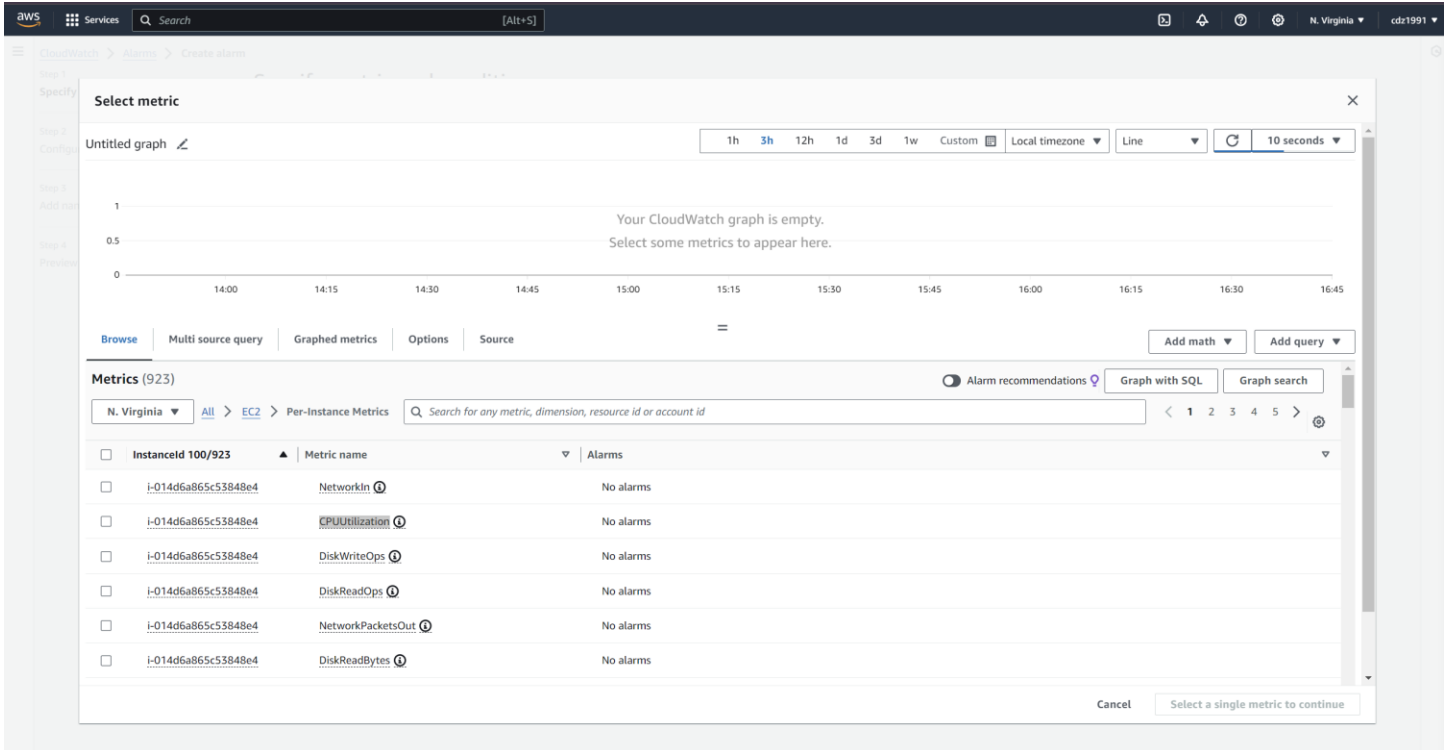
Name	State	Last state update (Local)	Conditions	Actions
No alarms				
No alarms to display				
<a href="#">Read more about Alarms</a>				
<b>Create alarm</b> (highlighted with a red box)				

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

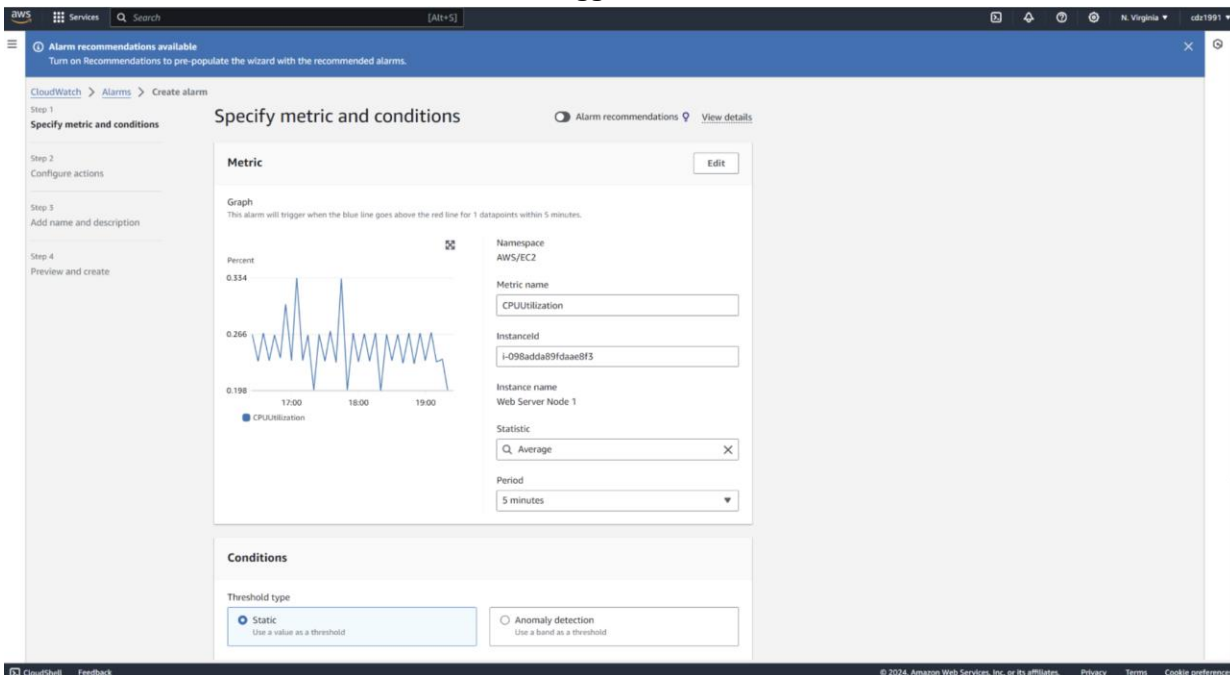




#### 4. Click on **Select metric > Select EC2 > Pre-Instance Metrics > CPU Utilization**



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



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

The screenshot shows the AWS CloudWatch 'Configure actions' step for creating an alarm. The left sidebar indicates the current step is 'Step 2: Configure actions'. The main content area is titled 'Configure actions' and contains two sections: 'Notification' and 'Lambda action'.

**Notification section:**

- Alarm state trigger:** Define the alarm state that will trigger this action. Three options are available:   
☒ **In alarm** (The metric or expression is outside of the defined threshold.)   
☐ **OK** (The metric or expression is within the defined threshold.)   
☐ **Insufficient data** (The alarm has just started or not enough data is available.)
- Send a notification to the following SNS topic:** Define the SNS (Simple Notification Service) topic that will receive the notification.   
☒ **Select an existing SNS topic.** (This option is highlighted with a red box.)   
☐ Create new topic   
☐ Use topic ARN to notify other accounts
- Send a notification to...** (This section is also highlighted with a red box.)   
A search bar contains the text 'Select an SNS topic'. Below the search bar, it says 'No matching SNS topics found'.   
An 'Add notification' button is at the bottom of this section.

**Lambda action section:**

This section is currently empty.

**Auto Scaling action section:**

This section contains an 'Add Auto Scaling action' button.

**EC2 action section:**

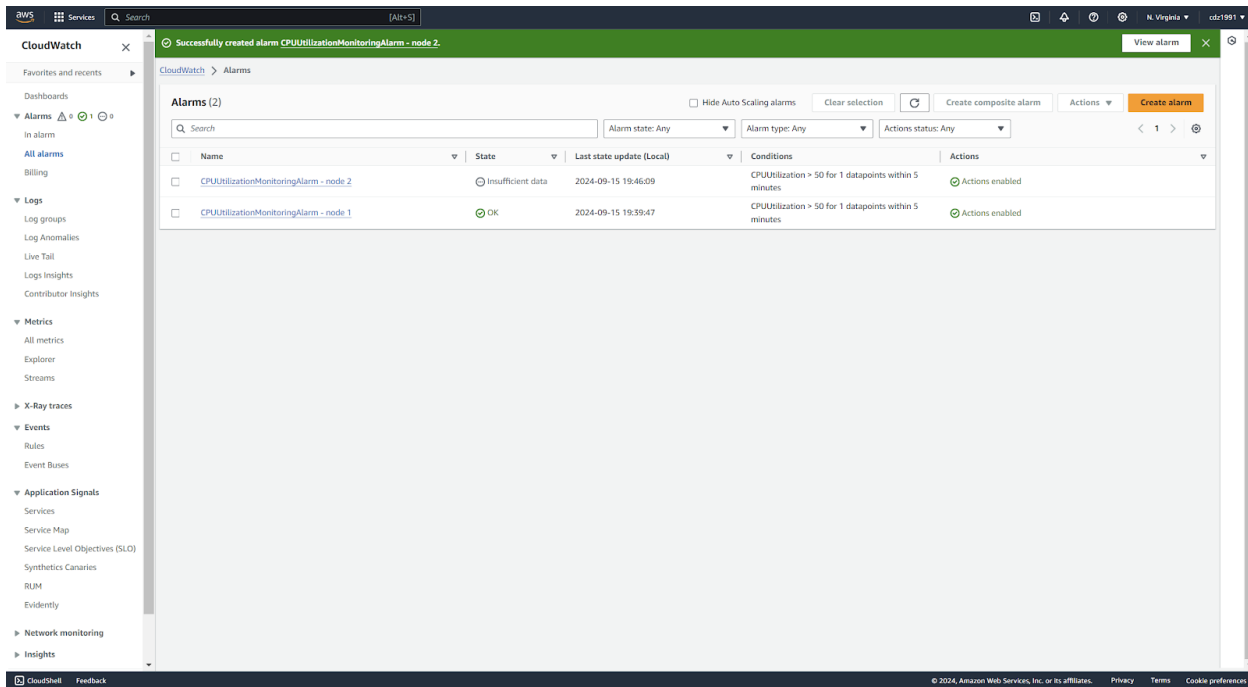
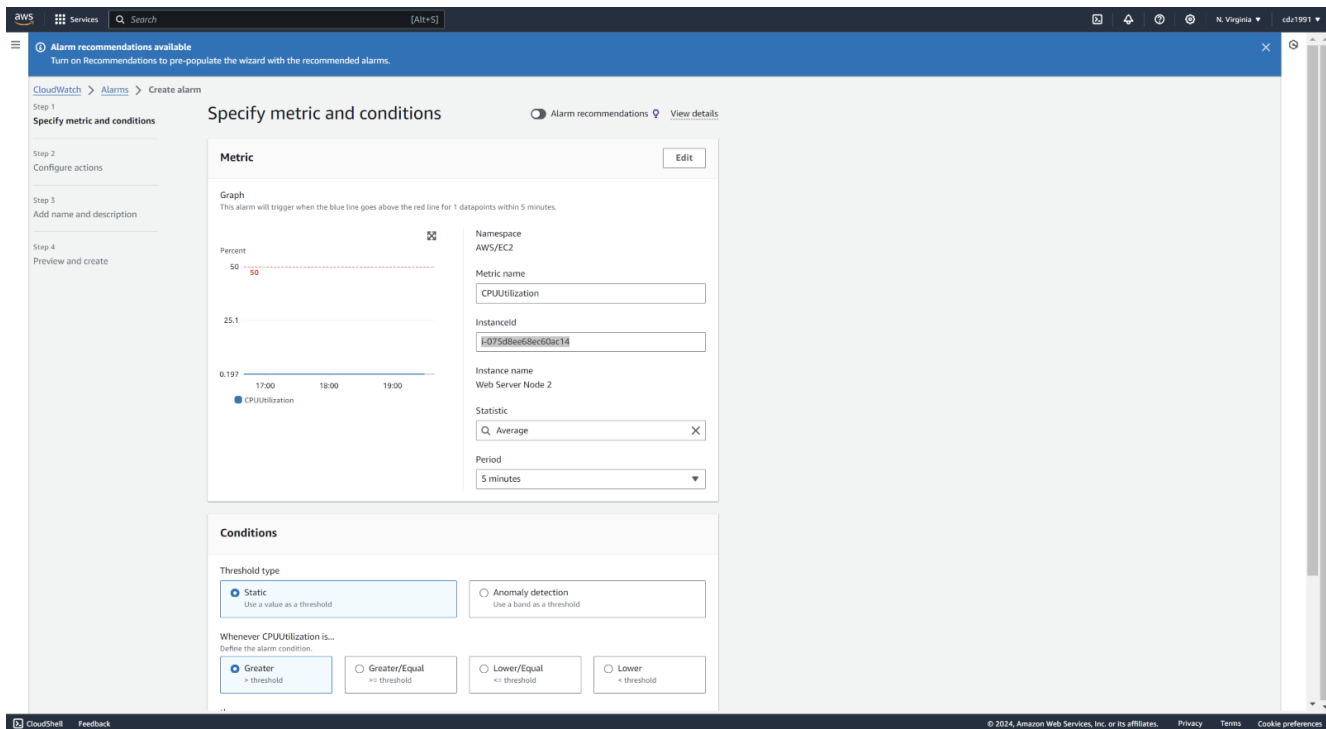
- Alarm state trigger:** Define the alarm state that will trigger this action. Three options are available:   
☒ **In alarm** (The metric or expression is outside of the defined threshold.)   
☐ **OK** (The metric or expression is within the defined threshold.)   
☐ **Insufficient data** (The alarm has just started or not enough data is available.)
- Take the following action...** Define what will happen to the EC2 instance with the Instance ID i-098adda9fdae8f3 when this alarm is triggered.   
☐ Recover this instance (You can only recover certain EC2 instance types. See documentation)   
☒ **Stop this instance** (You can only stop an instance if it is backed by an EBS volume. AWS will use the existing Service Linked Role (AWSServiceRoleForCloudWatchEvents) to perform this action. Show IAM policy document)   
☐ Terminate this instance (You will not be able to terminate this instance if termination protection is enabled. AWS will use the existing Service Linked Role (AWSServiceRoleForCloudWatchEvents) to perform this action. Show IAM policy document)   
☐ Reboot this instance (An instance reboot is equivalent to an operating system reboot. AWS will use the existing Service Linked Role (AWSServiceRoleForCloudWatchEvents) to perform this action. Show IAM policy document)
- Add EC2 action** button

**Systems Manager action section:**

- Systems Manager action** (Info icon)   
This action will create an Incident or Opsitem in Systems Manager when the alarm is **In alarm** state.   
**Add Systems Manager action** button

At the bottom of the page, there are buttons for 'Cancel', 'Previous', and 'Next'.

## 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

```

MobaXterm Personal Edition v24.1
(SSH client, X server and network tools)

SSH session to ec2-user@ec2-35-172-224-111.compute-1.amazonaws.com
• Direct SSH : ✓
• SSH compression : ✓
• SSH-browser : ✓
• X11-forwarding : ✗ (disabled or not supported by server)
• For more info, ctrl+click on help or visit our website.

Amazon Linux 2023
https://aws.amazon.com/linux/amazon-linux-2023

[ec2-user@ip-172-31-67-99 ~]$
[ec2-user@ip-172-31-67-99 ~]$ sudo yum update -y
Last metadata expiration check: 3:25:30 ago on Sun Sep 15 23:24:45 2024.
Dependencies resolved.
Nothing to do.
Complete!
[ec2-user@ip-172-31-67-99 ~]$ sudo -i
[root@ip-172-31-67-99 ~]# yes > /dev/null

[ec2-user@ip-172-31-67-99 ~]$ top
top - 03:04:12 up 3:39, 3 users, load average: 0.49, 0.13, 0.04
Tasks: 106 total, 2 running, 104 sleeping, 0 stopped, 0 zombie
%Cpu(s): 60.9 us, 38.7 sy, 0.0 ni, 0.0 id, 0.0 wa, 0.0 hi, 0.0 si, 0.3 st
MiB Mem : 949.5 total, 599.9 free, 123.5 used, 226.1 buff/cache
MiB Swap: 0.0 total, 0.0 free, 0.0 used, 688.6 avail Mem

  PID USER      PR  NI  VIRT  RES  SHR S %CPU  %MEM    TIME+  COMMAND
  9194 root        20   0 221356 1008  920 R  99.7   0.1   0:37.96 yes
```

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



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

[illegible]

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

Alarm state: In alarm

Alarm type: Any

Actions status: Any

< 1 >

⊗

<input type="checkbox"/>	Name	State	Last state update (Local)	Conditions	Actions
<input type="checkbox"/>	<a href="#">CPUUtilizationMonitoringAlarm - node 1</a>	<span style="color: red;">▲ In alarm</span>	2024-09-15 20:12:47	CPUUtilization > 50 for 1 datapoints within 5 minutes	<span style="color: green;">⊕ Actions enabled</span>
<input type="checkbox"/>	<a href="#">CPUUtilizationMonitoringAlarm - node 2</a>	<span style="color: red;">▲ In alarm</span>	2024-09-15 20:07:03	CPUUtilization > 50 for 1 datapoints within 5 minutes	<span style="color: green;">⊕ Actions enabled</span>

Instances (2) Info

Last updated 1 minute ago

Instance state

Actions

All states

< 1 > ⊗

<input type="checkbox"/>	Name	Instance ID	Instance state	Instance type	Status check	Alarm status	Availability Zone	Public IPv4 DNS	Public IPv4 ...
<input type="checkbox"/>	Web Server Node 1	<a href="#">i-098adka89fdae8f3</a>	<span>⊖ Stopped</span> <input type="button" value="⌕"/>	t2.micro	–	<span style="color: orange;">▲ 1 in alarm</span> <span style="color: green;">⊕</span>	us-east-1f	–	–
<input type="checkbox"/>	Web Server Node 2	<a href="#">i-075d8ee68ec60ac14</a>	<span>⊖ Stopped</span> <input type="button" value="⌕"/>	t2.micro	–	<span style="color: orange;">▲ 1 in alarm</span> <span style="color: green;">⊕</span>	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.