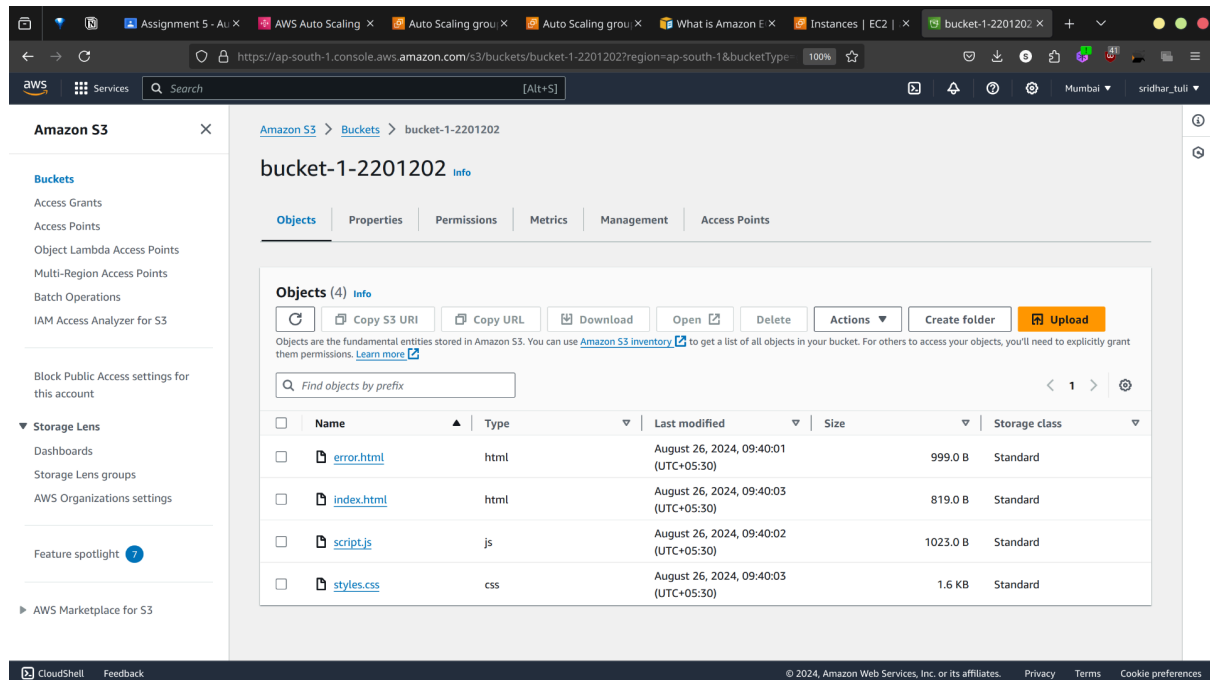


## Cloud Lab Assignment 5

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You need to create an auto-scaling configuration for the web tier of a cloud application. Follow the steps below.

- Create a static website with one or two HTML pages.



Create a startup script to install Apache server.

```
~/AWS/lab5 (0.007s)
ls
boto.py startup.sh

~/AWS/lab5 (0.005s)
cat startup.sh
#!/bin/bash

yes|sudo apt-get update
yes|sudo apt-get install apache2 -y
curl "https://awscli.amazonaws.com/awscli-exe-linux-x86_64.zip" -o "awscliv2.zip"
sudo apt install unzip
unzip awscliv2.zip
sudo ./aws/install
sudo aws configure set aws_access_key_id "AKIATWBJZ7ONRBVEGN7G"
sudo aws configure set aws_secret_access_key "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"
sudo aws configure set region "ap-south-1"
sudo aws s3 sync s3://bucket-1-2201202/ /var/www/html/
sudo systemctl start apache2
sudo systemctl enable apache2

~/AWS/lab5
```

Create a Python program using boto that creates an Amazon AutoScaling group. Define scale up and scale down policies and corresponding CloudWatch alarms. Supply the startup script you created in the previous step while launching a new instance from the program. Use a security group with port 80 open. Copy the previously created pages and dependent files in the newly launched EC2 Instance.

## Initializing the Code

```
import boto3
import base64
import webbrowser
import time

ec2 = boto3.client('ec2')
autoscaling = boto3.client('autoscaling')
cloudwatch = boto3.client('cloudwatch')

ami_id = 'ami-0522ab6e1ddcc7055'
instance_type = 't2.micro'
key_name = 'keypair-lab3-new'
security_group_name = 'MyWebServerSG'
launch_configuration_name = 'my-launch-config'
auto_scaling_group_name = 'my-auto-scaling-group'
description = 'Security group for web server allowing HTTP traffic on port 80'

with open('startup.sh', 'r') as file:
    user_data_script = file.read()

user_data_encoded = base64.b64encode(user_data_script.encode('utf-8')).decode('utf-8')
```

## Creating Security Groups

```
def create_security_group():
    try:
        existing_groups = ec2.describe_security_groups(GroupNames=[security_group_name])
        security_group_id = existing_groups['SecurityGroups'][0]['GroupId']
        print(f'Using existing security group with ID: {security_group_id}')
    except ec2.exceptions.ClientError as e:
        if 'InvalidGroup.NotFound' in str(e):
            response = ec2.create_security_group(GroupName=security_group_name, Description=description)
            security_group_id = response['GroupId']
            print(f'Created security group with ID: {security_group_id}')

            ec2.authorize_security_group_ingress(
                GroupId=security_group_id,
                IpPermissions=[
                    {
                        'IpProtocol': 'tcp',
                        'FromPort': 80,
                        'ToPort': 80,
                        'IpRanges': [{ 'CidrIp': '0.0.0.0/0' }]
                    }
                ]
            )
            print(f'Added rule to allow inbound traffic on port 80 to security group: {security_group_name}')
        else:
            raise
    return security_group_id
```

## Setting up the Launch Configuration

```

def create_launch_configuration(security_group_id):
    try:
        existing_configs = autoscaling.describe_launch_configurations(LaunchConfigurationNames=[launch_configuration_name])
        print(f'Existing launch configuration found: {launch_configuration_name}')

        try:
            autoscaling.delete_launch_configuration(LaunchConfigurationName=launch_configuration_name)
            print(f'Deleted existing launch configuration: {launch_configuration_name}')
        except autoscaling.exceptions.ClientError as e:
            if 'ValidationError' in str(e) and 'Launch configuration name not found' in str(e):
                print(f'Launch configuration {launch_configuration_name} no longer exists, proceeding to create a new one.')
            else:
                raise
    except autoscaling.exceptions.ClientError as e:
        if 'LaunchConfigurationName.NotFound' in str(e):
            print(f'No existing launch configuration found with name: {launch_configuration_name}')
        else:
            raise

    autoscaling.create_launch_configuration(
        LaunchConfigurationName=launch_configuration_name,
        ImageId=ami_id,
        KeyName=key_name,
        SecurityGroups=[security_group_id],
        InstanceType=instance_type,
        UserData=user_data_encoded
    )
    print(f'Launch configuration {launch_configuration_name} created.')

```

## Auto Scaling Groups and Scaling Policies

```

def create_auto_scaling_group():
    autoscaling.create_auto_scaling_group(
        AutoScalingGroupName=auto_scaling_group_name,
        LaunchConfigurationName=launch_configuration_name,
        MinSize=1,
        MaxSize=5,
        DesiredCapacity=1,
        AvailabilityZones=['ap-south-1a', 'ap-south-1b'],
        HealthCheckType='EC2',
        HealthCheckGracePeriod=300
    )
    print(f'Auto Scaling Group {auto_scaling_group_name} created.')

def create_scaling_policies():
    scale_up_policy = autoscaling.put_scaling_policy(
        AutoScalingGroupName=auto_scaling_group_name,
        PolicyName='scale-up',
        ScalingAdjustment=1,
        AdjustmentType='ChangeInCapacity'
    )

    scale_down_policy = autoscaling.put_scaling_policy(
        AutoScalingGroupName=auto_scaling_group_name,
        PolicyName='scale-down',
        ScalingAdjustment=-1,
        AdjustmentType='ChangeInCapacity'
    )

    return scale_up_policy['PolicyARN'], scale_down_policy['PolicyARN']

```

## Cloud Watch Alarm

```
def create_cloudwatch_alarms(scale_up_policy_arn, scale_down_policy_arn):
    cloudwatch.put_metric_alarm(
        AlarmName='scale-up-alarm',
        MetricName='CPUUtilization',
        Namespace='AWS/EC2',
        Statistic='Average',
        Period=300,
        Threshold=75.0,
        ComparisonOperator='GreaterThanThreshold',
        EvaluationPeriods=2,
        AlarmActions=[scale_up_policy_arn],
        Dimensions=[{'Name': 'AutoScalingGroupName', 'Value': auto_scaling_group_name}]
    )
    print('Scale-up CloudWatch alarm created.')

    cloudwatch.put_metric_alarm(
        AlarmName='scale-down-alarm',
        MetricName='CPUUtilization',
        Namespace='AWS/EC2',
        Statistic='Average',
        Period=300,
        Threshold=25.0,
        ComparisonOperator='LessThanThreshold',
        EvaluationPeriods=2,
        AlarmActions=[scale_down_policy_arn],
        Dimensions=[{'Name': 'AutoScalingGroupName', 'Value': auto_scaling_group_name}]
    )
    print('Scale-down CloudWatch alarm created.')
```

## Getting the public DNS to access the website hosted

```
def get_instance_public_dns():
    print("Waiting for instance to be launched...")
    time.sleep(60)

    response = autoscaling.describe_auto_scaling_groups(
        AutoScalingGroupNames=[auto_scaling_group_name]
    )
    instance_ids = [instance['InstanceId'] for instance in response['AutoScalingGroups'][0]['Instances']]

    if not instance_ids:
        print("No instances found in the Auto Scaling group.")
        return None

    instance_info = ec2.describe_instances(InstanceIds=[instance_ids[0]])
    public_dns = instance_info['Reservations'][0]['Instances'][0]['PublicDnsName']

    return public_dns
```

## The main function

```
if __name__ == "__main__":
    security_group_id = create_security_group()
    print("Security group created")
    create_launch_configuration(security_group_id)
    print("Launch configuration created")
    ()
    print("AutoScaling group created")
    scale_up_policy_arn, scale_down_policy_arn = create_scaling_policies()
    print("Scaling policies created")
    create_cloudwatch_alarms(scale_up_policy_arn, scale_down_policy_arn)
    print("CloudWatch alarms created")
    print("AutoScaling group, policies, and alarms created successfully.")

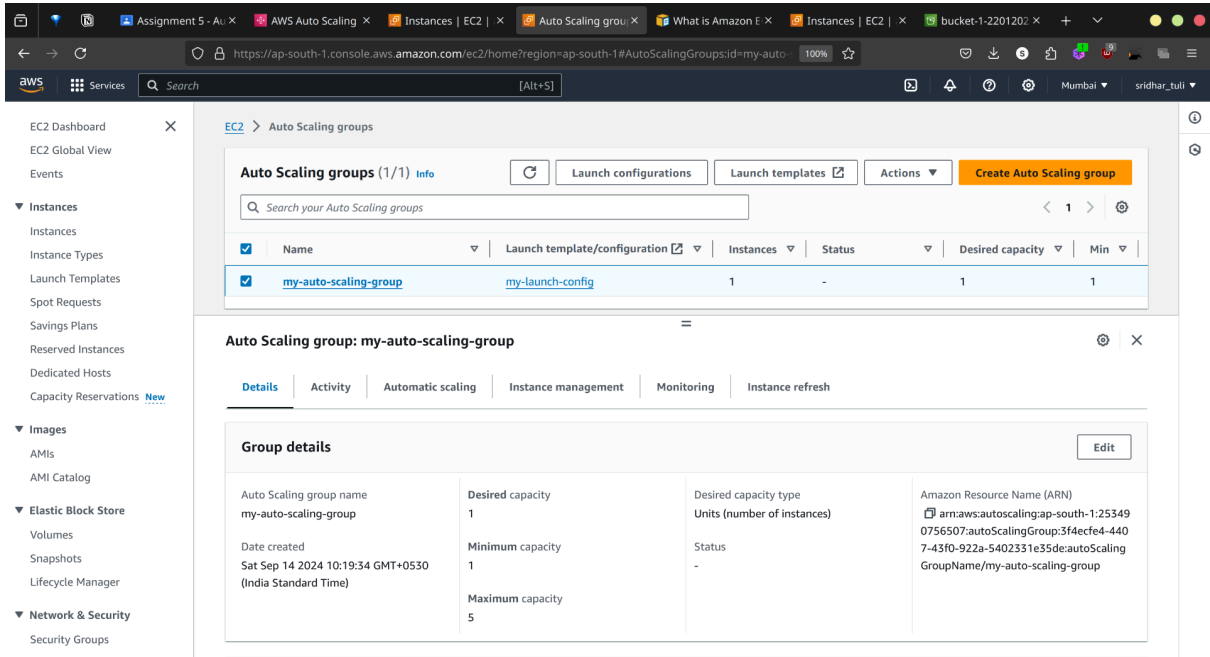
    public_dns = get_instance_public_dns()
    if public_dns:
        website_url = f"http://{public_dns}"
        print(f"Opening the website: {website_url}")
        webbrowser.open(website_url)
        print("Please check your browser to verify if the static website works.")
    else:
        print("Unable to retrieve the public DNS. Please check the AWS console for more information.")
```

Output of the code

```
BotoEnv ~/AWS/lab5 (1m 4.78s)
python boto.py
Using existing security group with ID: sg-083c6a7b961c341d9
Security group created
Existing launch configuration found: my-launch-config
Deleted existing launch configuration: my-launch-config
Launch configuration my-launch-config created.
Launch configuration created
Auto Scaling Group my-auto-scaling-group created.
AutoScaling group created
Scaling policies created
Scale-up CloudWatch alarm created.
Scale-down CloudWatch alarm created.
CloudWatch alarms created
AutoScaling group, policies, and alarms created successfully.
Waiting for instance to be launched...
Opening the website: http://ec2-13-201-46-240.ap-south-1.compute.amazonaws.com
Please check your browser to verify if the static website works.

BotoEnv ~/AWS/lab5
```

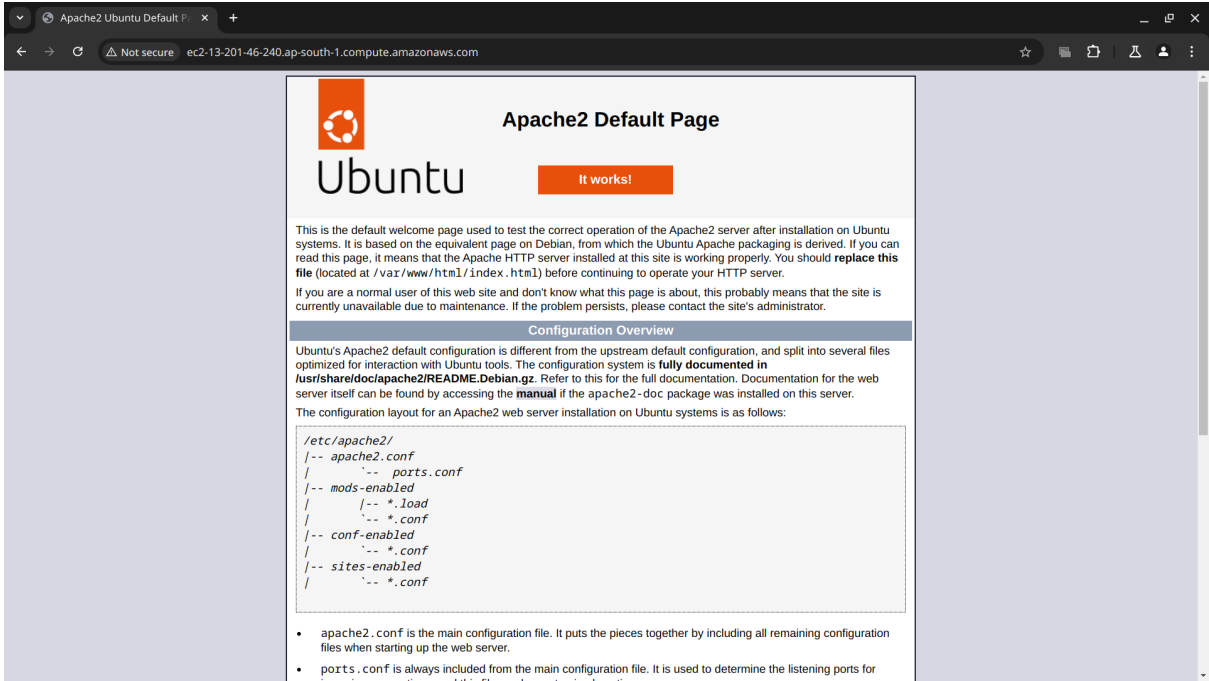
Auto Scaling Groups being created on AWS



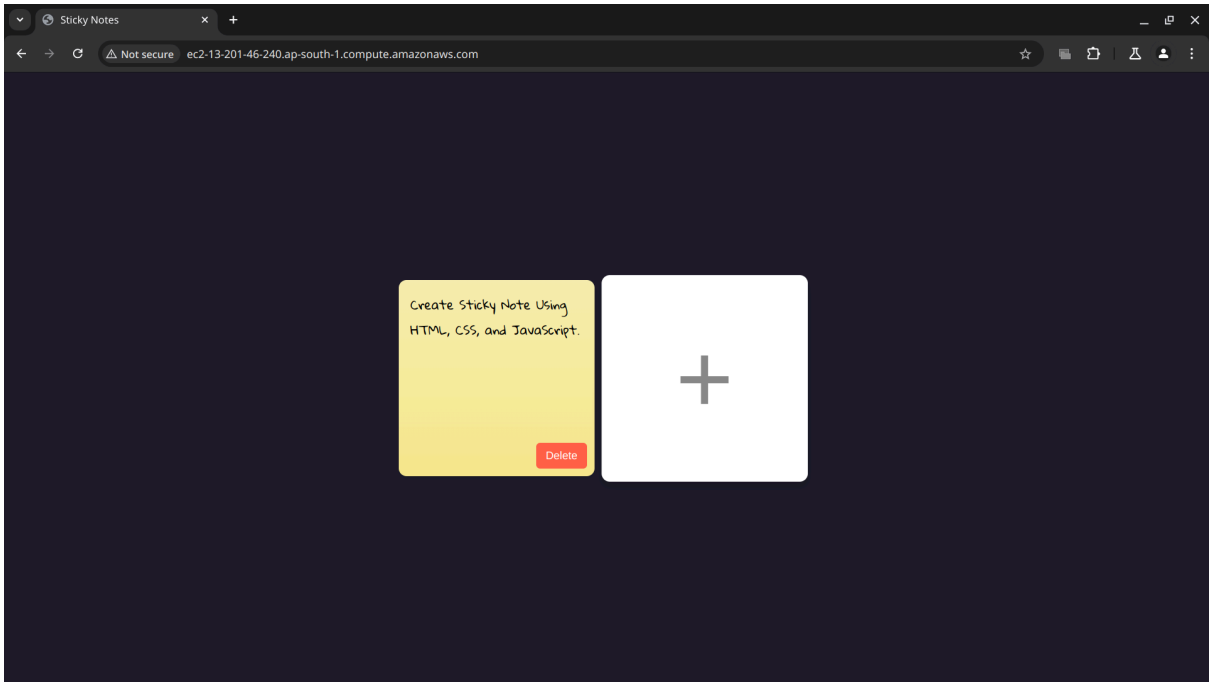
Q. Open the public DNS of the newly launched EC2 instance in a browser and verify if the static website works.

Opening the website

i) Launching of Apache Server



ii) After some time the website will launch



## 2nd Question

1. Go to the Amazon EC2 dashboard. Go to Auto Scaling Groups.
2. Define launch configuration. Create an Auto Scaling Group. Create the Scaling Policies ( for Scale Up and Scale Down).
3. Create Scale Up Alarm and Scale Down Alarm using CloudWatch Alarms.
4. Take necessary screenshots. Delete the Auto Scaling Group and launch configuration after your work is done.

The screenshot shows the AWS Management Console for the 'Auto Scaling groups' page. The left sidebar contains navigation links for EC2 Dashboard, EC2 Global View, Events, Instances, Instance Types, Launch Templates, Spot Requests, Savings Plans, Reserved Instances, Dedicated Hosts, Capacity Reservations, Images, AMIs, AMI Catalog, Elastic Block Store, Volumes, Snapshots, Lifecycle Manager, Network & Security, and Security Groups. The main content area shows the 'Auto Scaling groups (1/1)' list with a table containing one entry: 'my-auto-scaling-group' with launch template 'my-launch-config', 1 instance, and a desired capacity of 1. Below the table, the 'Auto Scaling group: my-auto-scaling-group' details are shown, including group name, desired capacity (1), minimum capacity (1), maximum capacity (5), date created (Sat Sep 14 2024 10:19:34 GMT+0530), and the Amazon Resource Name (ARN).

## Scaling Policies on AWS Site

The screenshot shows the AWS Management Console for the 'Dynamic scaling policies (2)' page. The page displays two scaling policies: 'scale-down' and 'scale-up'. Both policies are of type 'Simple scaling' and are enabled. The 'scale-down' policy is triggered by the 'scale-down-alarm' and takes the action to 'Remove 1 capacity units'. The 'scale-up' policy is triggered by the 'scale-up-alarm' and takes the action to 'Add 1 capacity units'. Both policies have a cooldown of 300 seconds before allowing another scaling activity.

Cloud Watch Alarms

[CloudWatch](#) > Alarms

Alarms (2)

☐ Hide Auto Scaling alarms

Clear selection

Create composite alarm

Actions

Create alarm

Alarm state: Any

Alarm type: Any

Actions status: Any

< 1 >

<input type="checkbox"/>	Name	State	Last state update (UTC)	Conditions	Actions
<input type="checkbox"/>	<a href="#">scale-down-alarm</a>	In alarm	2024-09-14 04:59:38	CPUUtilization < 25 for 2 datapoints within 10 minutes	Actions enabled
<input type="checkbox"/>	<a href="#">scale-up-alarm</a>	OK	2024-09-14 04:50:25	CPUUtilization > 75 for 2 datapoints within 10 minutes	Actions enabled

Deleting the AutoScaling Group

[EC2](#) > Auto Scaling groups

Auto Scaling groups (1/1) [Info](#)

Launch configurations

Launch templates

Actions

Create Auto Scaling group

< 1 >

<input checked="" type="checkbox"/>	Name	Launch template/configuration	Instances	Status	Desired capacity	Min
<input checked="" type="checkbox"/>	<a href="#">my-auto-scaling-group</a>	<a href="#">my-launch-config</a>	1	Deleting	0	0

====END OF FILE====