Placement Empowerment Program

Cloud Computing and DevOps Centre

Implement Auto-scaling in the Cloud Set up an autoscaling 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.

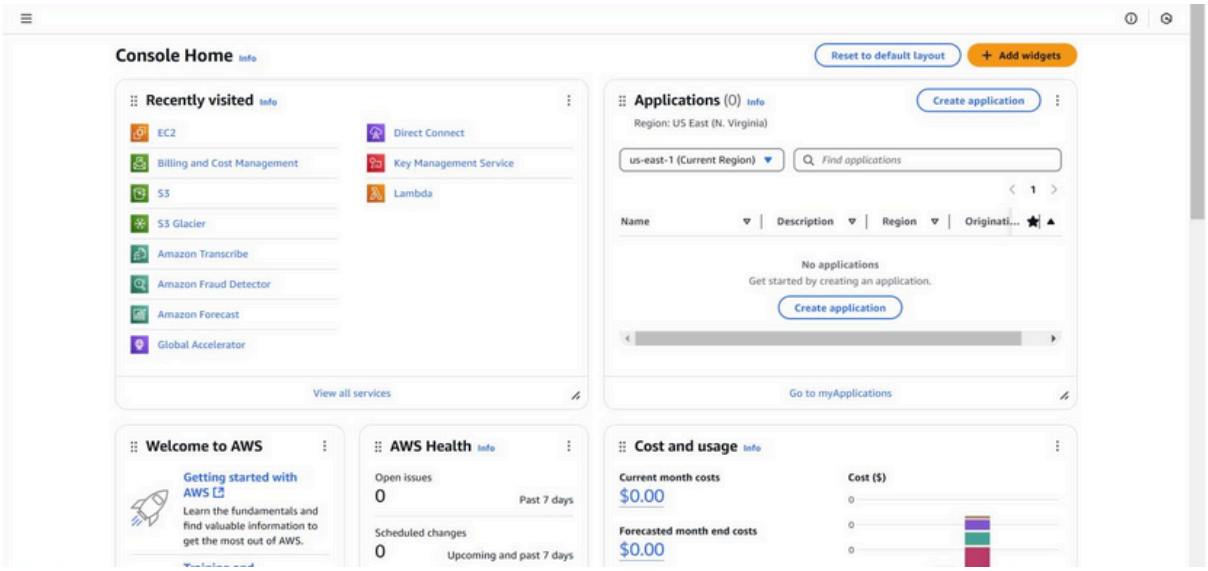
Importance

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.

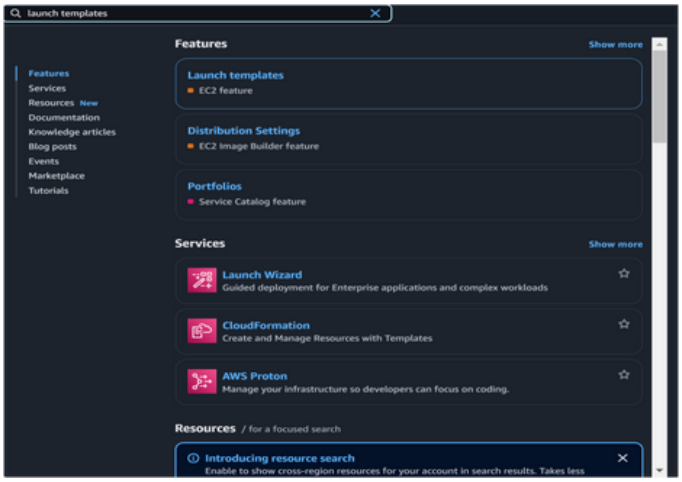
Step-by-Step OverviewStep 1:

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



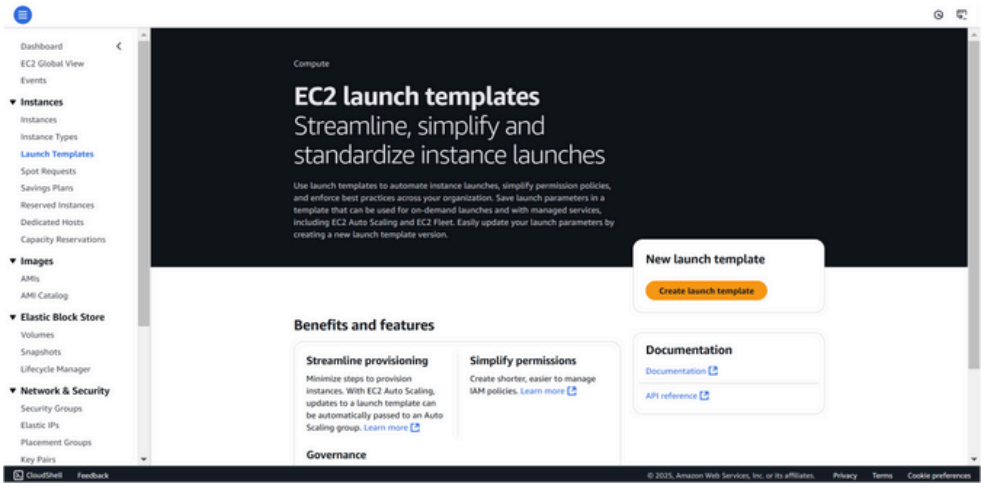
Step 2:

Search for Launch Templates.



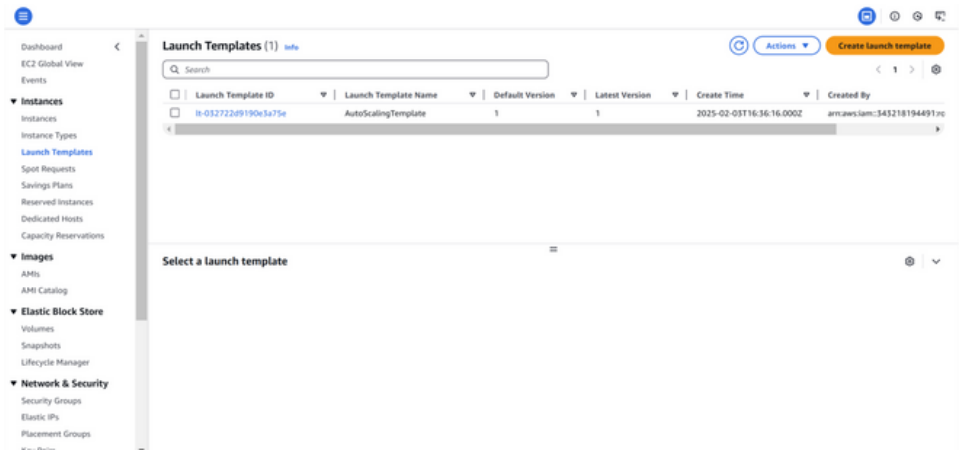
Step 3:

Click on the Create launch template.



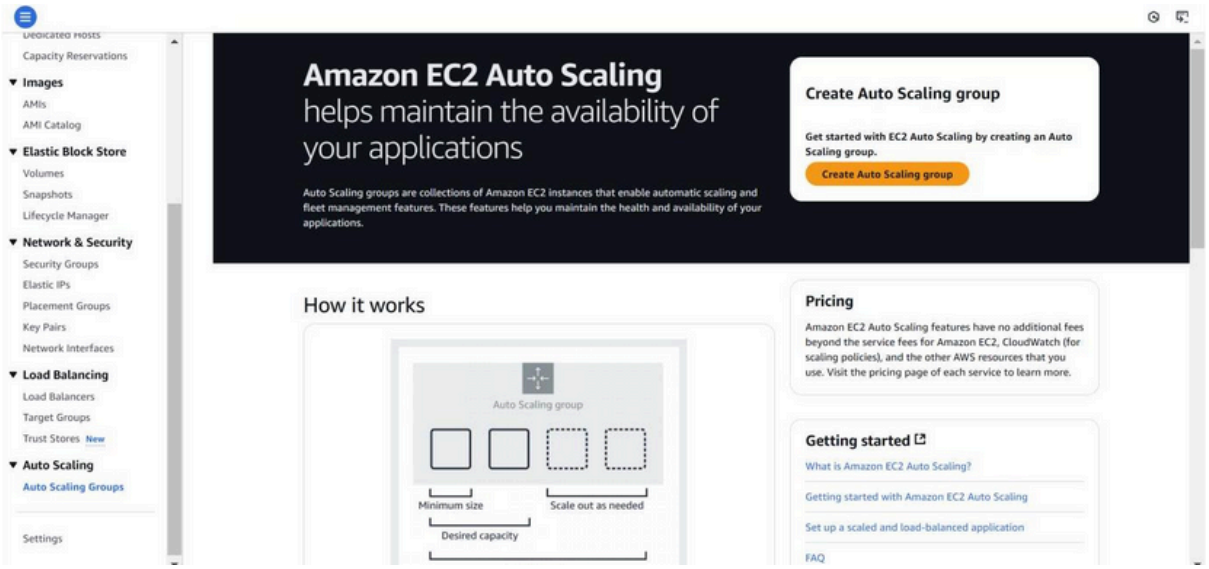
Step 4:

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:

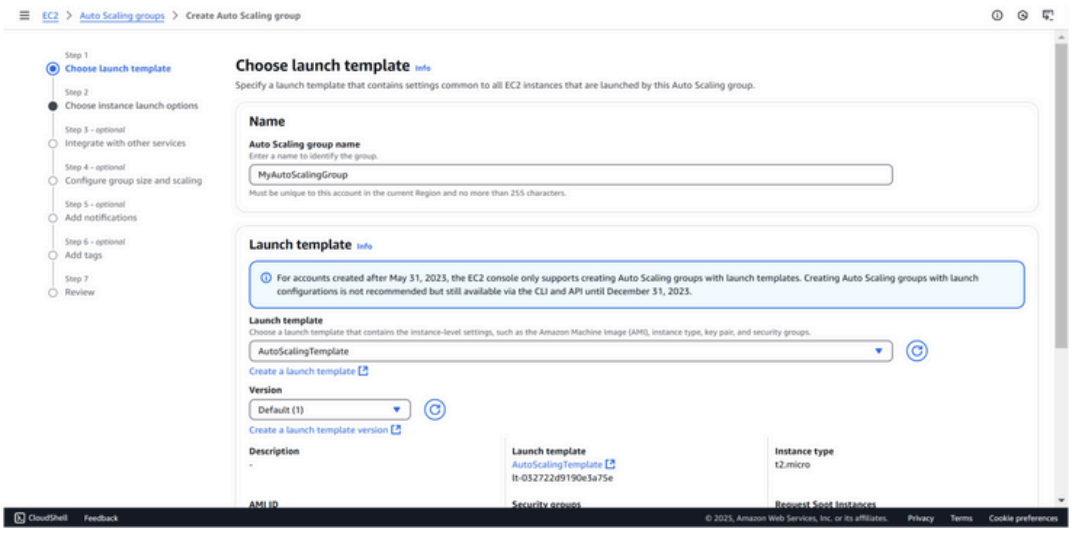
Go to the EC2 Dashboard . On the left sidebar, click on Auto Scaling Groups. Click on Create an Auto Scaling group.



Step 6:

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

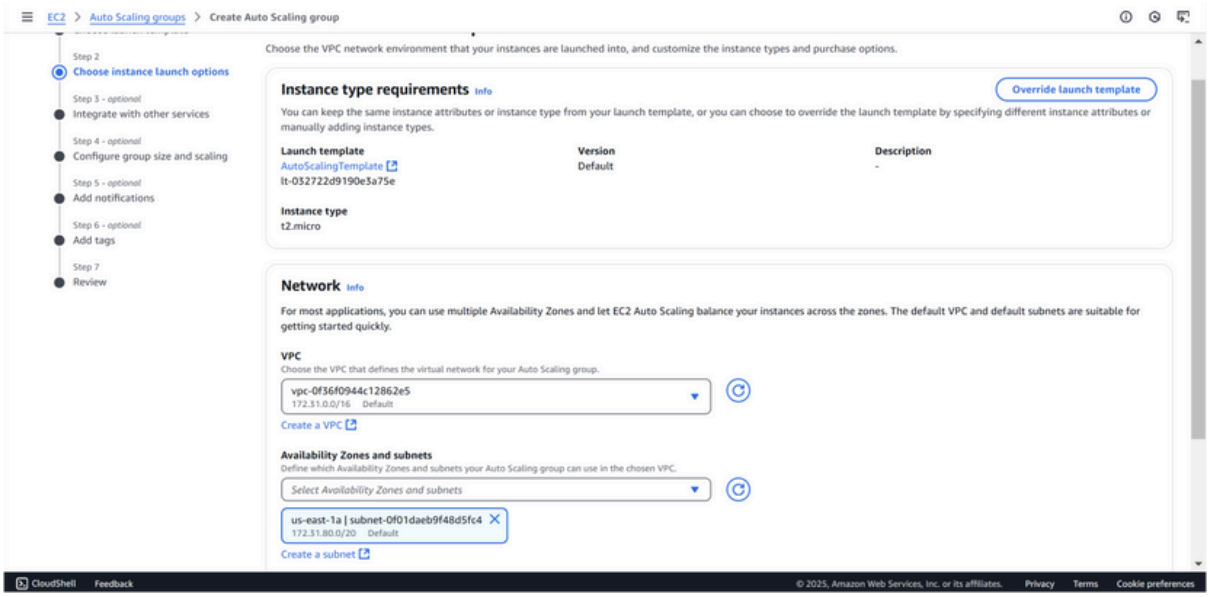
Launch Template: Select the launch template you created earlier (AutoScalingTemplate).



Step 7:

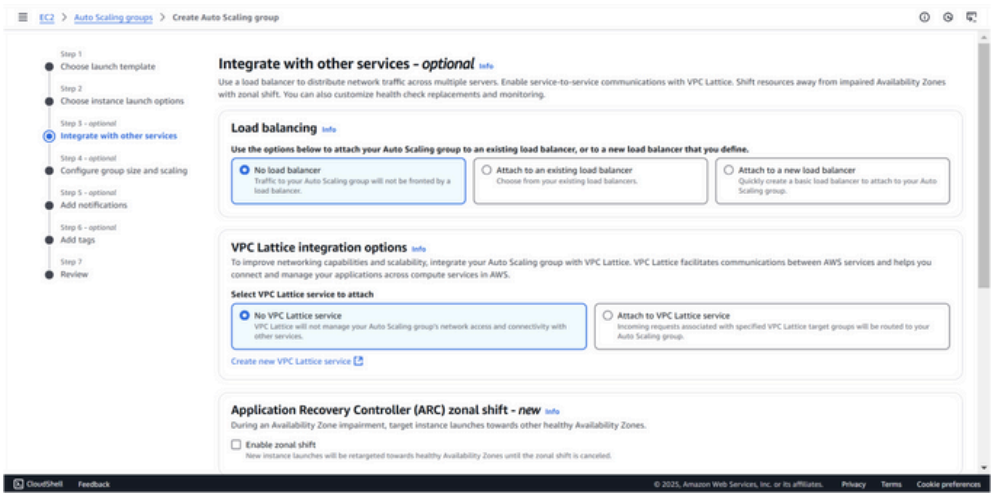
VPC and Subnets: Choose your VPC (it’s fine to use the default one).

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 .


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
Integrate with other services - optional Info
Use a load balancer to distribute network traffic across multiple servers. Enable service-to-service communications with VPC Lattice. Shift resources away from impaired Availability Zones with zonal shift. You can also customize health check replacements and monitoring.
Load balancing Info
Use the options below to attach your Auto Scaling group to an existing load balancer, or to a new load balancer that you define.
No load balancer
Traffic to your Auto Scaling group will not be fronted by a load balancer.
Attach to an existing load balancer
Choose from your existing load balancers.
Attach to a new load balancer
Quickly create a basic load balancer to attach to your Auto Scaling group.
VPC Lattice integration options Info
To improve networking capabilities and scalability, integrate your Auto Scaling group with VPC Lattice. VPC Lattice facilitates communications between AWS services and helps you connect and manage your applications across compute services in AWS.
Select VPC Lattice service to attach
No VPC Lattice service
VPC Lattice will not manage your Auto Scaling group's network access and connectivity with other services.
Attach to VPC Lattice service
Incoming requests associated with specified VPC Lattice target groups will be routed to your Auto Scaling group.
Create new VPC Lattice service
Application Recovery Controller (ARC) zonal shift - new Info
During an Availability Zone impairment, target instance launches towards other healthy Availability Zones.
Enable zonal shift
New instance launches will be retargeted towards healthy Availability Zones until the zonal shift is canceled.
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Feedback
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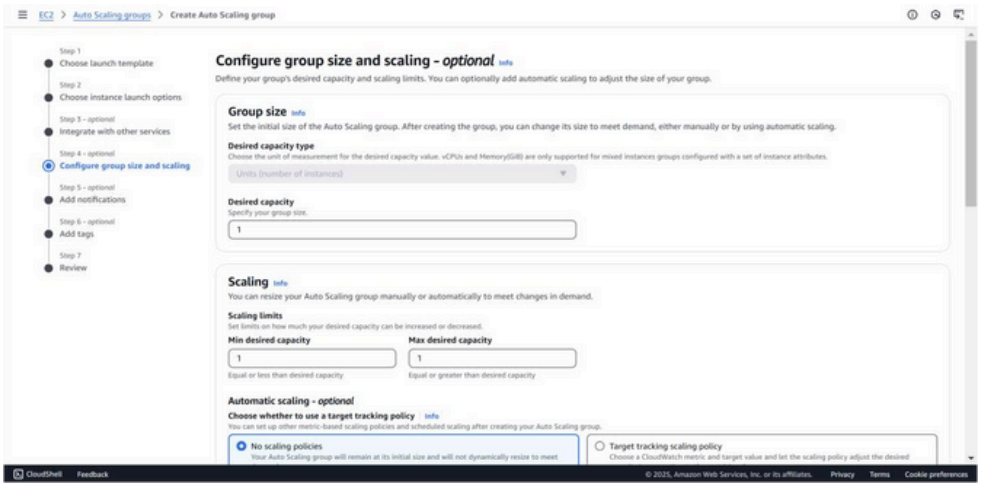
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Integrate with other services
Step 4 - optional
Configure group size and scaling
Step 5 - optional
Add notifications
Step 6 - optional
Add tags
Step 7
Review
Configure group size and scaling - optional Info
Define your group's desired capacity and scaling limits. You can optionally add automatic scaling to adjust the size of your group.
Group size Info
Set the initial size of the Auto Scaling group. After creating the group, you can change its size to meet demand, either manually or by using automatic scaling.
Desired capacity type
Choose the unit of measurement for the desired capacity value. vCPUs and Memory(GiB) are only supported for mixed instances groups configured with a set of instance attributes.
Units (number of instances)
Desired capacity
Specify your group size.
1
Scaling Info
You can resize your Auto Scaling group manually or automatically to meet changes in demand.
Scaling limits
Set limits on how much your desired capacity can be increased or decreased.
Min desired capacity
1
Equal or less than desired capacity
Max desired capacity
1
Equal or greater than desired capacity
Automatic scaling - optional
Choose whether to use a target tracking policy Info
You can set up other metric-based scaling policies and scheduled scaling after creating your Auto Scaling group.
No scaling policies
Your Auto Scaling group will remain at its initial size and will not dynamically resize to meet
Target tracking scaling policy
Choose a CloudWatch metric and target value and let the scaling policy adjust the desired
CloudShell
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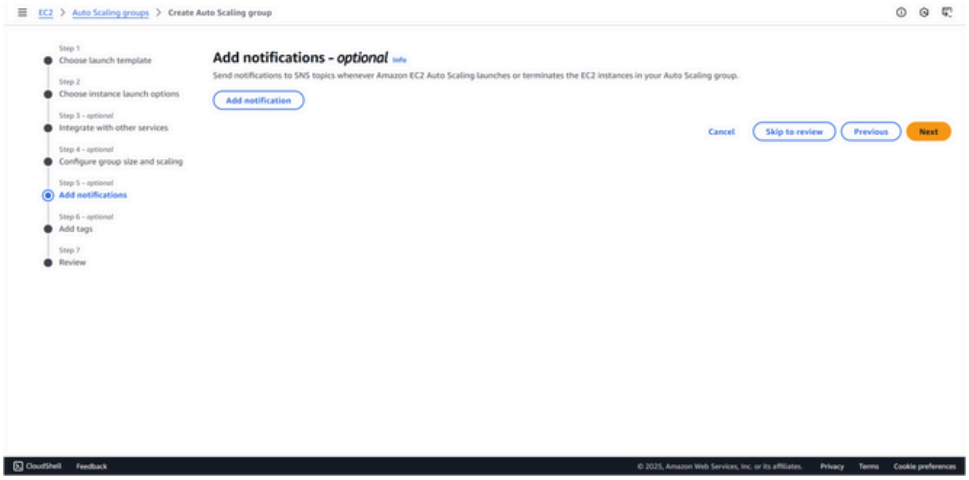
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Step 2
Choose instance launch options
Step 3 - optional
Integrate with other services
Step 4 - optional
Configure group size and scaling
Step 5 - optional
Add notifications
Step 6 - optional
Add tags
Step 7
Review
Add notifications - optional Info
Send notifications to SNS topics whenever Amazon EC2 Auto Scaling launches or terminates the EC2 instances in your Auto Scaling group.
Add notification
Cancel
Skip to review
Previous
Next
CloudShell
Feedback
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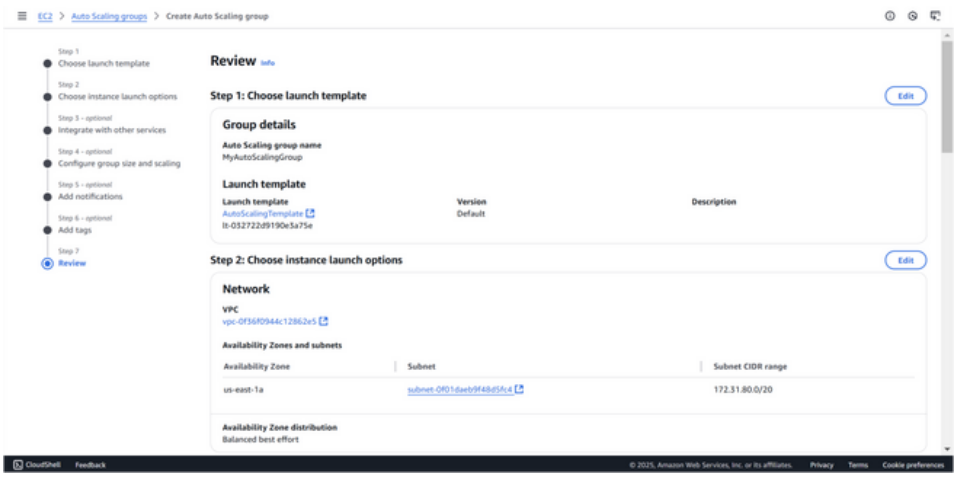
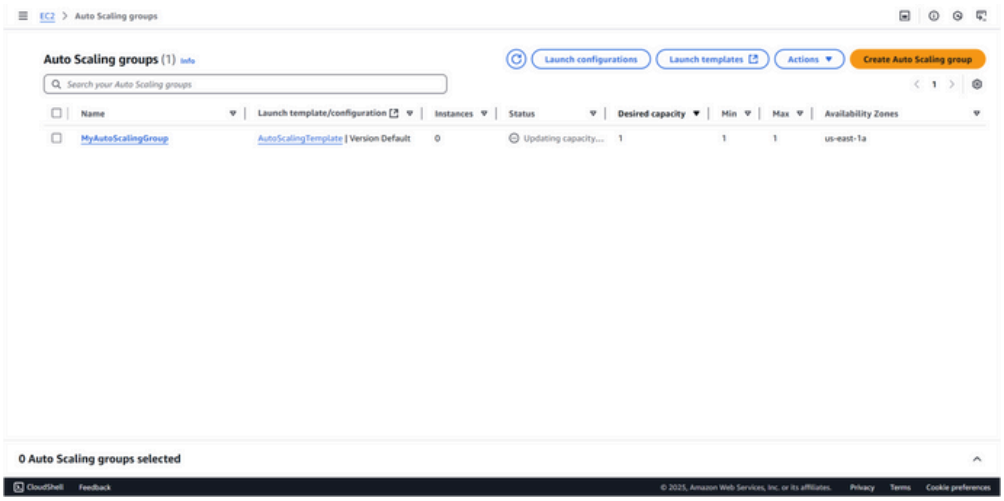
Step 9:

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





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.