Placement Empowerment Program

Cloud Computing and DevOps Centre

Implement Auto-scaling in the CloudSet up an auto-scaling group for your cloud VMs to handle variable workloads.

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Introduction

As modern applications face varying workloads, ensuring optimal performance and availability is critical. Auto Scaling, a feature provided by cloud platforms like AWS, dynamically adjusts computing resources in response to demand changes. This Proof of Concept (PoC) demonstrates how to set up an Auto Scaling Group (ASG) for virtual machines (VMs) to handle fluctuating workloads effectively. It explores defining launch configurations, setting scaling policies, and testing automatic scaling based on CPU usage.

Overview

This PoC focuses on implementing a scalable architecture using AWS Auto Scaling Groups. The workflow includes:

1. **Defining a Launch Template**: Configuring virtual machines (VMs) with required specifications like instance type, AMI, key pairs, and security groups.

2. **Creating an Auto Scaling Group**: Setting initial group size and linking it to the launch template to manage instances dynamically.

3. **Configuring Scaling Policies**: Setting up metrics like CPU utilization to trigger scaling actions (e.g., scaling up during high CPU usage).

4. **Testing Auto Scaling**: Simulating high CPU load to verify that the ASG launches additional instances to handle demand.

This PoC will demonstrate the reliability, flexibility, and cost-efficiency of dynamic scaling in a cloud environment.

Objective

The primary objective of this PoC is to:

1. Implement an **Auto Scaling Group (ASG)** to manage workloads effectively.

2. Define and configure a **Launch Template** for virtual machines.

3. Set up and test **scaling policies** based on predefined metrics, such as CPU utilization.

4. Validate the scaling process by simulating real-world scenarios (e.g., high CPU usage).

By completing this PoC, the goal is to gain hands-on experience with Auto Scaling and to understand its importance in ensuring application availability and cost management.

Importance

1. Improved Application Availability: Auto Scaling ensures that applications remain available even during traffic spikes by automatically adding more VMs to meet demand.

2. Cost Optimization: It dynamically reduces the number of VMs during low traffic periods, minimizing unnecessary costs.

3. Efficient Resource Utilization: By scaling resources based on actual demand, Auto Scaling prevents over-provisioning and underutilization.

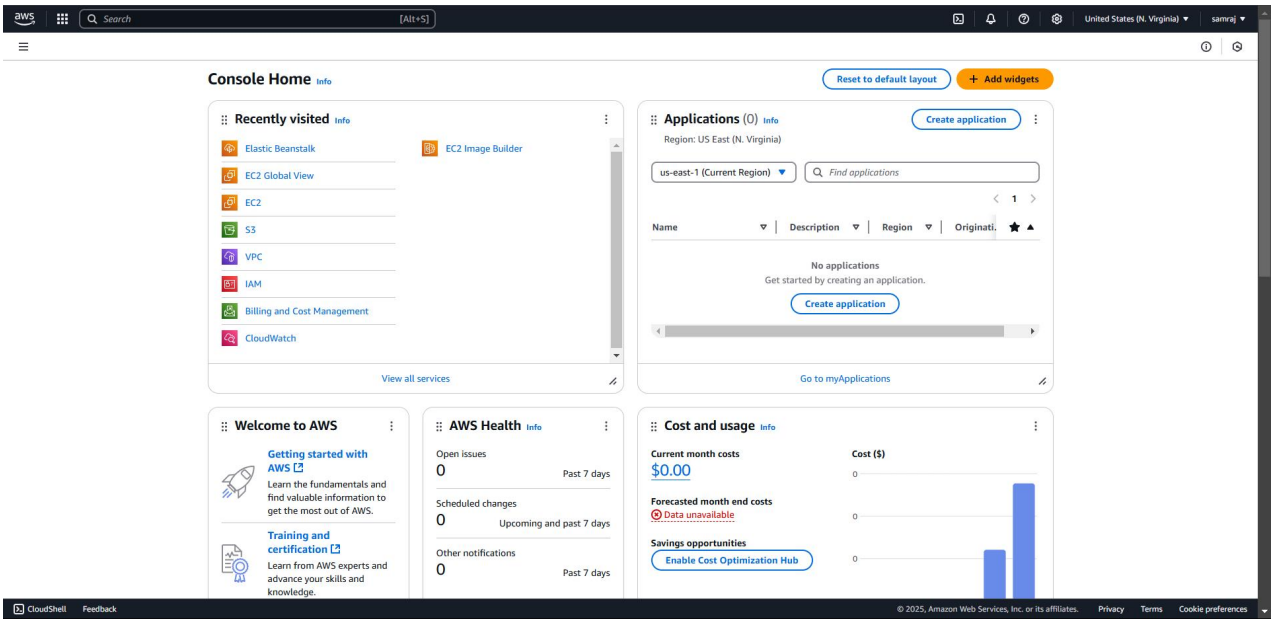
4. Resilience to Failures: Auto Scaling can replace unhealthy instances automatically, ensuring consistent application performance.

5. Real-World Relevance: The ability to manage variable workloads is a critical skill in cloud computing and aligns with industry practices.

Step-by-Step Overview

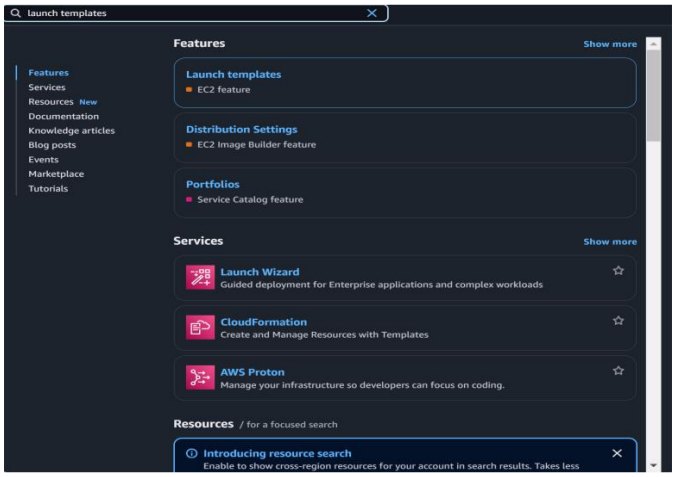
Step 1:

1. Go to AWS Management Console.
2. Enter your username and password to log in.



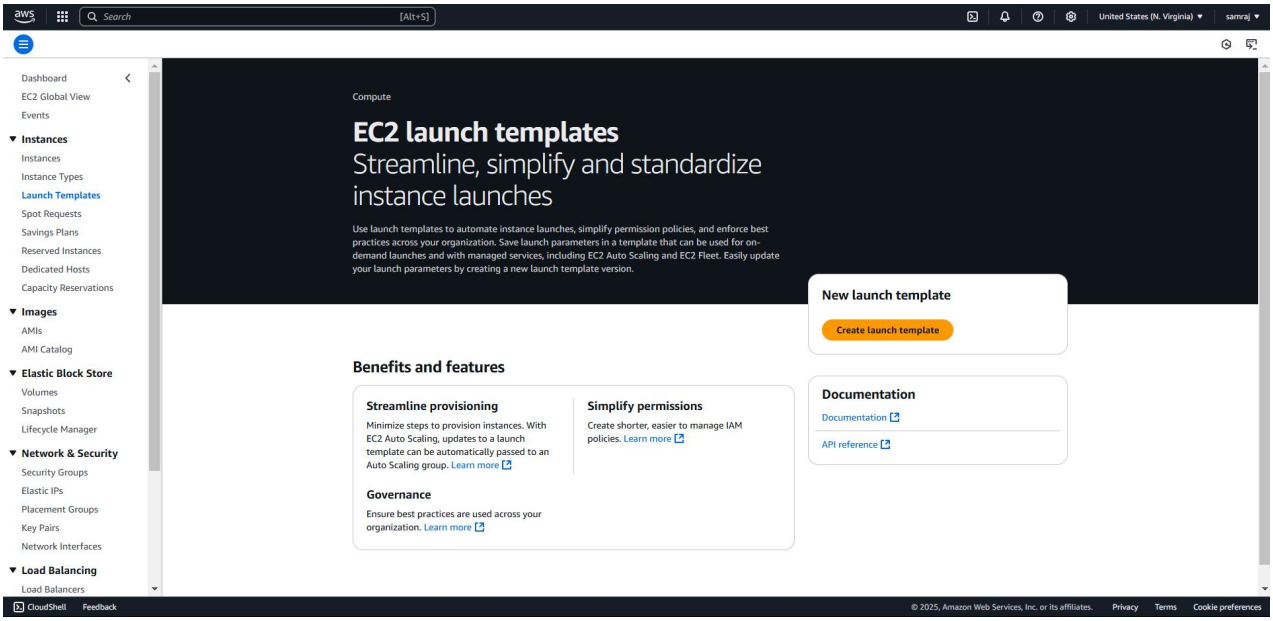
Step 2:

Search for Launch Templates.



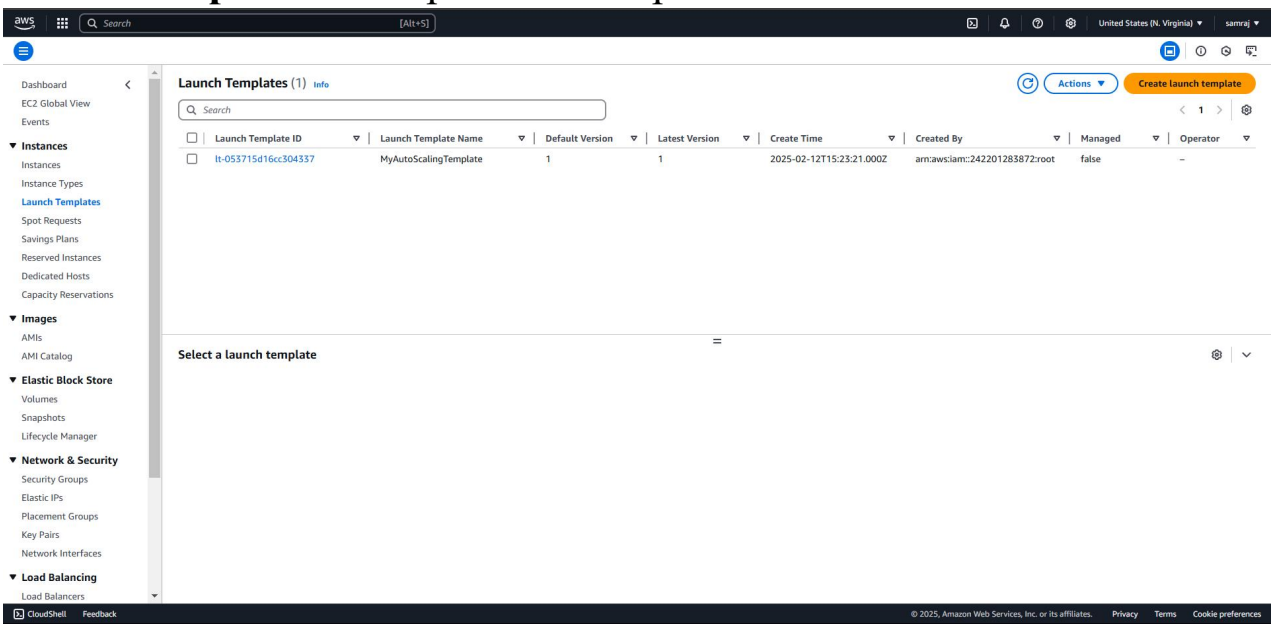
Step 3:

Click on the Create launch template.



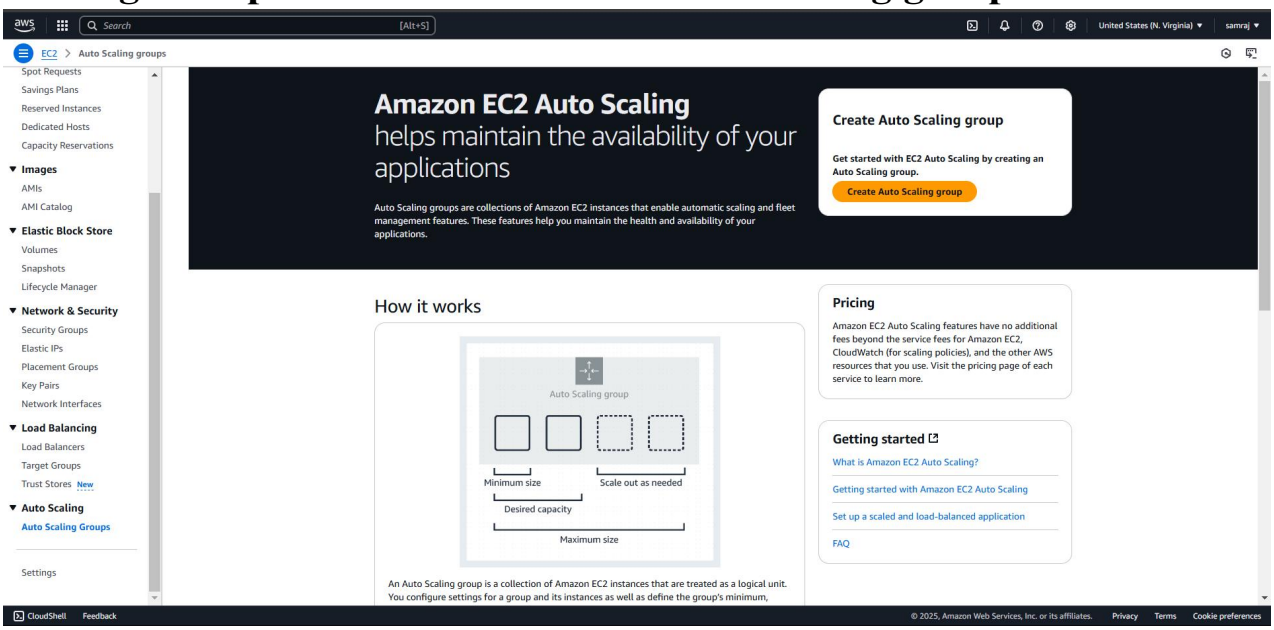
Step 4:

Create a **Launch Template** named **AutoScalingTemplate** using an **Amazon Machine Image (AMI)** like Amazon Linux 2 or any default image, and choose an **instance type** such as **t2.micro** for free-tier eligibility. Select an **existing key pair** (or create a new one) to enable SSH access, and configure a **security group** that allows HTTP (port 80) and SSH (port 22). Once all details are filled out, click **Create launch template** to complete the setup.



Step 5:

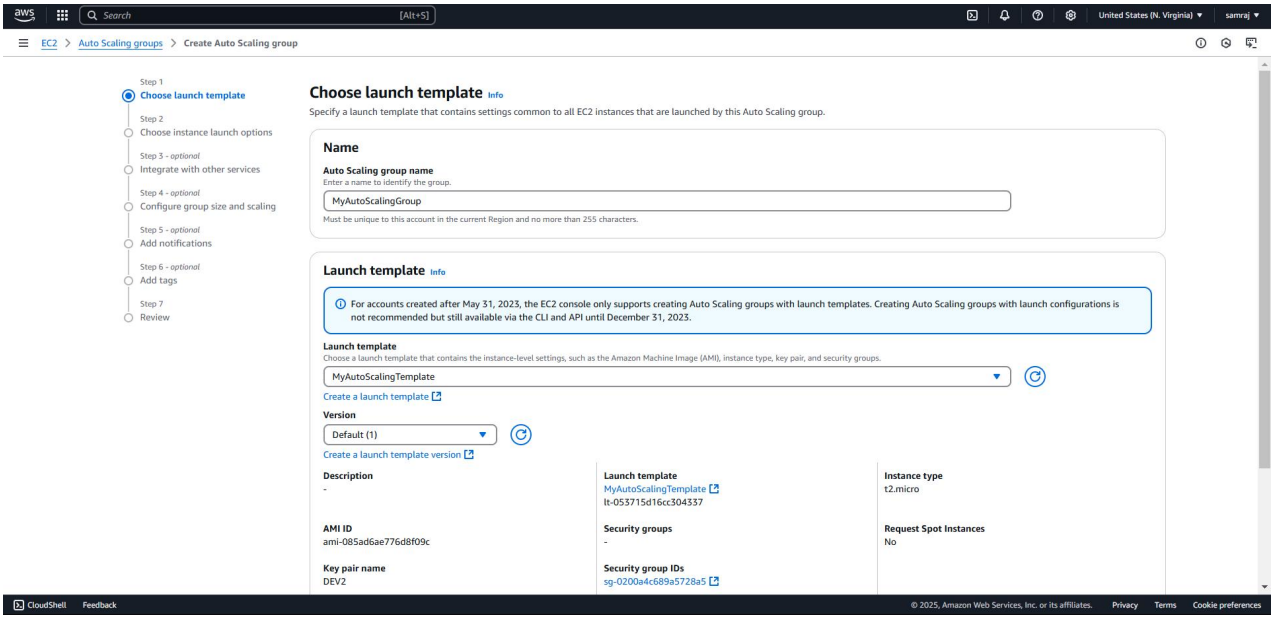
Go to the **EC2 Dashboard** . On the left sidebar, click on **Auto Scaling Groups**. Click on **Create an Auto Scaling group**.



Step 6:

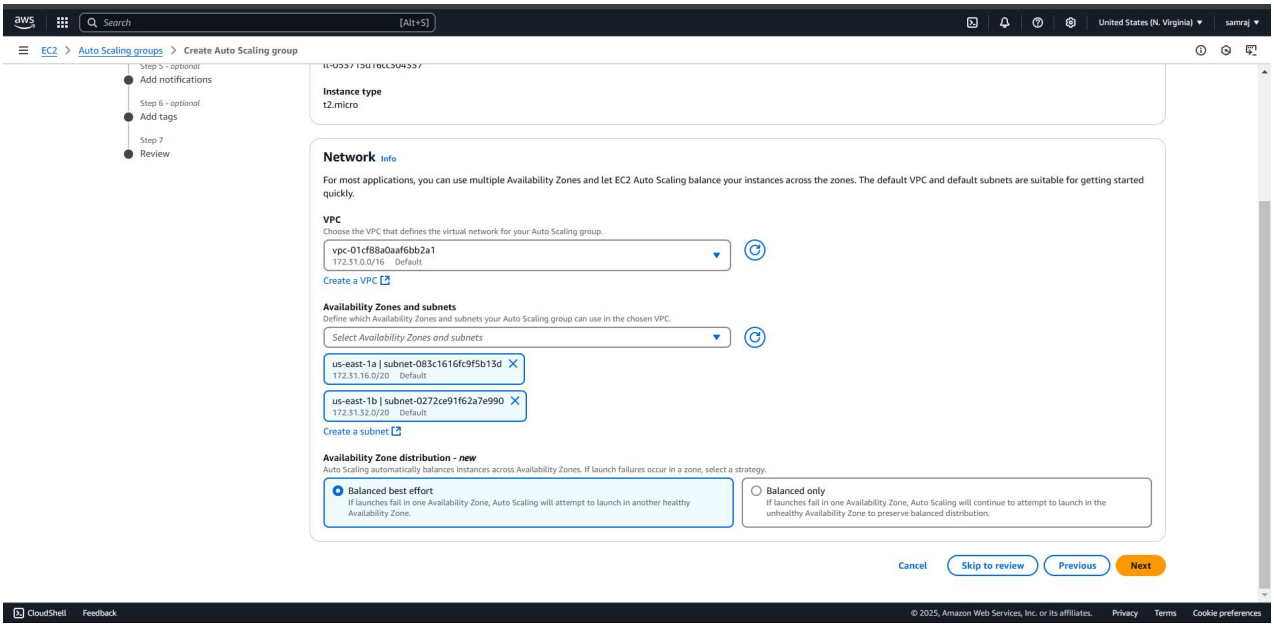
Auto Scaling group name: Give it a name (e.g., MyAutoScalingGroup).

Launch Template: Select the launch template you created earlier (AutoScalingTemplate).



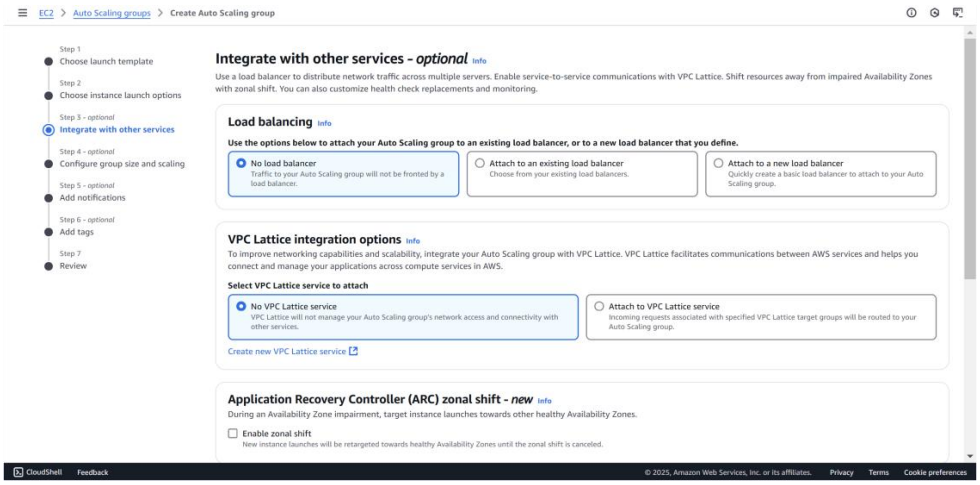
Step 7:

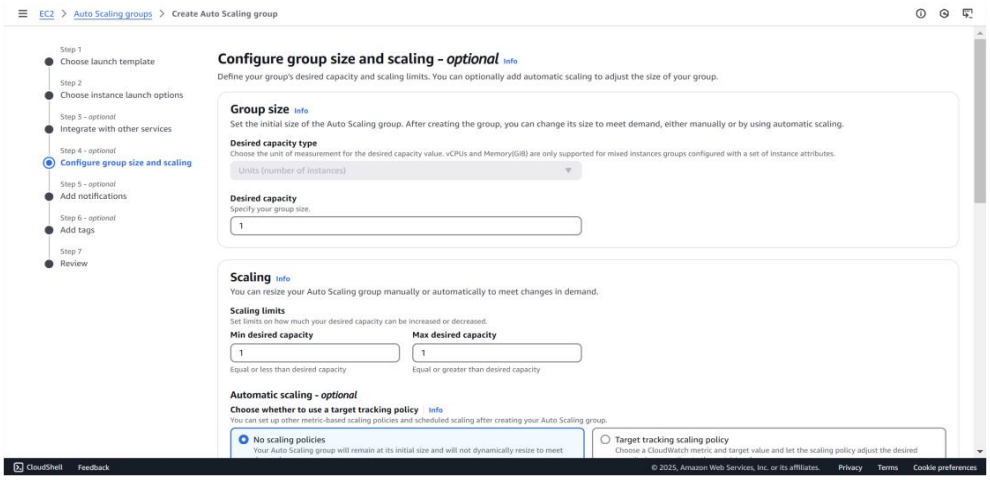
VPC and Subnets: Choose your **VPC** (it's fine to use the default one). Select at least two subnets in different Availability Zones (this ensures high availability).

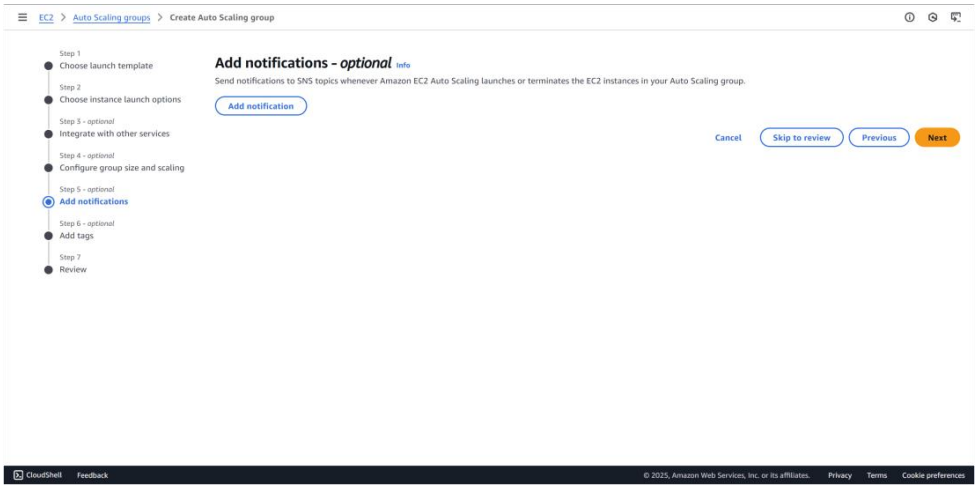


Step 8:

For this PoC leave the next settings as default and click next .

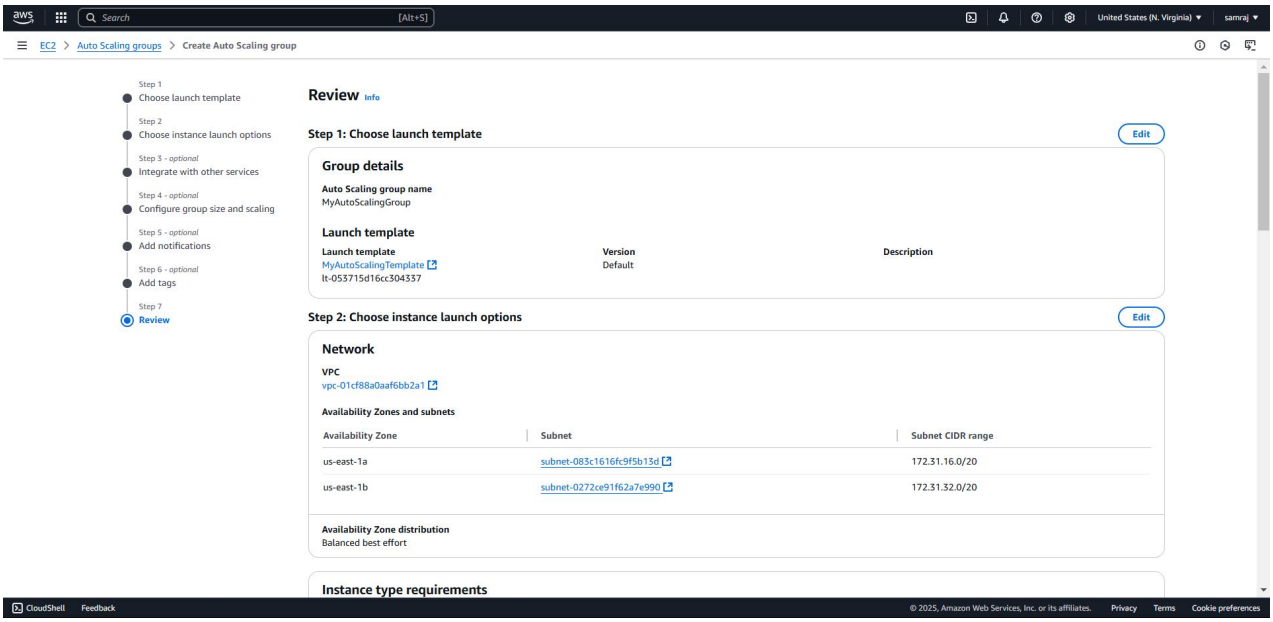






Step 9:

Review all the settings you've configured. Once satisfied, click **Create Auto Scaling Group**.


Search [Alt+S]
United States (N. Virginia)
samraj
EC2 > Auto Scaling groups > Create Auto Scaling group
Step 1 Choose launch template
Step 2 Choose instance launch options
Step 3 - optional Integrate with other services
Step 4 - optional Configure group size and scaling
Step 5 - optional Add notifications
Step 6 - optional Add tags
Step 7 Review
Review Info
Step 1: Choose launch template
Edit
Group details
Auto Scaling group name
MyAutoScalingGroup
Launch template
Launch template
MyAutoScalingTemplate
lt-053715d16cc304337
Version
Default
Description
Step 2: Choose instance launch options
Edit
Network
VPC
vpc-01cf88a0aaf6bb2a1
Availability Zones and subnets
Availability Zone
Subnet
Subnet CIDR range
us-east-1a
subnet-083c1616fc9f5b13d
172.31.16.0/20
us-east-1b
subnet-0272ce91f62a7e990
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Availability Zone distribution
Balanced best effort
Instance type requirements
CloudShell
Feedback
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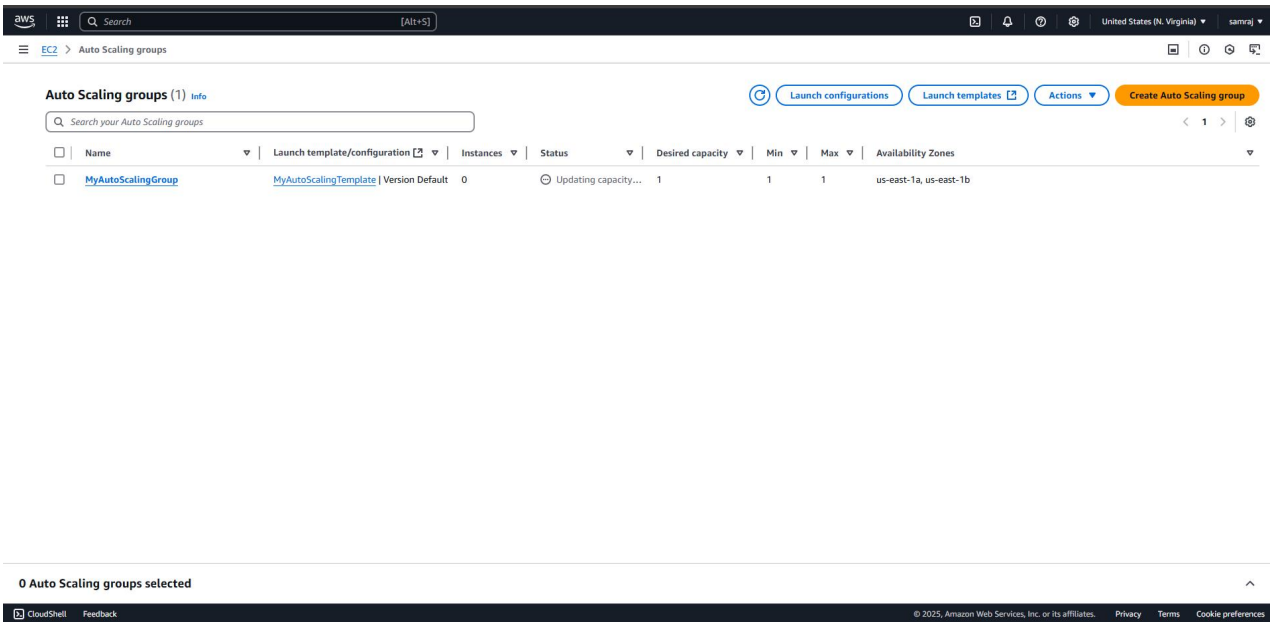
Search [Alt+S]
United States (N. Virginia)
samraj
EC2 > Auto Scaling groups
Auto Scaling groups (1) Info
Launch configurations
Launch templates
Actions
Create Auto Scaling group
Search your Auto Scaling groups
Name
Launch template/configuration
Instances
Status
Desired capacity
Min
Max
Availability Zones
MyAutoScalingGroup
MyAutoScalingTemplate | Version Default
0
Updating capacity...
1
1
1
us-east-1a, us-east-1b
0 Auto Scaling groups selected
CloudShell
Feedback
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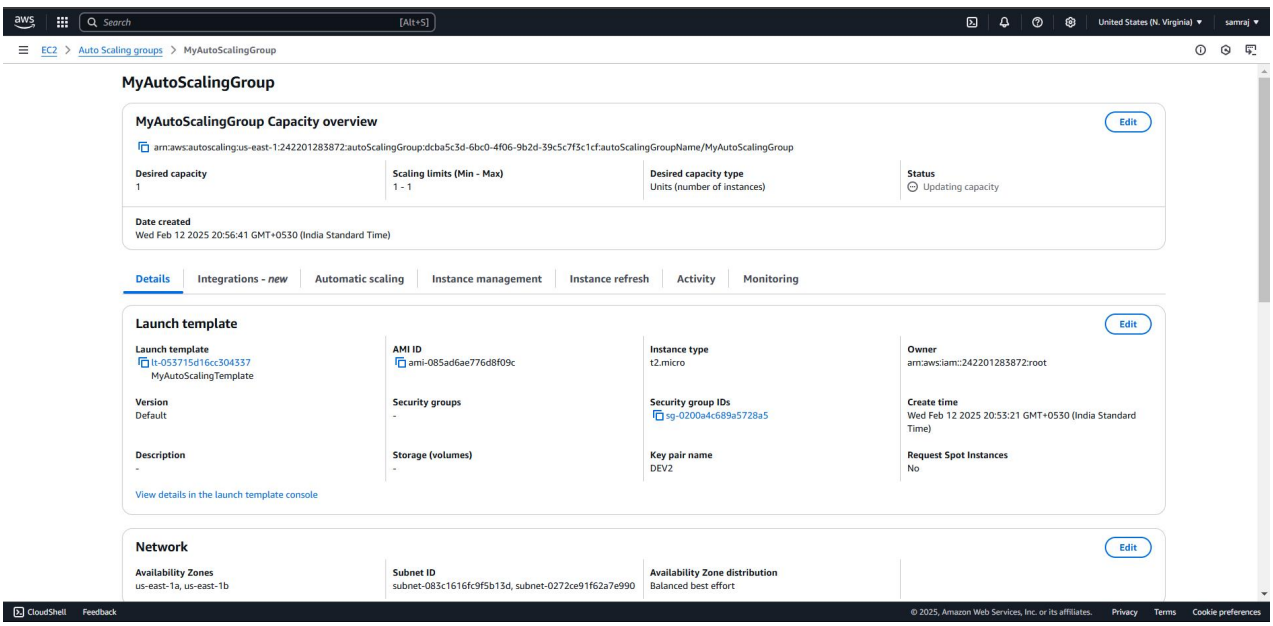
Search [Alt+S]
United States (N. Virginia)
samraj
EC2 > Auto Scaling groups > MyAutoScalingGroup
MyAutoScalingGroup
MyAutoScalingGroup Capacity overview
Edit
arn:aws:autoscaling:us-east-1:242201283872:autoScalingGroup:dcba5c3d-6bc0-4f06-9b2d-39c5c7f3c1cf:autoScalingGroupName/MyAutoScalingGroup
Desired capacity
1
Scaling limits (Min - Max)
1 - 1
Desired capacity type
Units (number of instances)
Status
Updating capacity
Date created
Wed Feb 12 2025 20:56:41 GMT+0530 (India Standard Time)
Details
Integrations - new
Automatic scaling
Instance management
Instance refresh
Activity
Monitoring
Launch template
Edit
Launch template
lt-053715d16cc304337
MyAutoScalingTemplate
AMI ID
ami-085ad6ae776d8f09c
Instance type
t2.micro
Owner
arn:aws:iam::242201283872:root
Version
Default
Security groups
-
Security group IDs
sg-0200a4c689a5728a5
Create time
Wed Feb 12 2025 20:53:21 GMT+0530 (India Standard Time)
Description
-
Storage (volumes)
-
Key pair name
DEV2
Request Spot Instances
No
View details in the launch template console
Network
Edit
Availability Zones
us-east-1a, us-east-1b
Subnet ID
subnet-083c1616fc9f5b13d, subnet-0272ce91f62a7e990
Availability Zone distribution
Balanced best effort
CloudShell
Feedback
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Step 10:

Testing Auto Scaling :

Important Note

Do Not Perform This Test If You Want to Avoid Costs:

1. Launching and running additional EC2 instances will incur charges beyond the AWS Free Tier.

2. Simulating high CPU usage and triggering scaling may increase costs temporarily due to additional resource allocation.

1. **Simulate High CPU Usage on an EC2 Instance**

   Connect to one of your EC2 instances in the Auto Scaling Group using SSH.

   Run a command to create artificial CPU load. For example:

   sudo yum install -y stress

   stress --cpu 2 --timeout 300

   This command will utilize 2 CPU cores for 5 minutes, simulating high CPU usage.

2. **Monitor Scaling Activities**

   Navigate to the **AWS Management Console** > **EC2 Dashboard** > **Auto Scaling Groups**.

   Select your Auto Scaling Group and go to the **Activity History** tab.

Check if a new instance is being launched based on your scaling policy (e.g., CPU utilization exceeding 50%).

3. **Terminate the Stress Test**

   Once testing is done, stop the CPU load by pressing Ctrl+C in the terminal or by terminating the stress process.

4. **Verify Scaling Down**

   After the CPU usage drops, monitor the Auto Scaling Group again to confirm that unnecessary instances are terminated, returning to the desired capacity.

Outcome

This Proof of Concept (PoC) aimed to implement Auto Scaling in AWS to dynamically manage EC2 instances based on workload demand, ensuring efficient resource utilization and cost-effectiveness.

Here's the outcome of the PoC:

1. **Launch Template and Auto Scaling Group Setup**: Successfully created a launch template and configured an Auto Scaling Group with scaling policies to dynamically manage EC2 instances based on workload.

2. **Dynamic Scaling and Monitoring**: Implemented scaling policies triggered by CPU utilization and verified automatic scaling actions using the Auto Scaling Group's Activity History.

3. **Cost Awareness**: Highlighted potential costs of running additional instances beyond the AWS Free Tier during testing and ensured resource usage was optimized.