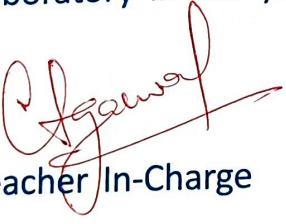


Thadomal Shahani Engineering College
Bandra (W.), Mumbai- 400 050.

© CERTIFICATE ©

Certify that Mr. Atharva Jadhav
of I. T. Department, Semester IV with
Roll No. 44 has completed a course of the necessary
experiments in the subject Advance DevOps under my
supervision in the **Thadomal Shahani Engineering College**
Laboratory in the year 2023 - 2024


Teacher In-Charge

Head of the Department

Date 20/10/2023.

Principal

CONTENTS

| SR. NO. | EXPERIMENTS | DATE | PAGE | TEACHERS SIGN. |
|---------|--|----------|------|---------------------|
| 1. | To study and perform the setup of AWS EC2 service & launch EC2 instance. | 18/7/23 | | |
| 2. | To study and perform the setup of AWS cloud9 service & launch a python program in cloud9 | 25/7/23 | | |
| 3. | To study AWS Codepipeline & deploy web application using code.pipeline. | 9/8/23 | | |
| 4. | To study AWS S3 service & create a bucket hosting Web application. | 1/8/23 | | |
| 5. | To understand Kubernetes Cluster architecture. | 13/10/23 | | |
| 6. | To understand terraform lifecycle and to build, change & destroy AWS infrastructure using Terraform. | 22/8/23 | | Chirwal 20/10/23 |
| 7. | To perform static analysis on python using SonarQube | 29/8/23 | | |
| 8. | To understand continuous monitoring using Nagios. | 12/9/23 | | |
| 9. | To understand AWS lambda function and create a lambda function. | 5/9/23 | | |
| 10. | To create a lambda function using Python for adding data to DynamoDB database. | 5/9/23 | | |
| 11. | Written Assignment 1 | 1/8/23 | | |
| 12. | Written Assignment 2 | 13/10/23 | | |
| | | | | |
| | | | | |
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| | | | | |

Lab Assignment -01

Aim- To make a EC2 Machine in AWS

THEORY-

Amazon Elastic Compute Cloud (Amazon EC2) is a web service that provides secure, resizable compute capacity in the cloud. It is designed to make web-scale cloud computing easier for developers.

STEPS-

LOGIN TO AWS ACCOUNT,

THEN SEARCH EC2.

The screenshot shows the AWS Management Console homepage. On the left, there's a sidebar with 'AWS services' (Recently visited services: EC2, Billing; All services), 'Build a solution' (Launch a virtual machine, Build a web app, Build using virtual servers), and navigation links like EC2 Dashboard, Events, Tags, Limits, Instances, Images, and AMIs. The main content area has a header 'AWS Management Console'. It features a 'Stay connected to your AWS resources on-the-go' section about the AWS Console Mobile App, an 'Explore AWS' section with 'AWS Certification' and 'Amazon Lookout for Metrics', and a central 'Resources' section showing usage statistics for various Amazon EC2 resources in the Asia Pacific (Mumbai) Region. A callout box in the resources section encourages using the AWS Launch Wizard for Microsoft SQL Server.

NOW CLICK ON LAUNCH / CREATE NEW INSTANCES.

The screenshot shows the 'Instances' page in the AWS EC2 console. The left sidebar includes 'New EC2 Experience', 'EC2 Dashboard', 'Events', 'Tags', 'Limits', 'Instances' (selected), 'Images', and 'AMIs'. The main content area displays a summary of resources (0 instances running, 0 Dedicated Hosts, etc.) and a callout for using the AWS Launch Wizard for Microsoft SQL Server. Below this are tabs for 'Launch instance' and 'Service health'. On the right, there's an 'Account attributes' section listing supported platforms (VPC, Default VPC vpc-eb864d80), settings (EBS encryption, Zones, Default credit specification, Console experiments), and an 'Explore AWS' section with a performance comparison for T4g instances.

Choose any machine you want to create here I am creating UBUNTU(free tier).

Cancel and Exit

Step 1: Choose an Amazon Machine Image (AMI)

An AMI is a template that contains the software configuration (operating system, application server, and applications) required to launch your instance. You can select an AMI provided by AWS, our user community, or the AWS Marketplace; or you can select one of your own AMIs.

Click on T2 micro (free tier one)

Step 2: Choose an Instance Type

Currently selected: t2.micro (- ECUs, 1 vCPUs, 2.5 GHz, 1 GiB memory, EBS only)

| | Family | Type | vCPUs | Memory (GiB) | Instance Storage (GB) | EBS-Optimized Available | Network Performance | IPv6 Support |
|-------------------------------------|--------|------------|-------|--------------|-----------------------|-------------------------|---------------------|--------------|
| <input type="checkbox"/> | t2 | t2.nano | 1 | 0.5 | EBS only | - | Low to Moderate | Yes |
| <input checked="" type="checkbox"/> | t2 | t2.micro | 1 | 1 | EBS only | - | Low to Moderate | Yes |
| <input type="checkbox"/> | t2 | t2.small | 1 | 2 | EBS only | - | Low to Moderate | Yes |
| <input type="checkbox"/> | t2 | t2.medium | 2 | 4 | EBS only | - | Low to Moderate | Yes |
| <input type="checkbox"/> | t2 | t2.large | 2 | 8 | EBS only | - | Low to Moderate | Yes |
| <input type="checkbox"/> | t2 | t2.xlarge | 4 | 16 | EBS only | - | Moderate | Yes |
| <input type="checkbox"/> | t2 | t2.2xlarge | 8 | 32 | EBS only | - | Moderate | Yes |
| <input type="checkbox"/> | t3 | t3.nano | 2 | 0.5 | EBS only | Yes | Up to 5 Gigabit | Yes |
| <input type="checkbox"/> | t3 | t3.micro | 2 | 1 | EBS only | Yes | Up to 5 Gigabit | Yes |
| <input type="checkbox"/> | t3 | t3.small | 2 | 2 | EBS only | Yes | Up to 5 Gigabit | Yes |
| <input type="checkbox"/> | t3 | t3.medium | 2 | 4 | EBS only | Yes | Up to 5 Gigabit | Yes |

Cancel

Previous

Review and Launch

Next: Configure Instance Details

Click on NEXT, then Again Click Next.

THEN CREATE A KEY PAIR BY ANY NAME AND DOWNLOAD IT. THEN CLICK NEXT

Now add security group ALL TRAFFIC ,

PROTOCOL – ALL,

SOURCE- ANYWHERE.

Step 6: Configure Security Group

A security group is a set of firewall rules that control the traffic for your instance. On this page, you can add rules to allow specific traffic to reach your instance. For example, if you want to set up a web server and allow Internet traffic to reach your instance, add rules that allow unrestricted access to the HTTP and HTTPS ports. You can create a new security group or select from an existing one below. Learn more about Amazon EC2 security groups.

Assign a security group: Create a new security group

Select an existing security group

Security group name:

Description:

| Type | Protocol | Port Range | Source | Description |
|-------------|----------|------------|---|---|
| SSH | TCP | 22 | Custom <input type="button" value="..."/> 0.0.0/0 | e.g. SSH for Admin Desktop <input type="button" value="X"/> |
| All traffic | All | 0 - 65535 | Anywhere <input type="button" value="..."/> 0.0.0.0/0, ::/0 | e.g. SSH for Admin Desktop <input type="button" value="X"/> |

Add Rule



Rules with source of 0.0.0.0/0 allow all IP addresses to access your instance. We recommend setting security group rules to allow access from known IP addresses only.

[Cancel](#) [Previous](#) [Review and Launch](#)

[Feedback](#) English (US) ▾

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NOW WAIT TILL THE STATUS CHECK IS 2/2 and Instance is running.

Once Check is complete click on launch instances.

| Name | Instance ID | Instance state | Instance type | Status check | Alarm status | Availability Zone | Public IPv4 DNS |
|---------------------|-------------|----------------|---------------|--------------|--------------|-------------------|-----------------|
| i-0308f5da45b1568d3 | Running | t2.micro | Initializing | No alarms | ap-south-1b | ec2-65-2-80-250 | |

FOLLOW SOME BASIC LINUX COMMANDS AS SHOWN BELOW-

NAME
sudo_root - How to run administrative commands

SYNOPSIS
sudo command
sudo -i

INTRODUCTION
By default, the password for the user "root" (the system administrator) is locked. This means you cannot login as root or use su. Instead, the installer will set up sudo to allow the user that is created during install to run all administrative commands.

This means that in the terminal you can use sudo for commands that require root privileges. All programs in the menu will use a graphical sudo to prompt for a password. When sudo asks for a password, it needs your password, this means that a root password is not needed.

To run a command which requires root privileges in a terminal, simply prepend sudo in front of it. To get an interactive root shell, use sudo -i.

ALLOWING OTHER USERS TO RUN SUDO
By default, only the user who installed the system is permitted to run sudo. To add more administrators, i. e. users who can run sudo, you have to add these users to the group 'sudo' by doing one of the following steps:

- * In a shell, do

```
Manual page sudo_root(8) line 1 (press h for help or q to quit)
```

i-0308f5da45b1368d3

Public IP: 65.2.80.250 Private IP: 172.31.8.68

Domain Name: TSEC.EDU

Registrant:
Thadomal Shahani Engineering College
P.G Kher Marg, Bandra(W)
Mumbai, Maharashtra 400 050
India

Administrative Contact:
Dr. Gopakumaran Thampi
Thadomal Shahani Engineering College
Nari Gurshahani Marg, Bandra(W)
Mumbai, 400050
India
+91.2226495808
gtthampi@yahoo.com

Technical Contact:
Chetan Agarwal
Thadomal Shahani Engineering College
Nari Gurshahani Marg, Bandra(W)
Mumbai, 400050
India
+91.2226495808
chetan.agarwal@thadomal.org

Name Servers:

Lab Outcome:

LO1 is mapped.

LO1: To Understand the fundamental of Cloud Computing and fully proficient with Cloud based DevOps Solution deployment options to meet your business requirements.

CONCLUTION – HENCE LEARNED AND IMPLIMENTED THE STEPS TO CREATE AN EC2 MACHINE.

LAB ASSGINMENT -02

AIM- To create a Cloud9 Environment.

Theory-

Cloud9 IDE is an Online IDE, published as open source from version 2.0, until version 3.0. It supports multiple programming languages, including C, C++, PHP, Ruby, Perl, Python, JavaScript with Node.js, and Go. It is written almost entirely in JavaScript, and uses Node.js on the back-end.

STEPS-

LOG IN TO YOUR AWS ACCOUNT,

SEARCH FOR CLOUD 9 IN THE SEARCH BAR



CLICK ON CREATE ENVIRONMNET,

NAME THE ENVIRONMNET

We do not recommend using your AWS root account to create or work with environments. Use an IAM user instead. This is an AWS security best practice. For more information, see [Setting Up to Use AWS Cloud9](#).

AWS Cloud9 > Environments > Create environment

Step 1 Name environment

Step 2 Configure settings

Step 3 Review

Name environment

Environment name and description

Name: Cloud9DE
The name needs to be unique per user. You can update it at any time in your environment settings.

Description - Optional:
This will appear on your environment's card in your dashboard. You can update it at any time in your environment settings.
This is for experimental purpose
Limit: 200 characters

Cancel Next step

Feedback English (US) ▾ © 2006 - 2021, Amazon Internet Services Private Ltd. or its affiliates. All rights reserved. Privacy Policy Terms of Use Cookie preferences

Now click on next step.

AWS root account login detected

We do not recommend using your AWS root account to create or work with environments. Use an IAM user instead. This is an AWS security best practice. For more information, see [Setting Up to Use AWS Cloud9](#).

AWS Cloud9 > Environments > Create environment

Step 1 Name environment

Step 2 Configure settings

Step 3 Review

Configure settings

Environment settings

Environment type: **Info**
Run your environment in a new EC2 instance or an existing server. With EC2 instances, you can connect directly through Secure Shell (SSH) or connect via AWS Systems Manager (without opening inbound ports).

Create a new EC2 instance for environment (direct access)
Launch a new instance in this region that your environment can access directly via SSH.

Create a new no-ingress EC2 instance for environment (access via Systems Manager)
Launch a new instance in this region that your environment can access through Systems Manager.

Create and run in remote server (SSH connection)
Configure the secure connection to the remote server for your environment.

Instance type:
 t2.micro (1 GiB RAM + 1 vCPU)
Free tier eligible. Ideal for educational users and exploration.

t3.small (2 GiB RAM + 2 vCPU)
Recommended for small-sized web projects.

m5.large (8 GiB RAM + 2 vCPU)
Recommended for production and general purpose development.

Other instance type
Select an instance type.

Platform:
 Amazon Linux 2 (recommended)

Cost-saving setting:
Choose a predetermined amount of time to auto hibernate your environment and prevent unnecessary charges. We recommend a hibernation setting of half an hour of inactivity to maximize savings.
After 30 minutes (default)

IAM role:
AWS Cloud9 creates a service-linked role for you. This allows AWS Cloud9 to call other AWS services on your behalf. You can delete the role from the AWS IAM console once you no longer have any AWS Cloud9 environments. [Learn more](#)

AWSServiceRoleForAWSCloud9

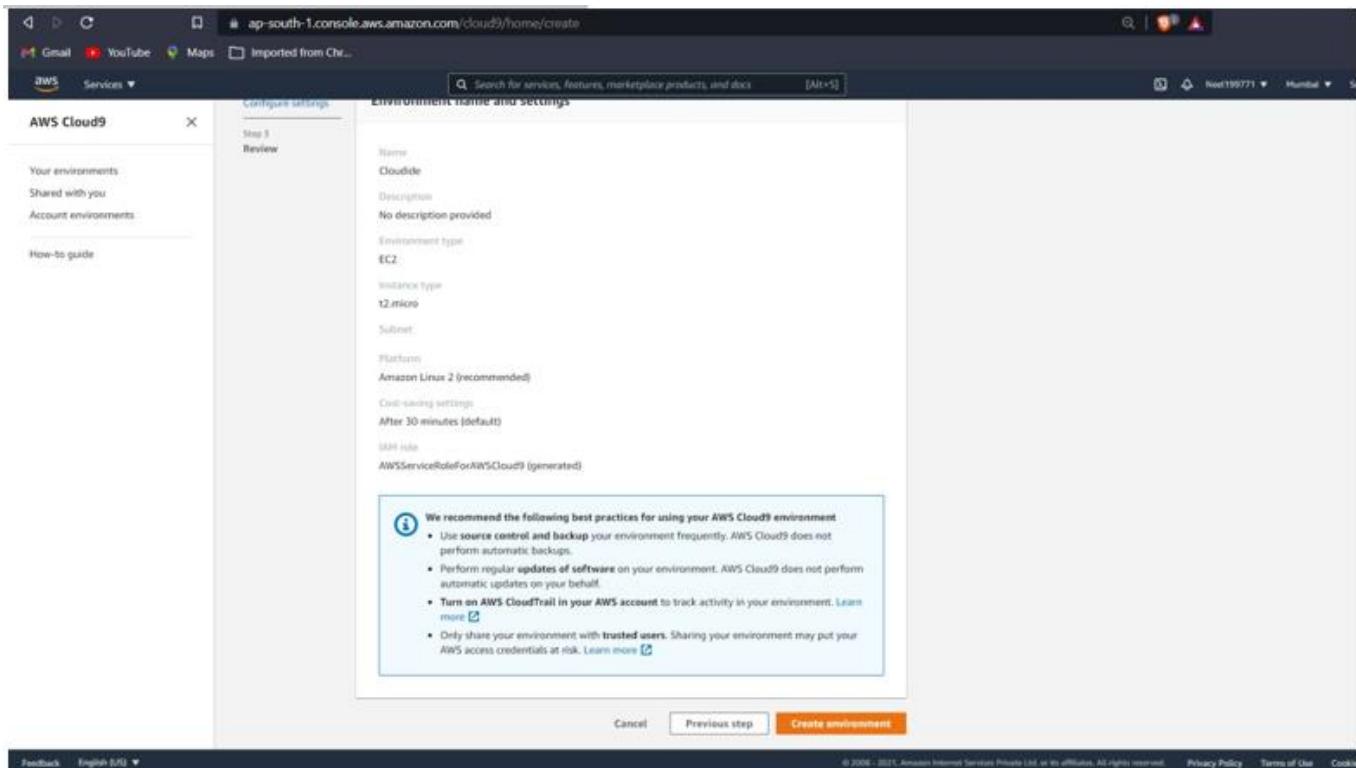
▶ Network settings (advanced)

No tags associated with the resource.

Add new tag
You can add 50 more tags.

Cancel Previous step Next step

Again, click on Next Step,
Now click on Create Environment.



Now select any coding language and perform any operation via a code. Shown below

The screenshot shows the AWS Cloud9 IDE interface. On the left, the file tree shows a directory structure under 'CloudIDE - home' containing Java files like 'Add.java', 'AddPrac0.class', 'AddPrac0.java', 'AddPrac5.java', 'BinaryOperators.java', 'BinarySearch.class', 'BinarySearch.java', 'BubbleSort.class', 'BubbleSort.java', 'frame1.class', 'Nw.c', 'READEME.md', and 'Sum1.py'. The main editor window displays a C program named 'Nw.c' with the following code:

```
#include<stdio.h>
int main()
{
    int a, b, sum;
    printf("Enter two no: ");
    scanf("%d %d", &a, &b);
    sum = a + b;
    printf("Sum : %d", sum);
    return(0);
}
```

The terminal window at the bottom shows the execution of the program:

```
root@ip-172-3: ~ # ./Nw.c
Enter two no: 5
6
Sum : 11
```

Conclusion – Hence learned and implemented steps to Create an Cloud9 environment.

ADVANCE DEVOPS LAB -3

AIM- To study AWS S3 service and create a bucket for hosing static web application.

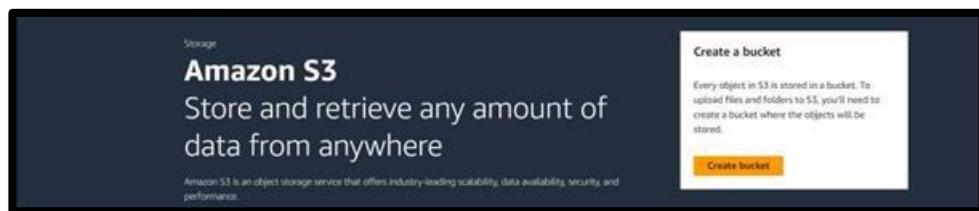
THEORY-

AWS Simple Storage Service (S3) from the aforementioned list, S3, is the object storage service provided by AWS. It is probably the most commonly used, go-to storage service for AWS users given the features like extremely high availability, security, and simple connection to other AWS Services.

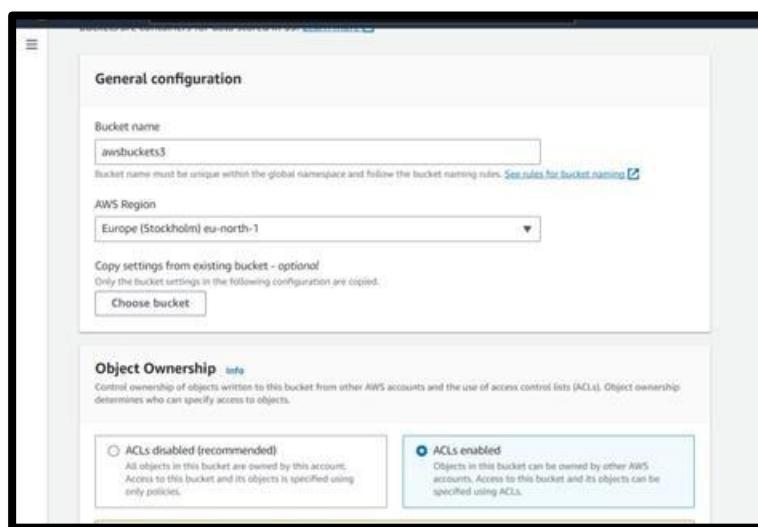
An Amazon S3 bucket can be set up to operate similarly to a website. This section illustrates how to host a website using Amazon S3. There are mainly 7 steps to hosting a static website using Amazon Web Service(AWS) S3.

Step 1: Creating a Bucket

1. First, we have to launch our S3 instance. Follow these steps for creating a Bucket
2. Open the Amazon S3 console by logging into the AWS Management Console at <https://console.aws.amazon.com/s3/>.
3. Click on Create Bucket.



4. Choose Bucket Name – Bucket Name Should be Unique
5. Object Ownership – Enable for making Public, Otherwise disable

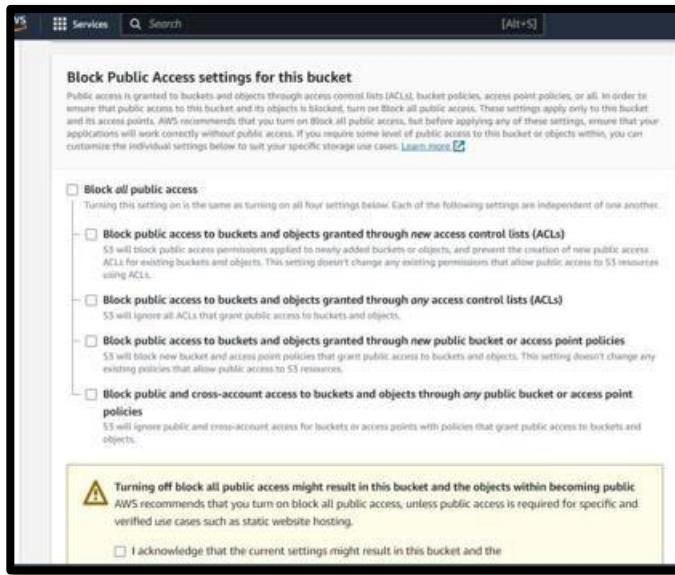


Name : Atharva Jadhav

Roll No. : 2105044

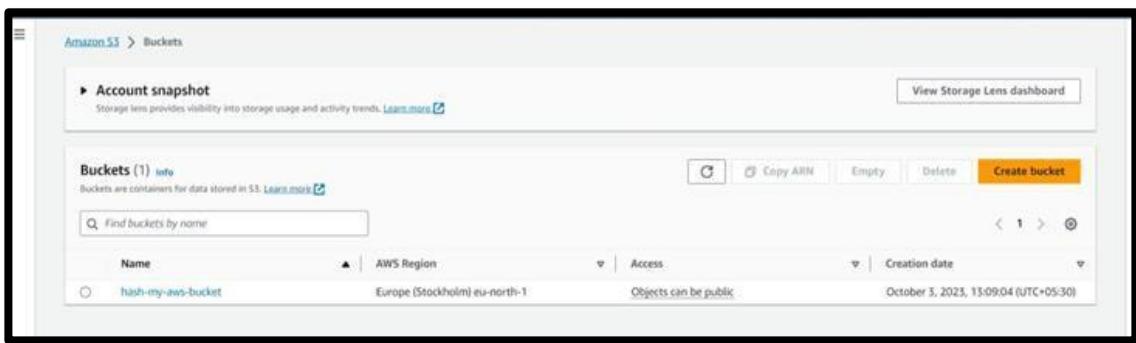
Step 2: Block Public Access settings for the bucket

1. Uncheck (Block all public access) for the public, otherwise set default. If you uncheck (Block all public keys).



2. Now click on create bucket

3. Bucket is created



Step 3: Now upload code files

Select Bucket and Click your Bucket Name.

Now, click on upload (then click add File/folder) and select your HTML code file from your PC/Laptop.

Name : Atharva Jadhav

Roll No. : 2105044

The screenshot shows the AWS S3 Transfer Manager interface after a successful upload. At the top, a green banner indicates "Upload succeeded". Below it, a summary table shows the destination bucket "s3://hash-my-aws-bucket" and two files uploaded: "aws.png" (image/png, 3.1 kB) and "main.html" (text/html, 359.0 B), both with a status of "Succeeded". The "Files and folders" tab is selected, displaying a table of the uploaded files.

| Files and folders (2 Total, 3.5 KB) | | | | |
|-------------------------------------|--------|-----------|---------|-----------|
| Name | Folder | Type | Size | Status |
| aws.png | - | image/png | 3.1 kB | Succeeded |
| main.html | - | text/html | 359.0 B | Succeeded |

Step 4: Once the Files are uploaded successfully, click on Permissions and now follow this Process –

- Block public access
- Object Ownership
- Make public Object

The screenshot shows the AWS S3 Bucket Objects page for "hash-my-aws-bucket". It lists two objects: "aws.png" (png, 3.1 kB, Standard storage) and "main.html" (html, 359.0 B, Standard storage). A context menu is open over the "aws.png" file, with the "Actions" section expanded. The "Actions" menu includes options like "Copy", "Move", "Restore", "Edit actions", "Rename object", "Edit storage class", "Edit server-side encryption", "Edit metadata", "Edit tags", and "Make public using ACL".

Step 6: Copy your Object URL

Now, click on your HTML File Object Name.

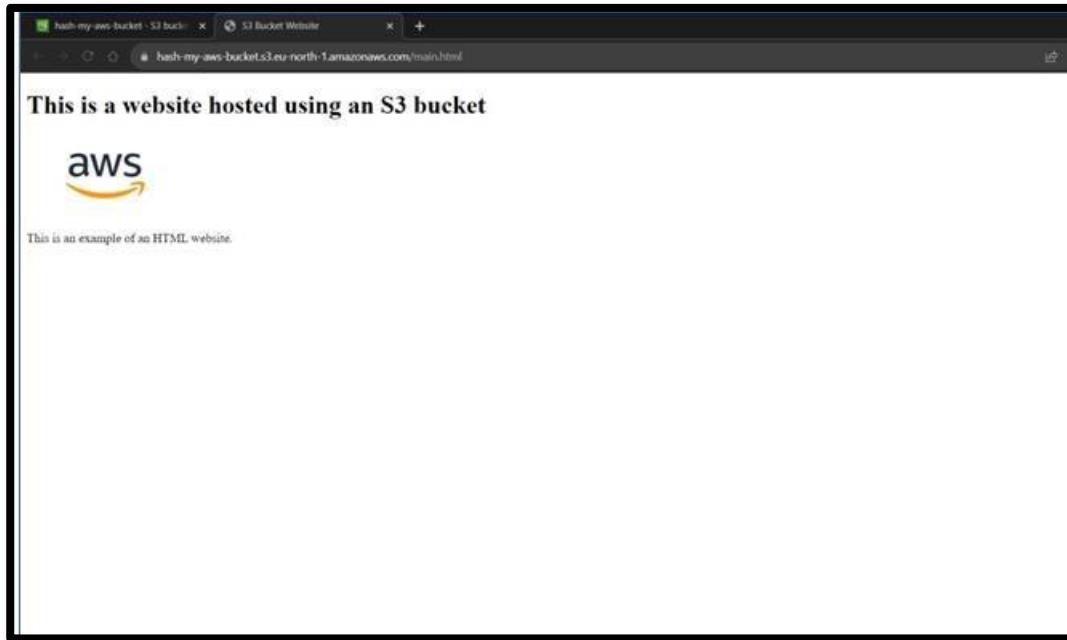
Copy the Object URL.

Name : Atharva Jadhav

Roll No. : 2105044

Step 7: Check out your Website!

Directly Paste this URL into the Other Tab or your other System.



CONCLUSION:- This experiment demonstrated how to utilize AWS S3, a powerful and scalable cloud storage solution, to host a static web application. S3's ability to serve static content with low latency and high reliability makes it a suitable choice for hosting static websites. By completing this experiment, we gained practical insights into leveraging cloud services for web hosting, which is vital for modern web development and deployment. AWS S3 offers a cost-effective and efficient solution for hosting various types of web applications, contributing to the agility and scalability of web development projects.

ASSIGNMENT 4

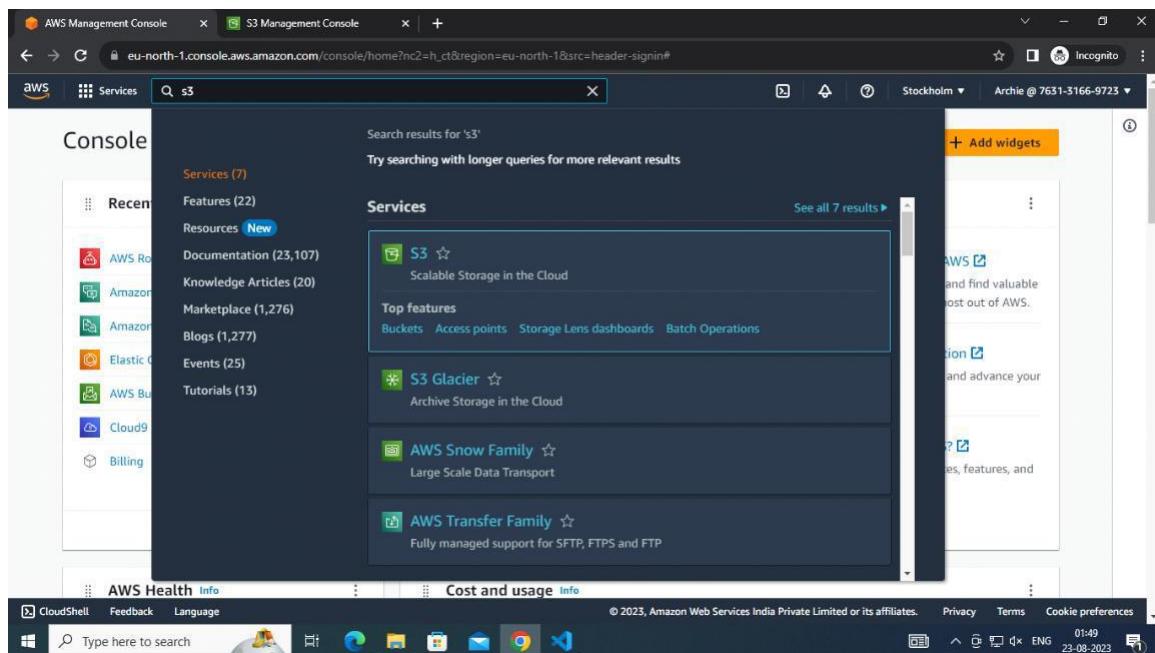
AIM: To build your application using AWS Code Build and Deploy on S3 using AWS Code Pipeline

THEORY:

Amazon Simple Storage Service (Amazon S3) is an object storage service offering industry-leading scalability, data availability, security, and performance. Customers of all sizes and industries can store and protect any amount of data for virtually any use case, such as data lakes, cloud-native applications, and mobile apps. With cost-effective storage classes and easy-to-use management features, you can optimize costs, organize data, and configure fine-tuned access controls to meet specific business, organizational, and compliance requirements.

STEPS:

1. Log in as IAM User. Search for S3 in console



2. Create a new bucket by clicking Create Bucket Buton

The screenshot shows the AWS S3 Management Console homepage. The main heading is "Amazon S3" with the subtext "Store and retrieve any amount of data from anywhere". Below this, a brief description states: "Amazon S3 is an object storage service that offers industry-leading scalability, data availability, security, and performance." To the right, there's a "Create a bucket" call-to-action button and a "Pricing" section. At the bottom, there's a "How it works" section featuring a video thumbnail titled "Introduction to Amazon S3" and a "Copy link" button. The browser interface includes standard navigation bars like CloudShell, Feedback, Language, and a search bar.

4. Give the bucket a name and click on Create Bucket to make a new bucket.

The screenshot shows the "Create bucket" configuration page. The "General configuration" section is active, showing fields for "Bucket name" (set to "Archie-bucket") and "AWS Region" (set to "Europe (Stockholm) eu-north-1"). There's also a "Choose bucket" button for copying settings from existing buckets. Below this, the "Object Ownership" section is visible, with a note about controlling ownership of objects written to the bucket. The browser interface at the bottom includes CloudShell, Feedback, Language, and a search bar.

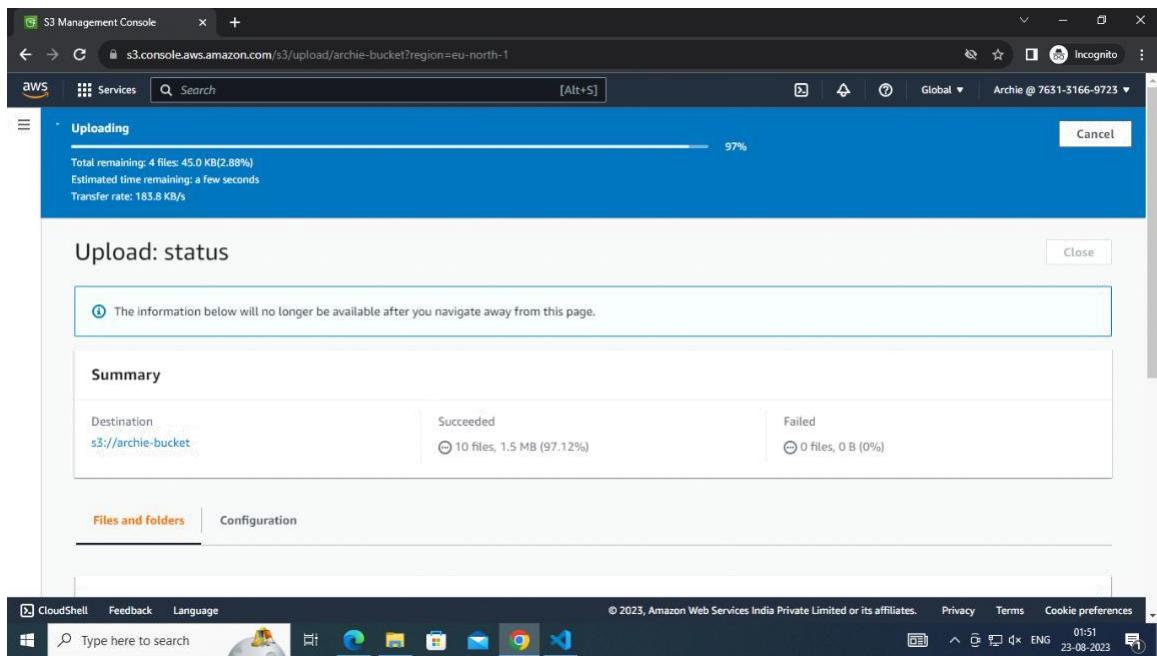
The screenshot shows the AWS S3 Management Console. At the top, a green banner displays the message "Successfully created bucket 'archie-bucket'". Below this, the "Buckets" section is visible, showing one bucket named "archie-bucket" with the following details:

| Name | AWS Region | Access | Creation date |
|---------------|-------------------------------|-------------------------------|---------------------------------------|
| archie-bucket | Europe (Stockholm) eu-north-1 | Bucket and objects not public | August 23, 2023, 01:50:23 (UTC-07:00) |

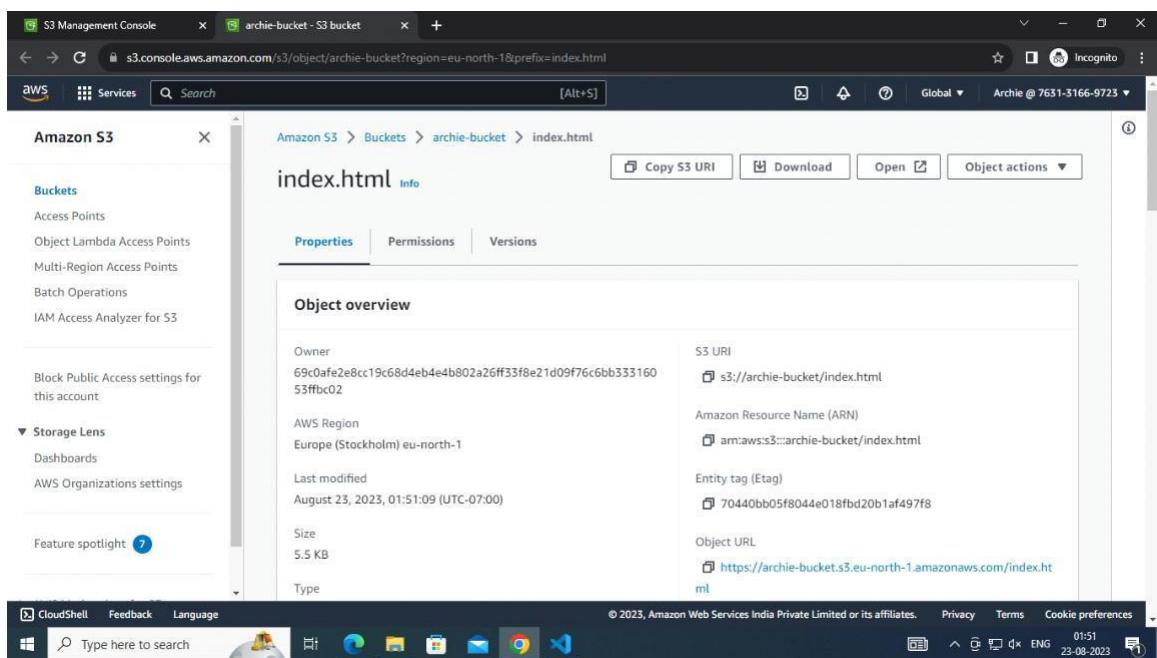
The browser's address bar shows the URL `s3.console.aws.amazon.com/s3/buckets?region=eu-north-1`. The operating system taskbar at the bottom includes icons for CloudShell, Feedback, Language, Type here to search, and several pinned applications.

5. Click on Upload button to add files and folders of your projects.

The screenshot shows the "Objects" tab of the "archie-bucket" page in the AWS S3 Management Console. The "Objects (0)" section indicates there are no objects in the bucket. A prominent orange "Upload" button is located at the bottom of the list table. The browser's address bar shows the URL `s3.console.aws.amazon.com/s3/buckets/archie-bucket?region=eu-north-1&tab=objects`. The operating system taskbar at the bottom includes icons for CloudShell, Feedback, Language, Type here to search, and several pinned applications.



6. Go to the index.html folder and copy the Object URL. Copy this URL to another web page, it will show error.



7. Now we need to enable permissions. Click on Premission tab.

The screenshot shows the AWS S3 console with three tabs open: 'archie-bucket - S3 bucket', 'archie-bucket - S3 bucket', and 'archie-bucket.s3.eu-north-1.amazonaws.com'. The third tab displays the contents of the 'archie-bucket' with 3 objects: 'images/' (Folder), 'index.html' (html), and 'style.css' (css). A green banner at the top indicates 'Upload succeeded'. The navigation bar includes 'Objects', 'Properties', 'Permissions', 'Metrics', 'Management', and 'Access Points'. Below the table, there are standard file operations like Copy S3 URI, Copy URL, Download, Open, Delete, Actions, Create folder, and Upload.

8. Change the public access permission.

The screenshot shows the AWS S3 console with the 'Permissions' tab selected. Under 'Permissions overview', it states 'Bucket and objects not public'. In the 'Block public access (bucket settings)' section, it says 'Block all public access' is 'On'. There is an 'Edit' button available. The navigation bar includes 'Objects', 'Properties', 'Permissions', 'Metrics', 'Management', and 'Access Points'. The status bar at the bottom shows the date and time as '23-08-2023 01:52'.

Block public access (bucket settings)

Public access is granted to buckets and objects through access control lists (ACLs), bucket policies, access point policies, or all. In order to ensure that public access to all your S3 buckets and objects is blocked, turn on Block all public access. These settings apply only to this bucket and its access points. AWS recommends that you turn on Block all public access, but before applying any of these settings, ensure that your applications will work correctly without public access. If you require some level of public access to your buckets or objects, within, you can customize the individual settings below to suit your specific storage use cases. [Learn more](#)

Block all public access

Turning this setting on is the same as turning on all four settings below. Each of the following settings are independent of one another.

- Block public access to buckets and objects granted through new access control lists (ACLs)**
S3 will block public access permissions applied to newly added buckets or objects, and prevent the creation of new public access ACLs for existing buckets and objects. This setting doesn't change any existing permissions that allow public access to S3 resources using ACLs.
- Block public access to buckets and objects granted through any access control lists (ACLs)**
S3 will ignore all ACLs that grant public access to buckets and objects.
- Block public access to buckets and objects granted through new public bucket or access point policies**
S3 will block new bucket and access point policies that grant public access to buckets and objects. This setting doesn't change any existing policies that allow public access to S3 resources.
- Block public and cross-account access to buckets and objects through any public bucket or access point policies**
S3 will ignore public and cross-account access for buckets or access points with policies that grant public access to buckets and objects.

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9. Go to the Object Ownership and Enable the ACLs

Successfully edited Block Public Access settings for this bucket.

Object Ownership [Info](#)

Control ownership of objects written to this bucket from other AWS accounts and the use of access control lists (ACLs). Object ownership determines who can specify access to objects.

Object Ownership
Bucket owner enforced
ACLs are disabled. All objects in this bucket are owned by this account. Access to this bucket and its objects is specified using only policies.

Edit

Access control list (ACL)

Grant basic read/write permissions to other AWS accounts. [Learn more](#)

Info This bucket has the bucket owner enforced setting applied for Object Ownership
When bucket owner enforced is applied, use bucket policies to control access. [Learn more](#)

Grantee Objects Bucket ACL

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Object Ownership

Control ownership of objects written to this bucket from other AWS accounts and the use of access control lists (ACLs). Object ownership determines who can specify access to objects.

ACLs disabled (recommended)
All objects in this bucket are owned by this account. Access to this bucket and its objects is specified using only policies.

ACLs enabled
Objects in this bucket can be owned by other AWS accounts. Access to this bucket and its objects can be specified using ACLs.

⚠ We recommend disabling ACLs, unless you need to control access for each object individually or to have the object writer own the data they upload. Using a bucket policy instead of ACLs to share data with users outside of your account simplifies permissions management and auditing.

⚠ Enabling ACLs turns off the bucket owner enforced setting for Object Ownership
Once the bucket owner enforced setting is turned off, access control lists (ACLs) and their associated permissions are restored. Access to objects that you do not own will be based on ACLs and not the bucket policy.

I acknowledge that ACLs will be restored.

10. Finally select all the files and folders and click on Actions and click on 'Make public using ACL'.

Objects (3)

Objects are the fundamental entities stored in Amazon S3. You can use [Amazon S3 inventory](#) to get a list of all objects in your bucket. For others to access your objects, you'll need to explicitly grant them permissions. [Learn more](#)

Copy S3 URI **Copy URL** **Download** **Open** **Delete** **Actions** **Create folder** **Upload**

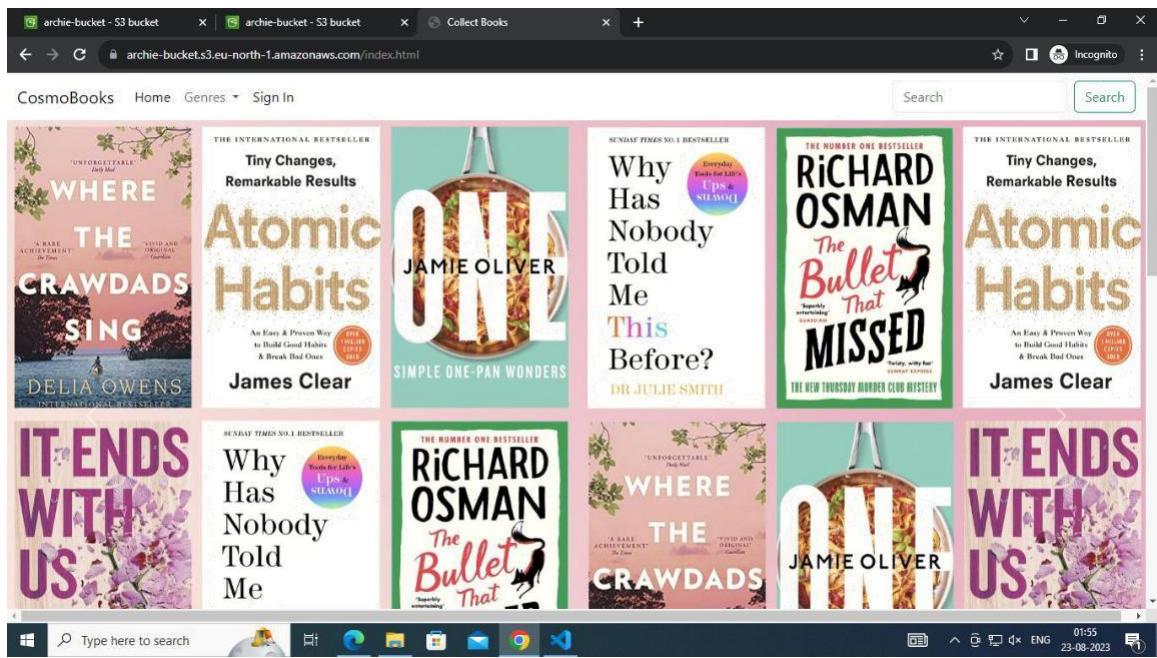
Find objects by prefix

| <input checked="" type="checkbox"/> | Name | Type | Last modified | Size | Storage class |
|-------------------------------------|------------|--------|---------------------------------------|---------|---------------|
| <input checked="" type="checkbox"/> | images/ | Folder | - | - | - |
| <input checked="" type="checkbox"/> | index.html | html | August 23, 2023, 01:51:09 (UTC-07:00) | 5.5 KB | Standard |
| <input checked="" type="checkbox"/> | style.css | css | August 23, 2023, 01:51:09 (UTC-07:00) | 904.0 B | Standard |

The screenshot shows the AWS S3 console interface. The top navigation bar includes tabs for 'Objects', 'Properties', 'Permissions', 'Metrics', 'Management', and 'Access Points'. Below this, a table lists three objects: 'images/' (Folder), 'index.html' (html), and 'style.css' (css). The 'index.html' row has a context menu open, with the 'Edit actions' section expanded. Within this section, the 'Make public using ACL' option is highlighted with a blue border. The bottom of the screen shows a Windows taskbar with various pinned icons.

11. Finally click on the 'Make Public' button and reload the web page.

The screenshot shows the 'Make public' dialog box. It contains a warning message: "The make public action enables public read access in the object access control list (ACL) settings. Learn more." Below this is a section titled 'Specified objects' which lists the same three files as the main S3 view. At the bottom right of the dialog is a prominent orange 'Make public' button.



CONCLUSION:

In this assignment, we learnt how to build our application using AWS Code Build and Deploy on S3 using AWS Code Pipeline.

Roll No:- 44
Batch:- T13
Name :-Atharva Jadhav

ADVANCE DEVOPS ASSIGNMENT-5

AIM: To understand the Kubernetes Cluster Architecture.

LO MAPPED: LO1 , LO3

THEORY:

Q.1 What are the various Kubernetes services running on nodes? Describe the role of each service.

In a Kubernetes cluster, there are several essential services that run on nodes. These services are critical for the proper functioning of the cluster. Below, I'll describe the role of each service in detail:

kubelet:

The kubelet is responsible for managing containers on a node. It ensures that the containers in a Pod are running and healthy. It communicates with the control plane to receive Pod specifications and takes actions to make sure the containers match the desired state. For example, if a Pod specification indicates that it should run three containers, the kubelet ensures that those containers are up and running. If a container fails, the kubelet restarts it.

Example: Let's say you have a Pod with three containers, and one of them crashes due to a software issue. The kubelet will detect the failure and restart the failed container to maintain the desired state.

kube-proxy:

Kube-proxy is responsible for managing network connectivity to and from Pods. It maintains network rules on the host to enable communication between Pods and external networks. It sets up routes, handles load balancing, and ensures that network traffic is properly directed to the correct Pod.

Example: If you have a service in your cluster that needs to load balance traffic to a set of Pods, kube-proxy manages this load balancing by configuring network rules and routes, directing traffic to the appropriate Pods.

Container Runtime:

The container runtime is responsible for running containers within Pods. Kubernetes supports various container runtimes, such as Docker, containerd, and CRI-O. These runtimes are responsible for pulling container images, creating containers, and managing their lifecycle.

Example: If you define a Pod that runs a Docker container with a specific image, the container runtime (e.g., Docker) pulls the image from a container registry and runs the container as specified.

cAdvisor (Container Advisor): cAdvisor is responsible for collecting and exposing resource usage and performance data for containers. It provides valuable information about CPU, memory, network, and disk usage of running containers.

Example: You can use cAdvisor to monitor the resource consumption of your containers. For instance, it can help you identify a container that is consuming an unusually high amount of CPU or memory, indicating a potential performance issue.

Node Problem Detector (Optional):

The Node Problem Detector is responsible for detecting and reporting hardware and system failures on the node. It helps in identifying and isolating issues with nodes, such as hardware errors, kernel panics, or out-of-memory conditions.

Example: If a node experiences a hardware issue, such as a failing disk drive, the Node Problem Detector can detect this problem and report it, allowing administrators to take action and potentially drain the node to prevent further issues.

Device Plugins (Optional):

Device plugins are used to expose and manage specialized hardware resources on the node, such as GPUs, FPGAs, or hardware accelerators. They enable Pods to use these resources when required.

Example: If you have GPUs on your nodes and want to run machine learning workloads that require GPU acceleration, you can use a GPU device plugin to expose these GPUs to your Pods. Pods that need GPU resources can request them in their specifications.

OS Services (e.g., SSH, NTP):

These services, including SSH for remote access and NTP for time synchronization, are essential for maintaining the health and reliability of the node. SSH provides administrative access for troubleshooting and maintenance, while NTP ensures the node's clock is synchronized with the cluster, preventing time-related issues.

Example: You can use SSH to log in to a node for troubleshooting or updates. NTP ensures that all nodes in the cluster have synchronized clocks, which is crucial for maintaining consistency in distributed systems.

Kubelet Container:

The kubelet itself runs in its own container on the node. It is responsible for interacting with the container runtime, managing container logs, and performing garbage collection to reclaim disk space from unused container images.

Example: If you examine a running node, you'll find the kubelet running in its own container. It manages container-related tasks on the node, such as cleaning up old container images to free up storage space.

These roles collectively ensure the smooth operation of a Kubernetes node and the containers within it, making it possible to run and manage containerized applications in a distributed environment.

Q.2 What is Pod Disruption Budget (PDB)?

A **Pod Disruption Budget (PDB)** is a Kubernetes resource that allows you to control the disruption or eviction of Pods during voluntary disruptions (e.g., maintenance) and involuntary disruptions (e.g., hardware failures). PDBs define the minimum availability requirements for Pods in a set of related Pods, such as those belonging to a Deployment or StatefulSet. They ensure that a certain number of Pods are available at all times, helping to maintain the stability and availability of your applications in a Kubernetes cluster.

Here's a detailed explanation of PDBs and an example to illustrate their use:

Components of a Pod Disruption Budget (PDB):

minAvailable: This field specifies the minimum number of Pods that must be kept running in the group (e.g., a Deployment or StatefulSet). This ensures that a minimum number of replicas remain available during disruptions.

maxUnavailable: This field specifies the maximum number of Pods that can be unavailable during disruptions. It's complementary to minAvailable. You can choose to define one or the other, but not both. It provides a way to limit the maximum unavailability of Pods.

selector: PDBs are associated with Pods using label selectors. The selector is used to match Pods in the group that the PDB applies to.

Use Cases for PDBs:

Rolling Updates: When performing rolling updates of applications using Deployments or StatefulSets, PDBs can be used to ensure that a certain number of Pods remain available during the update process, preventing unintended disruptions to the application.

Node Drains: When nodes need maintenance or are being drained, PDBs can prevent the simultaneous eviction of too many Pods, ensuring that the application maintains its desired level of availability.

High Availability: PDBs can be used to enforce high availability requirements for critical components of an application. For example, a database cluster may require a certain number of replicas to be available at all times to prevent data loss.

Example of a Pod Disruption Budget:

Let's say you have a Deployment managing a web application with a replica count of 5. You want to ensure that at least 3 replicas of the web application are available at all times during updates or node maintenance. Here's how you would define a PDB for this use case:

```
apiVersion: policy/v1beta1 kind:  
PodDisruptionBudget metadata:  
  name: web-app-pdb  
spec:  
  minAvailable: 3  
  selector:  
    matchLabels:  
      app: web-app
```

In this example: `minAvailable: 3` specifies that at least 3 replicas of Pods with the label `app: webapp` must remain available during disruptions. `selector` specifies that this PDB applies to Pods with the label `app: web-app`. With this PDB in place, if you perform a rolling update of the Deployment or if nodes need maintenance, Kubernetes will ensure that at least 3 Pods of the `webapp` Deployment remain operational during these events, thereby meeting the specified availability requirements.

PDBs are a powerful tool for maintaining application stability and availability in Kubernetes clusters, particularly when handling planned or unplanned disruptions to your workloads.

Q.3 What is the role of Load Balance in Kubernetes?

In Kubernetes, a Load Balancer is a critical component that helps distribute network traffic evenly across a set of Pods or Services. Load balancing is essential for ensuring high availability, scaling applications, and maintaining stable network connections. Here's a detailed explanation of the role of Load Balancers in Kubernetes, along with an example:

Role of Load Balancers in Kubernetes:

Distributing Traffic: Load Balancers evenly distribute incoming network traffic across multiple Pods or Services. This ensures that no single Pod or Service becomes overwhelmed, improving the responsiveness and availability of the application.

High Availability: Load Balancers are typically configured with health checks to monitor the status of Pods or Services. If a Pod or Service becomes unhealthy or unresponsive, the Load Balancer can automatically route traffic away from it, ensuring the application remains available.

Scaling: As your application grows and you need to add more instances (Pods) to handle increased traffic, Load Balancers can seamlessly adapt to include these new instances in the traffic distribution. This makes it easier to scale your application horizontally.

Session Persistence: Some Load Balancers support session persistence or sticky sessions, which ensure that requests from the same client are consistently routed to the same backend Pod. This is useful for stateful applications that rely on session data.

External Access: Load Balancers often act as a point of entry for external traffic into your cluster. They can route traffic to the appropriate Services within the cluster based on the configuration and rules you define.

Types of Load Balancers in Kubernetes:

Service Type: LoadBalancer: Kubernetes provides a native LoadBalancer Service type. When you define a Service of type LoadBalancer, the Kubernetes cluster provisions an external Load Balancer, typically provided by the cloud provider, to distribute traffic to the Service. For example:

```
apiVersion: v1 kind:  
Service metadata:  
  name: my-service spec:  
    selector:  
      app: my-app  
    ports:  
      - protocol: TCP  
    port: 80
```

```
targetPort: 9376
type: LoadBalancer
```

Ingress Controllers: Ingress controllers, such as Nginx Ingress or HAProxy, are used to manage external access to Services within a cluster. Ingress controllers provide more advanced routing and traffic management capabilities than the basic LoadBalancer Service type.

Example of Load Balancer in Kubernetes:

Let's say you have a web application deployed as a set of Pods and you want to make it accessible to external users. You can create a LoadBalancer Service to achieve this:

```
apiVersion: v1 kind:
Service metadata:
name: web-service
spec:
selector:
  app: web-app
ports:
  - protocol: TCP
port: 80
targetPort: 8080
type: LoadBalancer
```

In this example:

metadata.name is the name of the Service. spec.selector specifies the Pods to which the traffic should be load balanced. spec.ports define the ports to which the Load Balancer should forward traffic.

type: LoadBalancer indicates that you want to provision an external Load Balancer for this Service.

Once this configuration is applied, Kubernetes (or the cloud provider) will provision an external Load Balancer and assign it an IP address. Users can then access your web application using this IP address, and the Load Balancer will distribute incoming requests across the Pods running your web application. Load Balancers are a fundamental component for ensuring the availability, scalability, and external accessibility of applications in a Kubernetes cluster. They play a

crucial role in maintaining a stable and responsive environment for your applications.

CONCLUSION: Hence, In this assignment we learned what is the Kubernetes Cluster Architecture.

Terraform

Lab-6

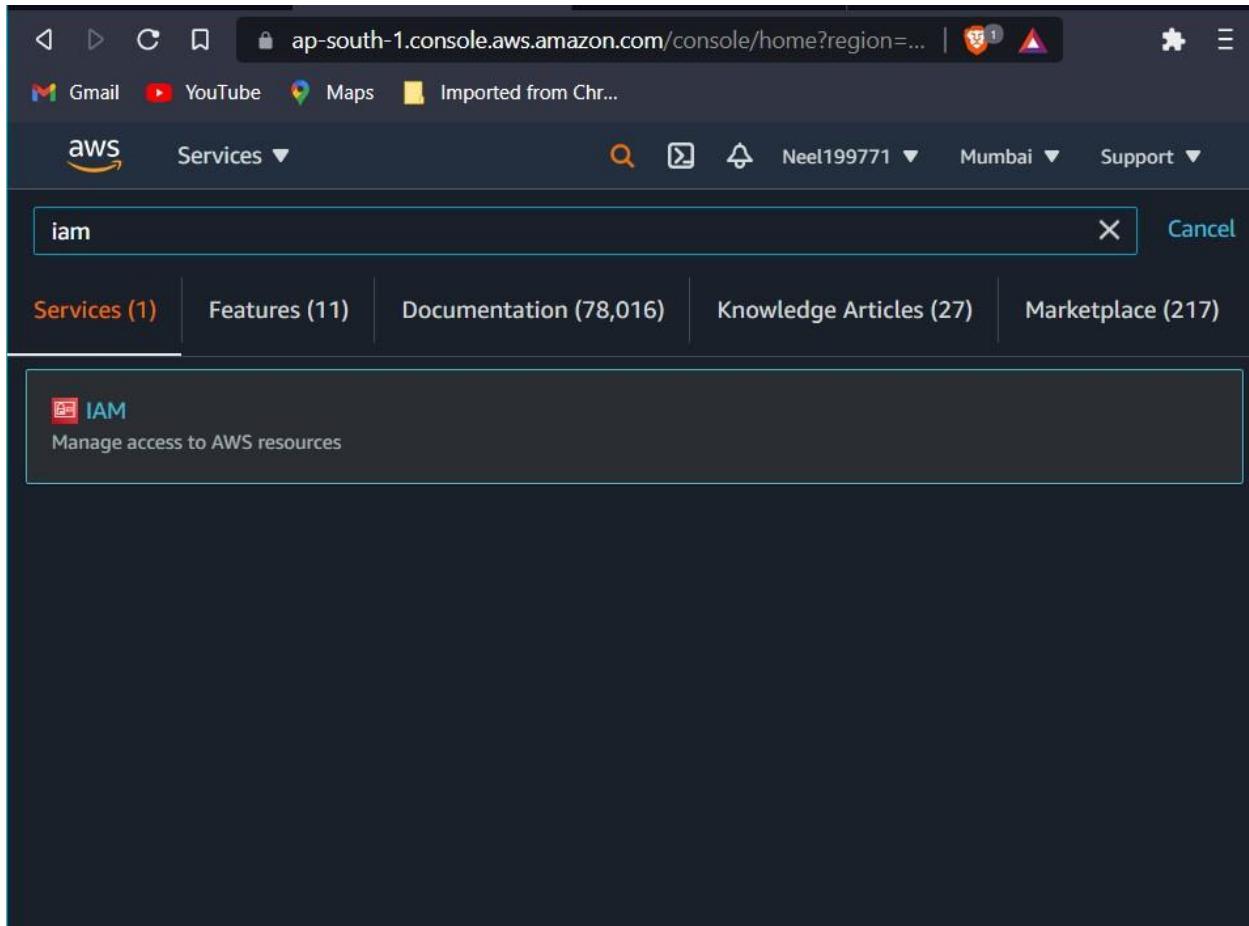
Aim:- To understand terraform lifecycle and to Build, change, and destroy AWS infrastructure using Terraform.

Theory:-

Terraform is an infrastructure as code (IaC) tool that allows you to build, change, and version infrastructure safely and efficiently.

Steps for Implementation:-

1- Open And Login to your AWS console and open IAM.



2- Click on Add Users

The screenshot shows the AWS Identity and Access Management (IAM) service. On the left, there's a sidebar with navigation links like Dashboard, Access management (User groups, Users, Roles, Policies, Identity providers, Account settings), and Access reports (Access analyzer, Archive rules, Analyzers, Settings, Credential report, Organization activity, Service control policies (SCPs)). The main content area is titled "Introducing the new Users list experience" with a message: "We've redesigned the Users list experience to make it easier to use. Let us know what you think." Below this, the "Users (0) Info" section is shown, stating: "An IAM user is an identity with long-term credentials that is used to interact with AWS in an account." There's a search bar "Find users by username or access key" and a table header with columns: User name, Groups, Last activity, MFA, Password age, Active key age. A message "No resources to display" is present. At the bottom, there are links for Feedback, English (US), Privacy Policy, Terms of Use, and Cookie preferences.

3- Give any name for username and check the programmatic access field shown below

The screenshot shows the "Add user" wizard, step 1: Set user details. It has five steps numbered 1 to 5. Step 1 is active. The title is "Add user". The sub-section "Set user details" asks: "You can add multiple users at once with the same access type and permissions. Learn more". A "User name*" input field contains "Neelu". Below it is a "Add another user" link. The next section, "Select AWS access type", asks: "Select how these users will access AWS. Access keys and autogenerated passwords are provided in the last step. Learn more". It shows two options: "Programmatic access" (checked) and "AWS Management Console access". "Programmatic access" is described as enabling an access key ID and secret access key for the AWS API, CLI, SDK, and other development tools. "AWS Management Console access" is described as enabling a password for the AWS Management Console. At the bottom, there are "Cancel" and "Next: Permissions" buttons, and a note "* Required".

4- Add group name and add AdministratorAccess policy by clicking checkbox

Create group

Create a group and select the policies to be attached to the group. Using groups is a best-practice way to manage users' permissions by job functions, AWS service access, or your custom permissions.

Learn more

Group name: AdvDevops

Create policy Refresh

Filter policies Search Showing 669 results

| Policy name | Type | Used as | Description |
|--|--------------|---------|--|
| <input checked="" type="checkbox"/> AdministratorAccess | Job function | None | Provides full access to AWS services and resources. |
| <input type="checkbox"/> AdministratorAccess-Amplify | AWS managed | None | Grants account administrative permissions while explicitly allowing direct access to AWS services. |
| <input type="checkbox"/> AdministratorAccess-AWSElastic... | AWS managed | None | Grants account administrative permissions. Explicitly allows developers and administrators to... |
| <input type="checkbox"/> AlexaForBusinessDeviceSetup | AWS managed | None | Provide device setup access to AlexaForBusiness services |
| <input type="checkbox"/> AlexaForBusinessFullAccess | AWS managed | None | Grants full access to AlexaForBusiness resources and access to related AWS services. |

Create group Cancel Previous Next: Tags

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5- Don't add tags

Add user

Review

Review your choices. After you create the user, you can view and download the autogenerated password and access key.

User details

| | |
|----------------------|--|
| User name | Neelu |
| AWS access type | Programmatic access - with an access key |
| Permissions boundary | Permissions boundary is not set |

Permissions summary

The user shown above will be added to the following groups.

| Type | Name |
|-------|-----------|
| Group | AdvDevops |

Tags

No tags were added.

Create user Cancel Previous

Feedback English (US) © 2006 - 2021, Amazon Internet Services Private Ltd. or its affiliates. All rights reserved. Privacy Policy Terms of Use Cookie preferences

6- Now Download .csv file

The screenshot shows the AWS IAM 'Add user' success page. A green 'Success' box indicates that a user named 'Neelu' has been created successfully. Below it, a table lists the user with columns for 'User' (Neelu), 'Access key ID' (AKIA6P37X2EDTWPPI7L), and 'Secret access key' (a masked value). A 'Download .csv' button is available to download the user information.

7- Go to services and Ec2

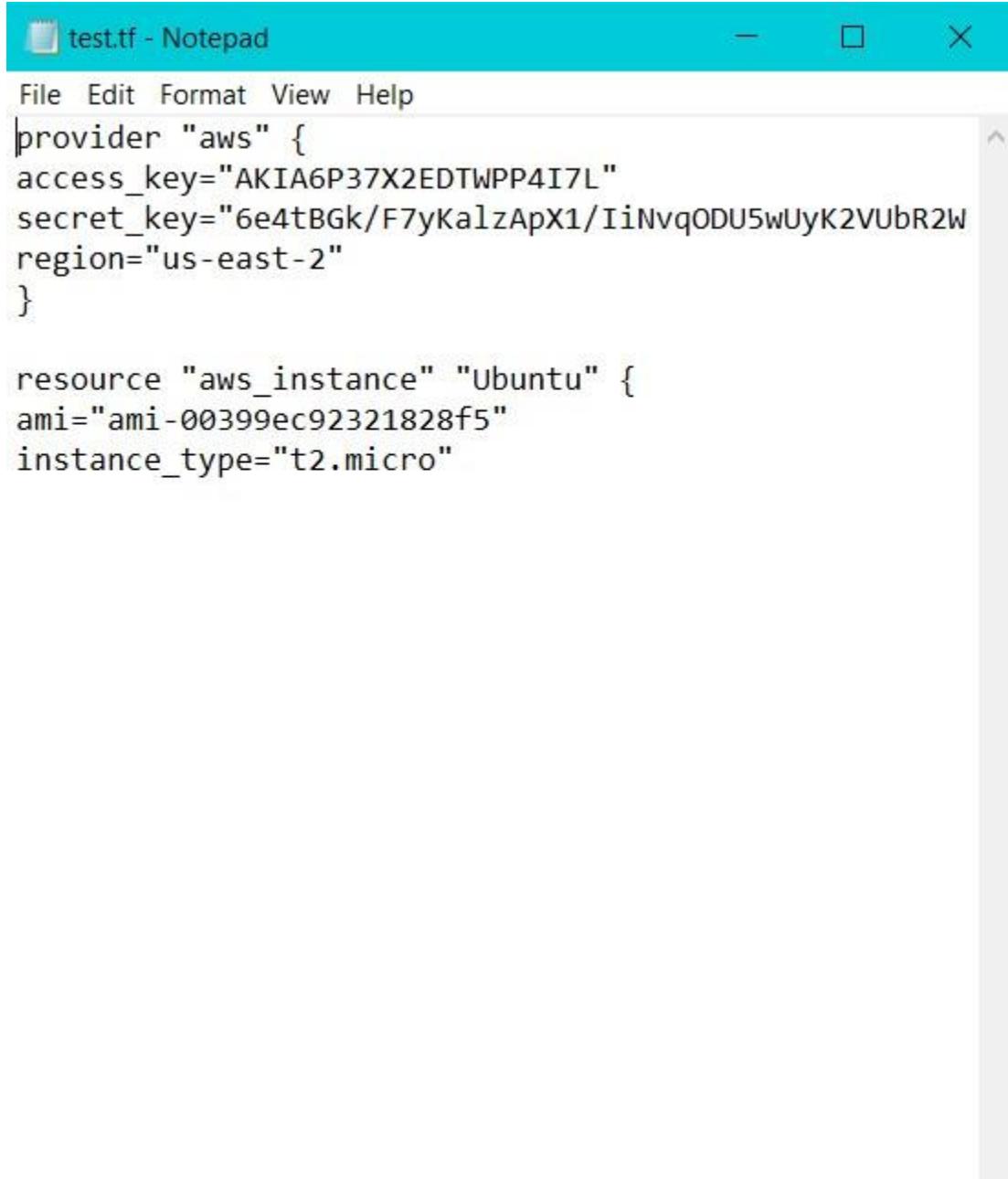
The screenshot shows the AWS EC2 service home page. The navigation bar includes links for 'Feedback', 'English (US)', 'Privacy Policy', 'Terms of Use', and 'Cookie preferences'. The main area displays a grid of service icons under 'All services', such as Compute, Customer Enablement, Machine Learning, AWS Cost Management, and many others.

Created a folder Name Terraform Scripts in the C drive where the AdvDevops folder was created



Now Go to note pad And Type the below Details properly But before It Just Change the ACCESS KEY AND SECRECT KEY TO THE ONE IN YOUR .csv File .

Set region same as below if you want MUMBAI as your region.

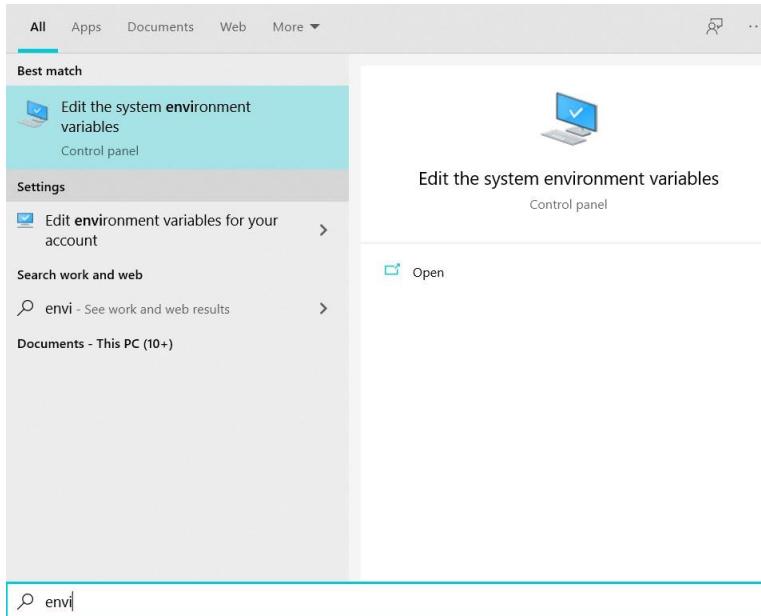


```
test.tf - Notepad
File Edit Format View Help
provider "aws" {
  access_key="AKIA6P37X2EDTWPP4I7L"
  secret_key="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
  region="us-east-2"
}

resource "aws_instance" "Ubuntu" {
  ami="ami-00399ec92321828f5"
  instance_type="t2.micro"
```

Now search EDIT THE SYSTEM ENVIRONMENT VARIABLES in your windows search.

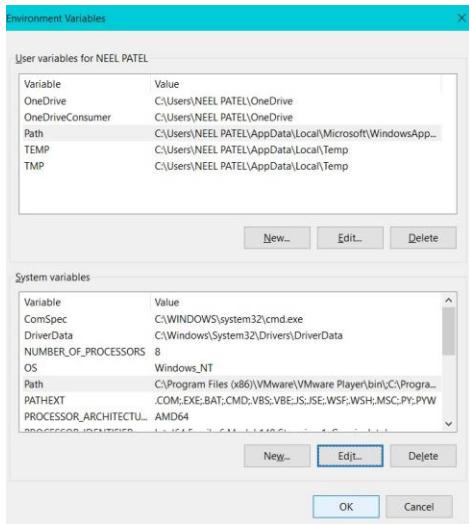
Open it



Now click on PATH OF USER VARIABLES, then click on Edit option

Now go to edit and then add new path C:\AdvDevOps

Repeat same procedure for system variables.



Now Open Command Prompt and then pate the path of Terraform script

Eg. CD C:\Terraform Script as shown below

Now type Terraform Init command

```
C:\Terraform Script>terraform init

Initializing the backend...

Initializing provider plugins...
- Finding latest version of hashicorp/aws...
- Installing hashicorp/aws v3.52.0...
- Installed hashicorp/aws v3.52.0 (signed by HashiCorp)

Terraform has created a lock file .terraform.lock.hcl to record the provider
selections it made above. Include this file in your version control repository
so that Terraform can guarantee to make the same selections by default when
you run "terraform init" in the future.

Terraform has been successfully initialized!

You may now begin working with Terraform. Try running "terraform plan" to see
any changes that are required for your infrastructure. All Terraform commands
should now work.

If you ever set or change modules or backend configuration for Terraform,
rerun this command to reinitialize your working directory. If you forget, other
commands will detect it and remind you to do so if necessary.
```

Then if there are no errors type Terraform Plan as shown below (type YES when command prompt ask)

```
C:\Terraform Script>terraform plan

Terraform used the selected providers to generate the following execution plan. Resource actions are indicated with the
following symbols:
+ create

Terraform will perform the following actions:

# aws_instance.Ubuntu will be created
+ resource "aws_instance" "Ubuntu" {
    + ami                                = "ami-0c1a7f89451184c8b"
    + arn                                = (known after apply)
    + associate_public_ip_address        = (known after apply)
    + availability_zone                  = (known after apply)
    + cpu_core_count                     = (known after apply)
    + cpu_threads_per_core              = (known after apply)
    + disable_api_termination          = (known after apply)
    + ebs_optimized                     = (known after apply)
    + get_password_data                = false
    + host_id                           = (known after apply)
```

Now Finally Type Terraform Apply

```
C:\Terraform Script>terraform apply

Terraform used the selected providers to generate the following execution plan. Resource actions are indicated with the
following symbols:
+ create

Terraform will perform the following actions:

# aws_instance.Ubuntu will be created
+ resource "aws_instance" "Ubuntu" {
    + ami                                = "ami-0c1a7f89451184c8b"
    + arn                                = (known after apply)
    + associate_public_ip_address        = (known after apply)
    + availability_zone                  = (known after apply)
    + cpu_core_count                     = (known after apply)
```

```
Plan: 1 to add, 0 to change, 0 to destroy.

Do you want to perform these actions?
Terraform will perform the actions described above.
Only 'yes' will be accepted to approve.

Enter a value: yes

aws_instance.Ubuntu: Creating...
aws_instance.Ubuntu: Still creating... [10s elapsed]
aws_instance.Ubuntu: Still creating... [20s elapsed]
aws_instance.Ubuntu: Still creating... [30s elapsed]
aws_instance.Ubuntu: Creation complete after 31s [id=i-0eac948a456860494]

Apply complete! Resources: 1 added, 0 changed, 0 destroyed.
```

Now go to EC2 and check that is an instance created by the name of UBUNTU and is it in running status or not If it is in Running Status then Come back to Command prompt And Terminate the Instance by

Typing - Terraform destroy

```
Plan: 0 to add, 0 to change, 1 to destroy.

Do you really want to destroy all resources?
Terraform will destroy all your managed infrastructure, as shown above.
There is no undo. Only 'yes' will be accepted to confirm.

Enter a value: yes

aws_instance.Ubuntu: Destroying... [id=i-0eac948a456860494]
aws_instance.Ubuntu: Still destroying... [id=i-0eac948a456860494, 10s elapsed]
aws_instance.Ubuntu: Still destroying... [id=i-0eac948a456860494, 20s elapsed]
aws_instance.Ubuntu: Destruction complete after 30s

Destroy complete! Resources: 1 destroyed.

C:\Terraform Script>
```

Now go back to EC2 if the instance is terminated, if yes then logout of the Aws Console.

And close the command prompt!

Conclusion:-

Terraform is a powerful Infrastructure as Code (IaC) tool that automates the provisioning, management, and destruction of AWS infrastructure. It can help you to save time, reduce errors, and improve the consistency of your infrastructure.

Advanced DevOps Experiment – 7

Aim: To perform static analysis using sonarQube

Download SonarQube and Sonar Scanner

The screenshot shows the SonarQube download page. At the top, there's a banner for SonarQube 9.1. Below it, the main heading is "Download SonarQube" with the subtitle "The leading product for Code Quality and Security". A sub-subtitle "HELPING DEVS SINCE 2008" follows. The page features four main sections for different editions:

- Community EDITION**: Used and loved by 200,000+ companies. It's labeled as "FREE & OPEN SOURCE".
 - All the following features:**
 - Static code analysis for 15 languages: Java, JavaScript, C#, TypeScript, Kotlin, Ruby, Go, Scala, Flex, Python, PHP, C/C++, Obj-C, Swift, ABAP, T-SQL, PL/SQL support
 - Detection of Injection Flaws
 - Download for free**
- Developer EDITION**: Built for developers by developers.
 - Community Edition plus:**
 - C, C++, Obj-C, Swift, ABAP, T-SQL, PL/SQL support
 - Detection of Injection Flaws
 - Download**
- Enterprise EDITION**: Designed to meet Enterprise Requirements.
 - Developer Edition plus:**
 - Portfolio Management & PDF Executive Reports
 - Project PDF reports
 - Download**
- Data Center EDITION**: Designed for High Availability.
 - Enterprise Edition plus:**
 - Component redundancy
 - Data resiliency
 - Horizontal Scalability
 - Download**

The screenshot shows the SonarScanner documentation page. The left sidebar has a navigation menu with sections like Try Out SonarQube, Requirements, Setup and Upgrade, Analyzing Source Code, Scanners (which is expanded to show SonarScanner for Gradle, .NET, Maven, Azure DevOps, Jenkins, Ant, and SonarScanner), Analysis Parameters, Languages, Test Coverage & Execution, Importing External Issues, and Background Tasks. The main content area is titled "SonarScanner". It includes a "4.6.2" version section with a "Show more versions" link, a "Configuring your project" section with instructions to create a configuration file named "sonar-project.properties", and a code snippet showing the contents of this file. On the right side, there's a sidebar titled "On this page" with links to various configuration-related topics.

After downloading, set Environment Variables. Add “sonarqube-9.1.0.47736\bin” to Path.

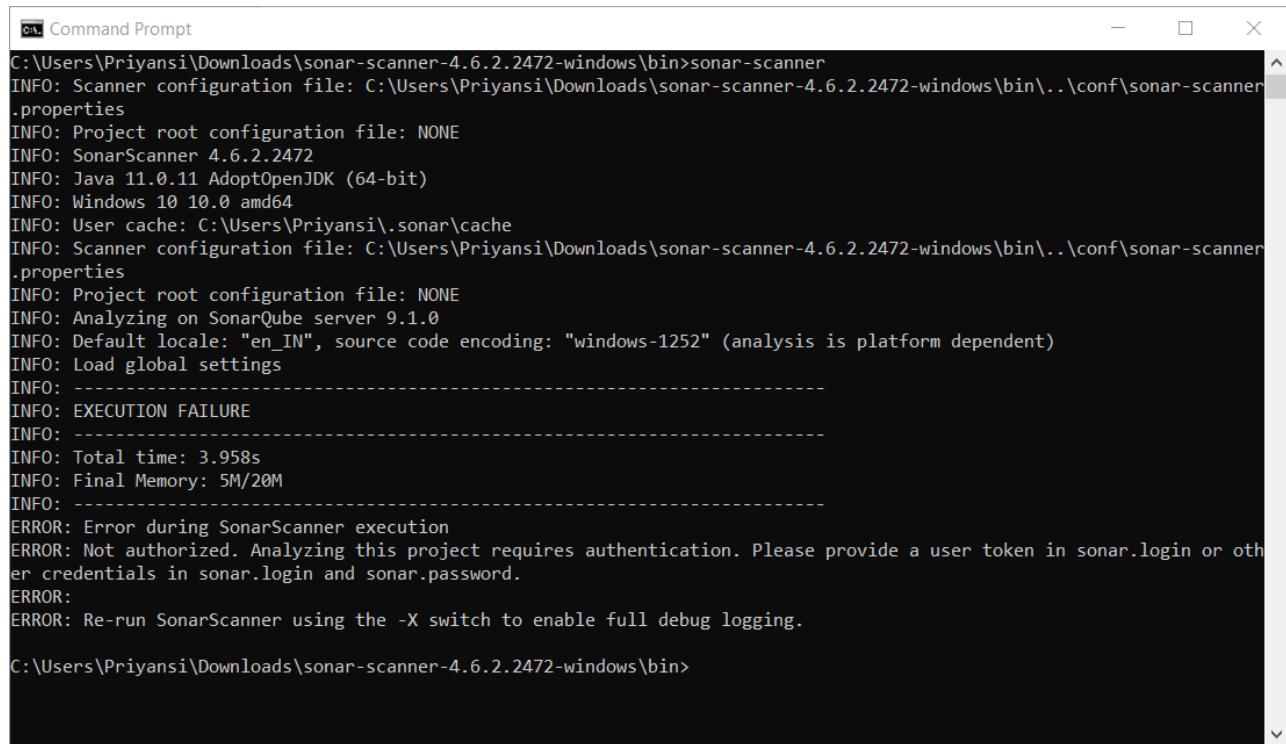
Open command prompt. Run commands:

- cd "sonarqube-9.1.0.47736\bin\windows-x86-64"
 - StartSonar.bat

```
jvm 1 at org.elasticsearch.client.RestHighLevelClient.performRequest(RestHighLevelClient.java:1702)
jvm 1 at org.elasticsearch.client.RestHighLevelClient.performRequestAndParseEntity(RestHighLevelClient.java:1672)
jvm 1 at org.elasticsearch.client.ClusterClient.health(ClusterClient.java:119)
jvm 1 at org.sonar.application.es.EsConnectorImpl.getClusterHealthStatus(EsConnectorImpl.java:64)
jvm 1 at org.sonar.application.process.EsManagedProcess.checkStatus(EsManagedProcess.java:90)
jvm 1 at org.sonar.application.process.EsManagedProcess.checkOperations(EsManagedProcess.java:75)
jvm 1 at org.sonar.application.process.EsManagedProcess.startOperation(EsManagedProcess.java:60)
jvm 1 at org.sonar.application.process.EsManagedProcessHandler.refreshStatus(ManagedProcessHandler.java:220)
jvm 1 at org.sonar.application.process.EsManagedProcessHandler.run(ManagedProcessHandler.java:285)
jvm 1 at org.sonar.application.process.ManagedProcessHandler$SyncMatcher.run(ManagedProcessHandler.java:285)
Caused by: java.util.concurrent.ExecutionException: java.net.ConnectException: Failed to connect to [/127.0.0.1:9001]
at org.elasticsearch.common.util.concurrent.BaseFuture$Sync.getValue(BaseFuture.java:262)
at org.elasticsearch.common.util.concurrent.BaseFuture$Sync.get(BaseFuture.java:249)
at org.elasticsearch.common.util.concurrent.BaseFuture.get(BaseFuture.java:76)
at org.elasticsearch.client.RestHighLevelClient.performClientRequest(RestHighLevelClient.java:2075)
... 10 common frames omitted
Caused by: java.net.ConnectException: Timeout connecting to [/127.0.0.1:9001]
at org.apache.http.nio.pool.RouteSpecificPool.timeout(RouteSpecificPool.java:169)
at org.apache.http.nio.pool.AbstractNIOConnPool.requestTimeout(AbstractNIOConnPool.java:628)
at org.apache.http.nio.pool.AbstractNIOConnPool$InternalSessionRequestCallback.timeout(AbstractNIOConnPool.java:894)
at org.apache.http.impl.nio.reactor.SessionRequestImpl.timeout(SessionRequestImpl.java:184)
at org.apache.http.impl.nio.reactor.DefaultConnectingIOReactor.processTimeouts(DefaultConnectingIOReactor.java:214)
at org.apache.http.impl.nio.reactor.DefaultConnectingIOReactor.processEvents(DefaultConnectingIOReactor.java:158)
at org.apache.http.impl.nio.reactor.AbstractMultiworkerIOReactor.execute(AbstractMultiworkerIOReactor.java:351)
at org.apache.http.impl.nio.pool.PoolingHttpClientConnectionManager.execute(PoolingHttpClientConnectionManager.java:221)
at org.apache.http.impl.nio.client.CloseableHttpAsyncClientBase$1.run(closeableHttpAsyncClientBase.java:64)
at java.base/java.lang.Thread.run(Thread.java:834)
[2021-09-29 13:50:50 INFO app][o.s.a.SchedulerImpl] Process(es) is up
[2021-09-29 13:50:50 INFO app][o.s.a.ProcessLauncherImpl] Launch process[[key=web, ipcIndex=2, logfilenamePrefix=web]] from [C:\Users\Priyansi\Downloads\sonarqube-9.1.0.47736]: C:\Program Files\Java\jdk-11.0.12\bin\java -Djava.awt.headless=true -Dfile.encoding=UTF-8 -Djava.io.tmpdir=C:\Users\Priyansi\Downloads\sonarqube-9.1.0.47736\temp -XX:+OmitStackTraceInFastThrow --add-opens=java.base/java.util=ALL-UNNAMED --add-opens=java.base/java.lang=ALL-UNNAMED --add-opens=java.base/java.io=ALL-UNNAMED --add-opens=java.rmi=sun.rmi.transport=ALL-UNNAMED --add-exports=java.base/jdk.internal.ref=ALL-UNNAMED --add-opens=jdk.management/com.sun.management.internal=ALL-UNNAMED -Xss12m -Xms12m -XX:+HeapDumpOnOutOfMemoryError -Dhttp.nonProxyHosts=localhost[127.0.0.1]:[] -cp ./lib/sonar-application-9.1.0.47736.jar;C:\Users\Priyansi\Downloads\sonarqube-9.1.0.47736\lib\jdbch2\H2-1.4.199.jar org.sonar.server.web.WebServer C:\Users\Priyansi\Downloads\sonarqube-9.1.0.47736\temp\process7774951691744101919\properties
jvm 1 | [2021-09-29 13:51:42 INFO app][o.s.a.SchedulerImpl] Process(web) is up
jvm 1 | [2021-09-29 13:51:42 INFO app][o.s.a.ProcessLauncherImpl] Launch process[[key=ce, ipcIndex=3, logfilenamePrefix=ce]] from [C:\Users\Priyansi\Downloads\sonarqube-9.1.0.47736]: C:\Program Files\Java\jdk-11.0.12\bin\java -Djava.awt.headless=true -Dfile.encoding=UTF-8 -Djava.io.tmpdir=C:\Users\Priyansi\Downloads\sonarqube-9.1.0.47736\temp -XX:+OmitStackTraceInFastThrow --add-opens=java.base/java.util=ALL-UNNAMED --add-opens=java.base/java.lang=ALL-UNNAMED --add-opens=java.base/java.io=ALL-UNNAMED --add-opens=java.rmi=sun.rmi.transport=ALL-UNNAMED --add-exports=java.base/jdk.internal.ref=ALL-UNNAMED --add-opens=java.base/java.lang=ALL-UNNAMED --add-opens=java.base/java.io=ALL-UNNAMED --add-opens=java.base/sun.nio=ch=ALL-UNNAMED --add-opens=jdk.management/com.sun.management.internal=ALL-UNNAMED -Xss12m -Xms12m -XX:+HeapDumpOnOutOfMemoryError -Dhttp.nonProxyHosts=localhost[127.0.0.1]:[] -cp ./lib/sonar-application-9.1.0.47736.jar;C:\Users\Priyansi\Downloads\sonarqube-9.1.0.47736\lib\jdbch2\H2-1.4.199.jar org.sonar.ce.ce.CeServer C:\Users\Priyansi\Downloads\sonarqube-9.1.0.47736\temp\process3944874143195035\properties
jvm 1 | [2021-09-29 13:51:42 WARN app][startup] #####SonarQube is starting#####SonarQube is starting#####
jvm 1 | [2021-09-29 13:51:42 WARN app][startup] Default Administrator credentials are still being used. Make sure to change the password or deactivate the account.
jvm 1 | [2021-09-29 13:51:42 WARN app][startup] #####SonarQube is starting#####SonarQube is starting#####
jvm 1 | [2021-09-29 13:51:46 INFO app][o.s.a.SchedulerImpl] Process(ce) is up
jvm 1 | [2021-09-29 13:51:46 INFO app][o.s.a.SchedulerImpl] SonarQube is up
```

Open another command prompt. Run command:

- cd "sonar-scanner-4.6.2.2472-windows\bin"
- sonar-scanner

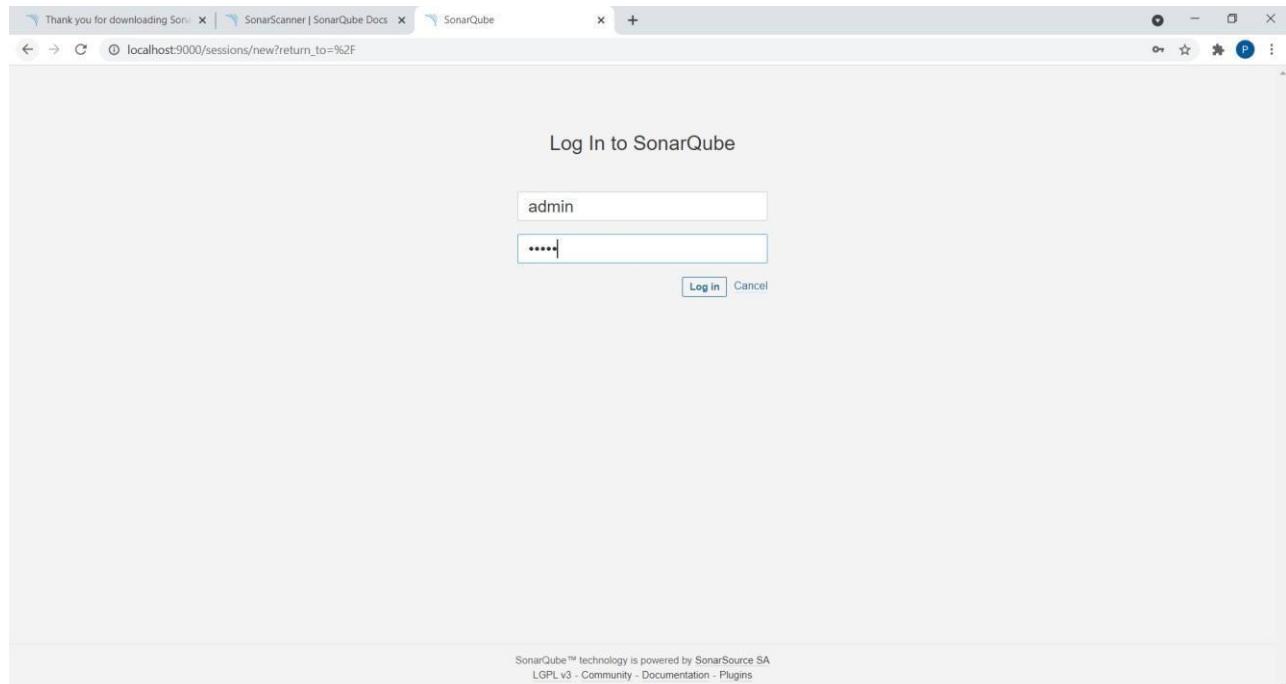


```
C:\Users\Priyansi\Downloads\sonar-scanner-4.6.2.2472-windows\bin>sonar-scanner
INFO: Scanner configuration file: C:\Users\Priyansi\Downloads\sonar-scanner-4.6.2.2472-windows\bin\..\conf\sonar-scanner.properties
INFO: Project root configuration file: NONE
INFO: SonarScanner 4.6.2.2472
INFO: Java 11.0.11 AdoptOpenJDK (64-bit)
INFO: Windows 10 10.0 amd64
INFO: User cache: C:\Users\Priyansi\.sonar\cache
INFO: Scanner configuration file: C:\Users\Priyansi\Downloads\sonar-scanner-4.6.2.2472-windows\bin\..\conf\sonar-scanner.properties
INFO: Project root configuration file: NONE
INFO: Analyzing on SonarQube server 9.1.0
INFO: Default locale: "en_IN", source code encoding: "windows-1252" (analysis is platform dependent)
INFO: Load global settings
INFO: -----
INFO: EXECUTION FAILURE
INFO: -----
INFO: Total time: 3.958s
INFO: Final Memory: 5M/20M
INFO: -----
ERROR: Error during SonarScanner execution
ERROR: Not authorized. Analyzing this project requires authentication. Please provide a user token in sonar.login or other credentials in sonar.login and sonar.password.
ERROR:
ERROR: Re-run SonarScanner using the -X switch to enable full debug logging.

C:\Users\Priyansi\Downloads\sonar-scanner-4.6.2.2472-windows\bin>
```

Server up and running on **localhost:9000**

Login using credentials as User: admin and Password: admin and Set a new password



How do you want to create your project?

Do you want to benefit from all of SonarQube's features (like repository import and Pull Request decoration)? Create your project from your favorite DevOps platform. First, you need to set up a DevOps platform configuration.

From Azure DevOps From Bitbucket From GitHub From GitLab

Set up global configuration Set up global configuration Set up global configuration Set up global configuration

Are you just testing or have an advanced use-case? Create a project manually

Manually

Embedded database should be used for evaluation purposes only

This embedded database will not scale; it will not support upgrading to newer versions of SonarQube, and there is no support for migrating your data out of it into a different database engine.

Click on Create a project **Manually**.

Create a project

All fields marked with * are required

Project display name *
sonarPythonProgram1

Up to 255 characters. Some scanners might override the value you provide.

Project key *
sonarPythonProgram1

The project key is a unique identifier for your project. It may contain up to 400 characters. Allowed characters are alphanumeric, '-' (dash), '_' (underscore), '.' (period) and ':' (colon), with at least one non-digit.

Set Up

Embedded database should be used for evaluation purposes only

The embedded database will not scale; it will not support upgrading to newer versions of SonarQube, and there is no support for migrating your data out of it into a different database engine.

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Give any Project display name.

The screenshot shows the SonarQube dashboard for the project 'sonarPythonProgram1'. At the top, there are three tabs: 'Thank you for downloading SonarQube!', 'SonarScanner | SonarQube Docs', and 'sonarPythonProgram1'. The main navigation bar includes 'Projects', 'Issues', 'Rules', 'Quality Profiles', 'Quality Gates', 'Administration', a search bar, and a user icon. Below the navigation, the project name 'sonarPythonProgram1' is displayed along with its status 'master'. The 'Overview' tab is selected. On the right, there are 'Project Settings' and 'Project Information' buttons. The main content area asks 'How do you want to analyze your repository?' and provides several integration options: 'With Jenkins', 'With GitHub Actions', 'With Bitbucket Pipelines', 'With GitLab CI', 'With Azure Pipelines', and 'Other CI'. It also offers a local analysis option: 'Locally'. A note at the bottom states: 'Embedded database should be used for evaluation purposes only. The embedded database will not scale; it will not support upgrading to newer versions of SonarQube, and there is no support for migrating your data out of it into a different database engine.'

Click on Locally.

The screenshot shows the SonarQube dashboard for the project 'sonarPythonProgram1' with the 'selectedTutorial=manual' parameter added to the URL. The main content area now displays steps for analyzing the project locally: 1. Provide a token (with a 'Generate' button) and 2. Run analysis on your project. A note at the bottom states: 'Embedded database should be used for evaluation purposes only. The embedded database will not scale; it will not support upgrading to newer versions of SonarQube, and there is no support for migrating your data out of it into a different database engine.' The footer includes copyright information: 'SonarQube™ technology is powered by SonarSource SA. Community Edition - Version 9.1 (build 47736) - LGPL v3 - Community - Documentation - Plugins - Web API - About'.

Give any name to token and click on Generate.

The screenshot shows the SonarQube dashboard for the project 'sonarPythonProgram1'. At the top, there are three tabs: 'Thank you for downloading SonarQube', 'SonarScanner | SonarQube Docs', and 'sonarPythonProgram1'. The main content area is titled 'Analyze your project' with the sub-instruction 'We initialized your project on SonarQube, now it's up to you to launch analyses!'. A step-by-step guide is displayed:

- Provide a token**: A token 'pythonToken1: 41740dddf269d68dfda1ec55f28cd250be46d48f' is shown with a 'Revoke' link. A note states: 'The token is used to identify you when an analysis is performed. If it has been compromised, you can revoke it at any point of time in your user account.' A 'Continue' button is present.
- Run analysis on your project**: This step is currently not visible.

A yellow warning box at the bottom left states: 'Embedded database should be used for evaluation purposes only. The embedded database will not scale, it will not support upgrading to newer versions of SonarQube, and there is no support for migrating your data out of it into a different database engine.' At the bottom right, there is footer text: 'SonarQube™ technology is powered by SonarSource SA Community Edition - Version 9.1 (build 47736) - LGPL v3 - Community - Documentation - Plugins - Web API - About'.

Click on **Continue**.

The screenshot shows the SonarQube dashboard for the project 'sonarPythonProgram1'. The interface is identical to the previous one, but the 'Provide a token' step has been completed, indicated by a green checkmark next to the token value 'pythonToken1: 41740dddf269d68dfda1ec55f28cd250be46d48f'.

The second step, 'Run analysis on your project', is now visible. It includes fields for selecting the build option ('Maven', 'Gradle', '.NET', 'Other (for JS, TS, Go, Python, PHP, ...)') and the operating system ('Linux', 'Windows', 'macOS'). Below these, instructions for downloading and unzipping the scanner for Windows are provided, along with a command-line example for executing the scanner:

```
sonar-scanner.bat -Dsonar.projectKey=sonarPythonProgram1 -Dsonar.sources=. -Dsonar.host.url=http://localhost:9000 -Dsonar.login=41740dddf269d68dfda1ec55f28cd250be46d48f
```

A 'Copy' button is available for the command. A note at the bottom encourages users to visit the official documentation for more details.

Save a Python program in a folder.

class Solution(object):

```
def romanToInt(self, s):
```

```

roman =
{'I':1,'V':5,'X':10,'L':50,'C':100,'D':500,'M':1000,'IV':4,'IX':9,'XL':40,'XC':90,'CD':400,'CM':900}
i = 0
num = " "
while i < len(s):
    if i+1<len(s) and s[i:i+2] in roman:
        num+=roman[s[i:i+2]]
        i+=2
    else:
        #print(i)
        num+=roman[s[i]]
        i+=1
return num
ob1 = Solution()
print(ob1.romanToInt("III"))
print(ob1.romanToInt("CDXLIII"))

```

Open command prompt in this folder and Run program using copied command.

```
"sonar-scanner.bat -D"sonar.projectKey=sonarPythonProgram1" -D"sonar.sources=." -D"sonar.host.url=http://localhost:9000" -D"sonar.login=41740dddf269d68dfda1ec55f28cd250be46d48f"
```

```

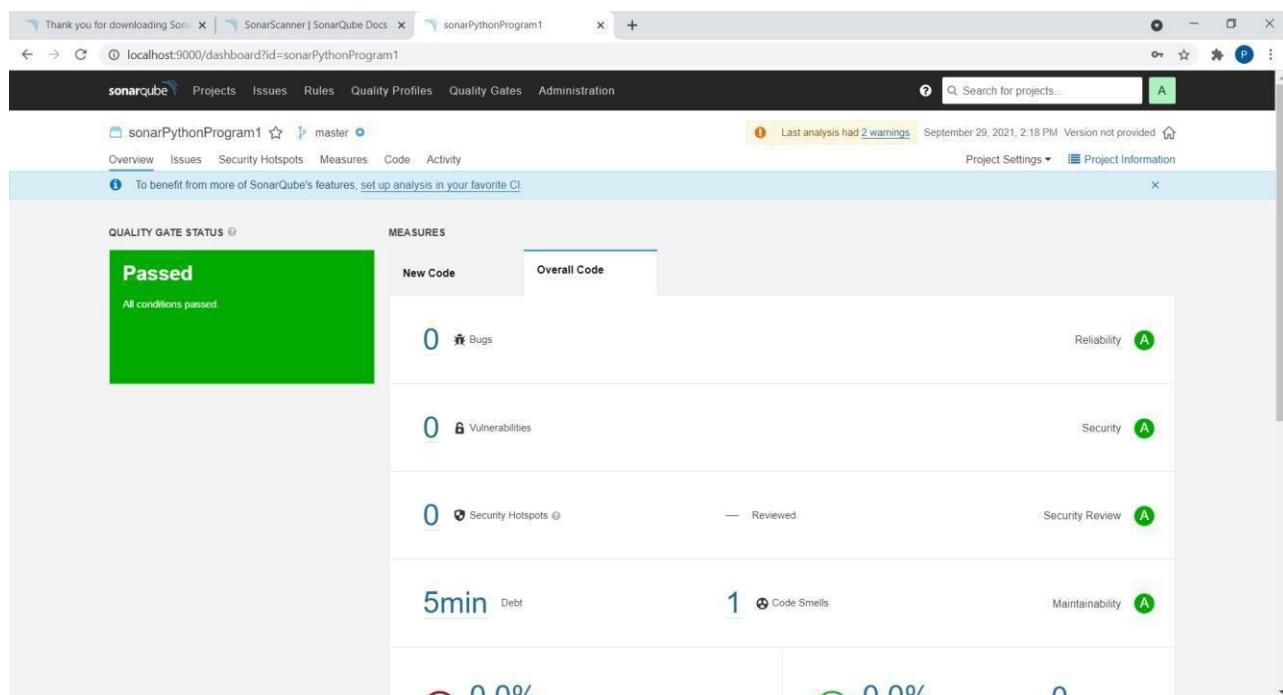
C:\Windows\System32\cmd.exe
Microsoft Windows [Version 10.0.19043.1237]
(c) Microsoft Corporation. All rights reserved.

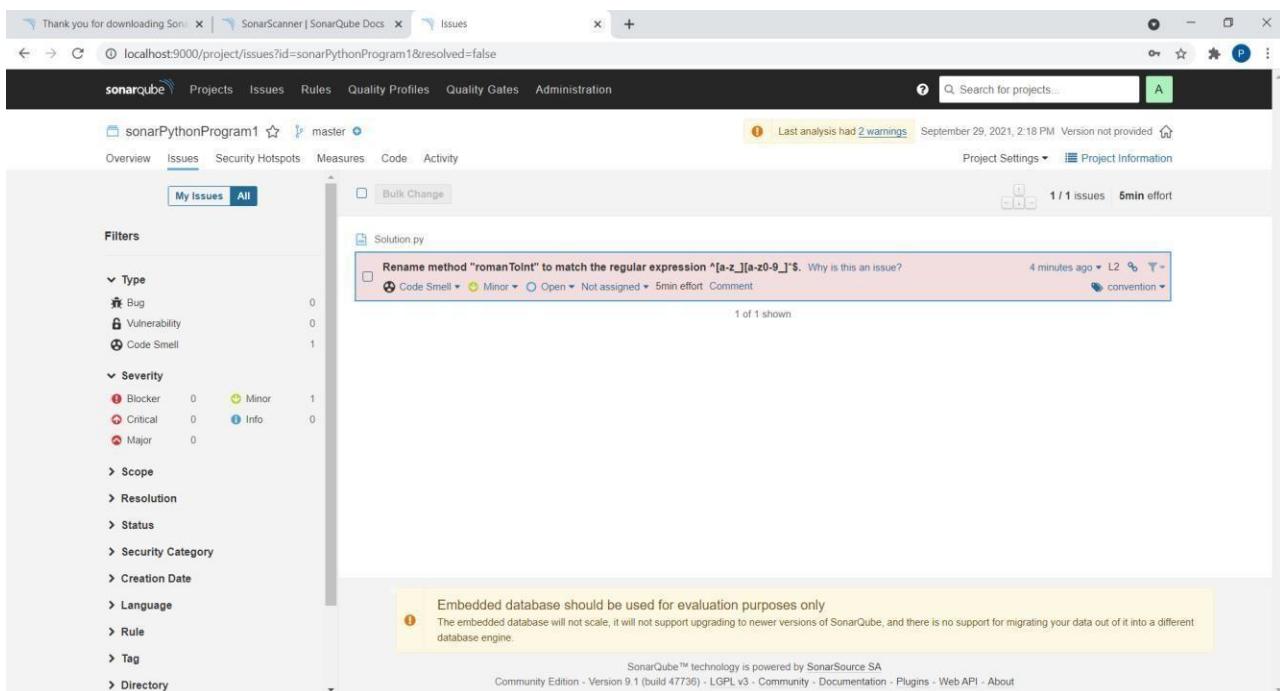
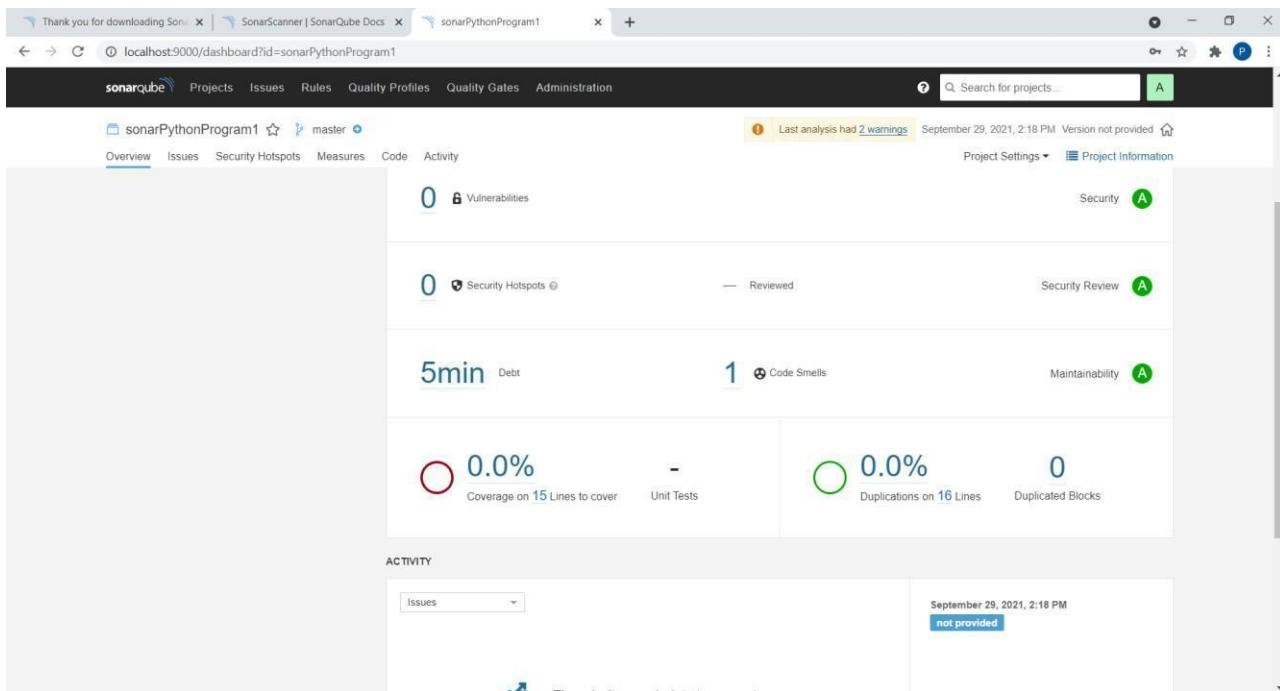
C:\Users\Priyansi\Documents\SonarExps>sonar-scanner.bat -D"sonar.projectKey=sonarPythonProgram1" -D"sonar.sources=." -D"sonar.host.url=http://localhost:9000" -D"sonar.login=41740dddf269d68dfda1ec55f28cd250be46d48f"
INFO: Scanner configuration file: C:\Users\Priyansi\Downloads\sonar-scanner-4.6.2.2472-windows\bin\..\conf\sonar-scanner.properties
INFO: Project root configuration file: NONE
INFO: SonarScanner 4.6.2.2472
INFO: Java 11.0.11 AdoptOpenJDK (64-bit)
INFO: Windows 10.0 amd64
INFO: User cache: C:\Users\Priyansi\.sonar\cache
INFO: Scanner configuration file: C:\Users\Priyansi\Downloads\sonar-scanner-4.6.2.2472-windows\bin\..\conf\sonar-scanner.properties
INFO: Project root configuration file: NONE
INFO: Analyzing on SonarQube server 9.1.0
INFO: Default locale: "en_IN", source code encoding: "windows-1252" (analysis is platform dependent)
INFO: Load global settings (done) | time=20ms
INFO: Load global settings (done) | time=20ms
INFO: Server id: 0F41A1F2-AXwphP4x91b8xeZLScu
INFO: User cache: C:\Users\Priyansi\.sonar\cache
INFO: load/download plugins
INFO: load plugins index
INFO: Load plugins index (done) | time=102ms
INFO: Load/download plugins (done) | time=167ms
INFO: Process project properties
INFO: Process project properties (done) | time=20ms
INFO: Execute project builders
INFO: Execute project builders (done) | time=2ms
INFO: Project key: sonarPythonProgram1
INFO: Base dir: C:\Users\Priyansi\Documents\SonarExps
INFO: Working dir: C:\Users\Priyansi\Documents\SonarExps\scannerwork
INFO: Load project settings for component key: 'sonarPythonProgram1'
INFO: Load project settings for component key: 'sonarPythonProgram1' (done) | time=40ms
INFO: Load quality profiles
INFO: Load quality profiles (done) | time=20ms
INFO: Load settings
INFO: Load active roles (done) | time=4452ms
WARN: SCM provider autodetection failed. Please use "sonar.scm.provider" to define SCM of your project, or disable the SCM Sensor in the project settings.
INFO: Indexing files...
INFO: Project configuration:
INFO: 1 file indexed
INFO: Quality profile for py: Sonar way
INFO: ----- Run sensors on module sonarPythonProgram1
INFO: Load metrics repository
INFO: Load metrics repository (done) | time=37ms
INFO: Sensor Python Sensor [python]
WARN: Your code is analyzed as compatible with python 2 and 3 by default. This will prevent the detection of issues specific to python 2 or python 3. You can get a more precise analysis by setting a python version in your configuration via the parameter "sonar.python.version"
INFO: Starting global symbols computation
INFO: 1 source file to be analyzed
INFO: Load project repositories

```

```
C:\Windows\System32\cmd.exe
INFO: Sensor HTML [web] (done) | time=2ms
INFO: Sensor VB.NET Project Type Information [vbnet]
INFO: Sensor VB.NET Project Type Information [vbnet] (done) | time=1ms
TINFO: Sensor VB.NET Analysis Log [vbnet]
TINFO: Sensor VB.NET Analysis Log [vbnet] (done) | time=12ms
TINFO: Sensor VB.NET Properties [vbnet]
TINFO: Sensor VB.NET Properties [vbnet] (done) | time=0ms
INFO: ----- Run sensors on project
INFO: Sensor Zero Coverage Sensor
INFO: Sensor Zero Coverage Sensor (done) | time=12ms
INFO: SCM Publisher No SCM system was detected. You can use the 'sonar.scm.provider' property to explicitly specify it.
INFO: CPD Executor Calculating CPD for 1 file
INFO: CPD Executor CPD calculation finished (done) | time=10ms
INFO: Analysis report generated in 59ms, dir size=103.9 kB
INFO: Analysis report compressed in 19ms, zip size=14.7 kB
INFO: Analysis report uploaded in 76ms
ANALYSIS SUCCESSFUL, you can browse http://localhost:9000/dashboard?id=sonarPythonProgram1
INFO: Note that you will be able to access the updated dashboard once the server has processed the submitted analysis report
INFO: More about the report processing at http://localhost:9000/api/ce/task?id=AXwvFlx9lb8xeZLXH1
INFO: Analysis total time: 7.502 s
INFO: -----
TINFO: EXECUTION SUCCESS
TINFO: -----
INFO: Total time: 10.887s
INFO: Final Memory: 7M/30M
INFO: -----
C:\Users\Priyansi\Documents\SonarExps>
```

Given below is the inspection of code quality to perform automatic reviews with static analysis of code to detect bugs, code smells, and security vulnerabilities.





Press “**Ctrl + C**” to stop the server.

```

[!] Command Prompt
jvm 1 |   at org.sonar.application.process.EsManagedProcess.isOperational(EsManagedProcess.java:60)
jvm 1 |   at org.sonar.application.process.ManagedProcessHandler.refreshState(ManagedProcessHandler.java:228)
jvm 1 |   at org.sonar.application.process.ManagedProcessHandlers$EventWatcher.run(ManagedProcessHandler.java:285)
jvm 1 | Caused by: java.util.concurrent.ExecutionException: java.net.ConnectException: Timeout connecting to [/127.0.0.1:9001]
jvm 1 |   at org.elasticsearch.common.util.concurrent.BaseFutureSync.getValue(BaseFuture.java:262)
jvm 1 |   at org.elasticsearch.common.util.concurrent.BaseFutureSync.get(BaseFuture.java:249)
jvm 1 |   at org.elasticsearch.common.util.concurrent.BaseFuture.get(BaseFuture.java:76)
jvm 1 |   at org.elasticsearch.client.RestHighLevelClient.performClientRequest(RestHighLevelClient.java:2075)
jvm 1 | ... 10 common frames omitted
jvm 1 | Caused by: java.net.ConnectException: Timeout connecting to [/127.0.0.1:9001]
jvm 1 |   at org.apache.http.nio.pool.RouteSpecificPool.timeout(RouteSpecificPool.java:169)
jvm 1 |   at org.apache.http.nio.pool.AbstractNIOConnPool.requestTimeout(AbstractNIOConnPool.java:628)
jvm 1 |   at org.apache.http.nio.pool.AbstractNIOConnPool$InternalRequestCallback.timeout(AbstractNIOConnPool.java:894)
jvm 1 |   at org.apache.http.impl.nio.reactor.SessionRequestImpl.timeout(SessionRequestImpl.java:184)
jvm 1 |   at org.apache.http.impl.nio.reactor.DefaultConnectingIOReactor.processTimeouts(DefaultConnectingIOReactor.java:214)
jvm 1 |   at org.apache.http.impl.nio.reactor.DefaultConnectingIOReactor.execute(DefaultConnectingIOReactor.java:158)
jvm 1 |   at org.apache.http.impl.nio.reactor.IOReactorBase$IOReactorWorker.execute(IOReactorBase$IOReactorWorker.java:351)
jvm 1 |   at org.apache.http.impl.nio.client.CloseableHttpAsyncClientBase$1.run(CloseableHttpAsyncClientBase.java:84)
jvm 1 |   at java.base/java.lang.Thread.run(Thread.java:834)
jvm 1 | 2021.09.29 13:58:50 INFO [appl][o.s.a.SchedulerImpl] Process[] is up
jvm 1 | 2021.09.29 13:58:50 INFO [appl][o.s.a.SchedulerImpl] Launch process[[key='web', ipcIndex=2, logfilenamePrefix=web]] from [C:\Users\Priyansi\Downloads\sonarqube-9.1.0.47736]: C:\Program Files\Java\jdk-11.0.12\bin\java -Djava.awt.headless=true -Dfile.encoding=UTF-8 -Djava.io.tmpdir=C:\Users\Priyansi\Downloads\sonarqube-9.1.0.47736\tmp -XX:-OmitStackTraceInFastThrow --add-opens=java.base/jdk.internal.ref=ALL-UNNAMED --add-opens=java.base/java.nio=ALL-UNNAMED --add-opens=java.base/java.lang=ALL-UNNAMED --add-opens=java.base/java.io=ALL-UNNAMED --add-opens=java.rmi=sun.rmi --transport=ALL-UNNAMED --add-exports=java.base/jdk.internal.ref=ALL-UNNAMED --add-opens=java.base/java.nio=ALL-UNNAMED --add-opens=java.base/java.lang=ALL-UNNAMED --add-opens=java.base/java.io=ALL-UNNAMED --add-opens=java.base/java.util.concurrent=ALL-UNNAMED --add-opens=java.base/java.util.concurrent.atomic=ALL-UNNAMED --add-opens=java.base/java.util.concurrent.locks=ALL-UNNAMED --add-opens=java.base/java.util.concurrent=ALL-UNNAMED --add-opens=java.base/java.util.concurrent.atomic=ALL-UNNAMED --add-opens=java.base/java.util.concurrent.locks=ALL-UNNAMED --add-opens=java.management/com.sun.management.internal=ALL-UNNAMED -Xmx512m -Xms128m -XX:HeapDumpOnOutOfMemoryError -Dhttp.nonProxyHosts=localhost|127.*|[::1] -cp ./lib/sonar-application-9.1.0.47736.jar;C:\Users\Priyansi\Downloads\sonarqube-9.1.0.47736\lib\jdbc\h2\h2-1.4.199.jar org.sonar.server.app.WebServer C:\Users\Priyansi\Downloads\sonarqube-9.1.0.47736\tmp\sq-process177945169172410119\properties
jvm 1 | 2021.09.29 13:58:51 INFO [appl][o.s.a.SchedulerImpl] Process[web] is up
jvm 1 | 2021.09.29 13:58:51 INFO [appl][o.s.a.SchedulerImpl] Launch process[[key='ce', ipcIndex=3, logfilenamePrefix=ce]] from [C:\Users\Priyansi\Downloads\sonarqube-9.1.0.47736]: C:\Program Files\Java\jdk-11.0.12\bin\java -Djava.awt.headless=true -Dfile.encoding=UTF-8 -Djava.io.tmpdir=C:\Users\Priyansi\Downloads\sonarqube-9.1.0.47736\tmp -XX:-OmitStackTraceInFastThrow --add-opens=java.base/java.util=ALL-UNNAMED --add-exports=java.base/jdk.internal.ref=ALL-UNNAMED --add-opens=java.base/java.nio=ALL-UNNAMED --add-opens=java.base/java.lang=ALL-UNNAMED --add-opens=java.base/java.io=ALL-UNNAMED --add-opens=java.base/java.util.concurrent=ALL-UNNAMED --add-opens=java.base/java.util.concurrent.atomic=ALL-UNNAMED --add-opens=java.base/java.util.concurrent.locks=ALL-UNNAMED --add-opens=java.management/com.sun.management.internal=ALL-UNNAMED -Xmx512m -Xms128m -XX:HeapDumpOnOutOfMemoryError -Dhttp.nonProxyHosts=localhost|127.*|[::1] -cp ./lib/sonar-application-9.1.0.47736.jar;C:\Users\Priyansi\Downloads\sonarqube-9.1.0.47736\lib\jdbc\h2\h2-1.4.199.jar org.sonar.ce.app.CeServer C:\Users\Priyansi\Downloads\sonarqube-9.1.0.47736\tmp\sq-process3944487414319503\sq.properties
jvm 1 | 2021.09.29 13:58:51:42 WARN [appl][startup] #####
jvm 1 | 2021.09.29 13:58:51:42 WARN [appl][startup] Default Administrator credentials are still being used. Make sure to change the password or deactivate the account.
jvm 1 | 2021.09.29 13:58:51:42 WARN [appl][startup] #####
jvm 1 | 2021.09.29 13:58:51:42 INFO [appl][o.s.a.SchedulerImpl] Process[ce] is up
jvm 1 | 2021.09.29 13:58:51:42 INFO [appl][o.s.a.SchedulerImpl] SonarQube is up
wrapper  CTRL-C trapped. Shutting down.
jvm 1 | 2021.09.29 14:38:57 INFO [appl][o.s.a.SchedulerImpl] Stopping SonarQube
jvm 1 | 2021.09.29 14:38:58 INFO [appl][o.s.a.SchedulerImpl] Process[] is stopped
jvm 1 | 2021.09.29 14:38:58 INFO [appl][o.s.a.SchedulerImpl] Process[web] is stopped
jvm 1 | 2021.09.29 14:38:58 INFO [appl][o.s.a.SchedulerImpl] Process[es] is stopped
jvm 1 | 2021.09.29 14:38:58 INFO [appl][o.s.a.SchedulerImpl] SonarQube is stopped
wrapper | <-- Wrapper Stopped
Terminate batch job (Y/N)? y
C:\Users\Priyansi\Downloads\sonarqube-9.1.0.47736\bin\windows-x86-64>

```

CONCLUSION :-

We implemented static analysis using SonarCube.

Name :-Atharva Jadhav

Roll No:- 2105044

Batch:- T13

Date Of Performance :- 12/09/2023

Experiment 8

Aim:-

To understand continuous monitoring using Nagios

Theory:-

Nagios is an open-source monitoring system that provides monitoring of services, applications, and network resources. It is designed to alert system administrators about potential issues before they become critical problems. Nagios allows you to monitor the entire IT infrastructure, including servers, switches, applications, and services. It provides a comprehensive monitoring solution for both small and large organizations. Some key features and capabilities of Nagios include:

Monitoring Capabilities: Nagios can monitor a wide variety of network services including SMTP, POP3, HTTP, NNTP, ICMP, SNMP, FTP, SSH, and many more.

Alerting and Notification: It provides alerting and notification functionalities to notify system administrators when something goes wrong. Nagios can send alerts via email, SMS, or other methods to ensure that the right people are notified in real-time.

Plugin Architecture: Nagios has a modular architecture that allows users to develop their plugins and addons to monitor specific devices and services that are not covered by default.

Customizable Dashboards and Reports: Nagios offers customizable dashboards and reporting capabilities that provide insights into the performance and health of the monitored resources.

Scalability and Flexibility: Nagios can scale to monitor complex, large-scale IT infrastructures. It is highly flexible and can be customized to meet specific monitoring and alerting requirements.

Extensibility: Nagios can be extended through various addons and plugins, allowing it to integrate with other tools and services, and enabling the monitoring of a wide range of devices and applications.

Historical Monitoring and Trend Analysis: Nagios can store historical data and provide trend analysis, allowing system administrators to identify patterns and plan for future infrastructure needs.

Community Support and Active Development: Being an open-source project, Nagios has a vibrant community that contributes to its development and support. This community-driven approach ensures that the software remains updated and robust.

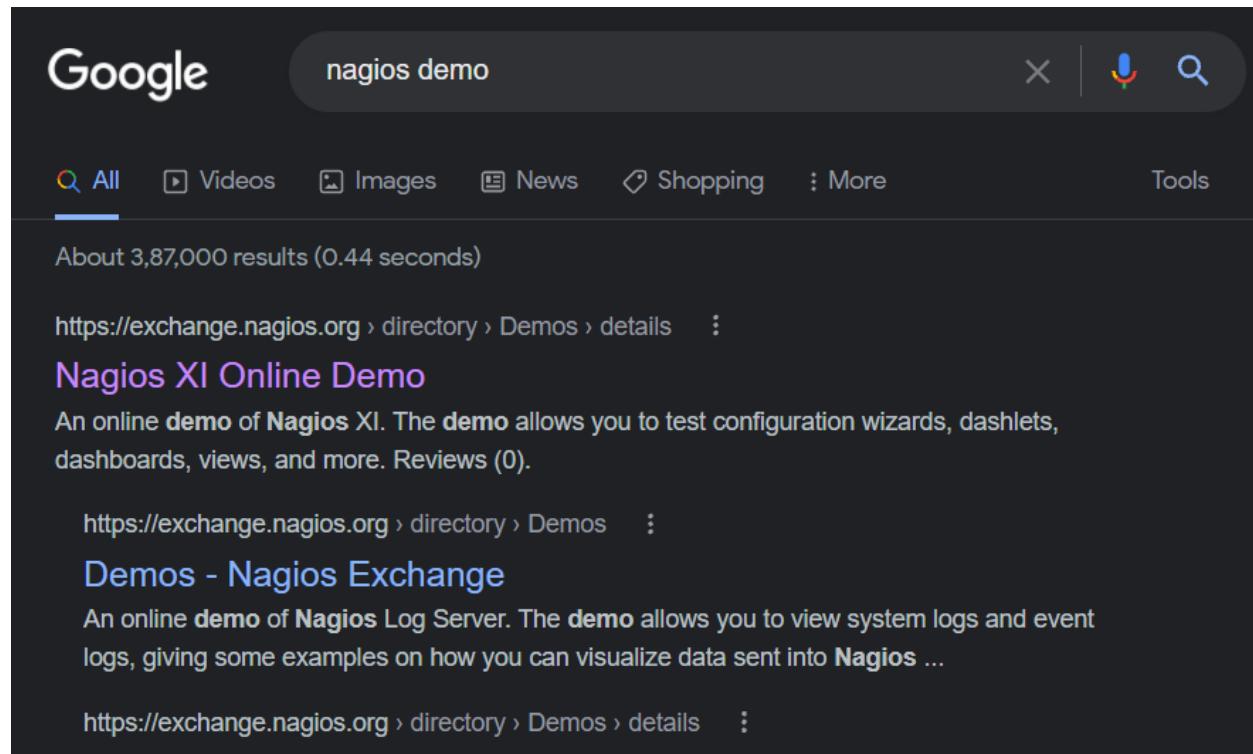
Centralized Monitoring: Nagios provides a centralized view of the entire IT infrastructure, allowing administrators to have a comprehensive overview of the health and performance of all monitored resources from a single location.

Integration with Third-Party Tools: Nagios can integrate with various third-party tools and services, making it a versatile monitoring solution that can fit into different IT ecosystems and workflows.

Steps :-

1) Go to google.com, Search Nagios Demo

Click on the first link shown below



2) Now click on the website-



Network: | Enterprise | Support | Library | Project | Exchange

Home Directory About

Home | Directory | Demos | Nagios XI Online Demo

Directory Tree

Nagios XI Online Demo

[Submit review](#) | [Recommend](#) | [Print](#) | [Visit](#) | [Claim](#)

Rating



Favoured: 0

0 votes

Owner [egalstad](#)

Website nagiosxi.demos.nagios.com

Hits 141800

Search Exchange

search...

Search

[Advanced Search](#)

Search All Sites

Go

Nagios Live Webinars

Let our experts show you how Nagios can help your organization.

3) Now click on login as administrator

The screenshot shows a web browser window with the URL nagiosxi.demos.nagios.com/nagiosxi/login.php in the address bar. The title bar says "Nagios XI Login". The main content area has two sections:

- Login:** A form with fields for "Username" and "Password", and a "Login" button. Below it is a link "Forgot your password?".
- Nagios XI Demo System:** A dashboard with a dark header featuring the Nagios logo and the text "Nagios XI Demo System". Below the header is a section titled "Demo Account Options" with the following information:
 - Administrator Access:** Username: nagiosadmin, Password: nagiosadmin. Buttons: "Log in as Administrator" (blue), "Log in as Read-Only User" (light blue).
 - Read-Only User Access:** Username: readonly, Password: readonly. Buttons: "Log in as Read-Only User" (light blue), "Log in as Normal User" (blue).
 - Advanced User Access:** Username: advanced, Password: advanced. Buttons: "Log in as Advanced User" (light blue), "Log in as Normal User" (blue).
 - Normal User Access:** Username: jdoe, Password: jdoe. Buttons: "Log in as Normal User" (blue), "Log in as Administrator" (light blue).
 - Administrator Access:** Username: darktheme, Password: darktheme. Buttons: "Log in as Administrator" (blue), "Log in as Read-Only User" (light blue).

At the bottom of the dashboard, there is a section titled "Demo Notes".

The screenshot shows the Nagios XI Home Dashboard. On the left, a sidebar contains navigation links for Quick View, Details, Graphs, Maps, and Incident Management. The main content area includes sections for Getting Started Guide, Host Status Summary (with a table showing Up, Down, Unreachable, Pending, Unhandled, Problems, and All counts), Service Status Summary (similar table), and Administrative Tasks. A sidebar on the right titled "We're Here To Help!" features a photo of a support representative and links to Support Forum, Customer Support Forum, Help Resources, Customer Ticket Support Center, and Customer Phone Support.

The screenshot shows the Nagios XI Host Status page. The left sidebar is identical to the Home Dashboard. The main content area displays a table of host status records. The columns include Host, Status, Duration, Attempt, Last Check, and Status Information. The table lists various hosts like europa.nagios.local, www.acme.com, www.chaoticmoon.com, Firewall, Log-Server.nagios.local, Log-Server2.nagios.local, NOAA, Netw, Network-Analyzer.nagios, Network-Analyzer.nagios.local, Network-Analyzer2, Network-Analyzer2.nagios.local, and Router, along with their current status (e.g., Down, Up, Pending) and detailed status information.

In the above image one can see Host Status Summary and Service Status Summary also how many host are up, down and also errors in detail

5) Now click on Host Group Status.

The screenshot shows the Nagios XI web interface. The top navigation bar includes links for Home, Views, Dashboards, Reports, Configure, Tools, Help, Admin, and Logout. The left sidebar contains sections for Quick View, Home Dashboard, Host Status, Service Status, Hostgroup Summary, Servicegroup Summary, Metrics, Graphs, Maps, and Incident Management. The main content area displays the Host Group Status and Service Status Summary. The Host Group Status section shows a summary view with icons for hosts and services, and a table for Status Summary For All Host Groups. The Service Status Summary section shows tables for Host Status Summary and Service Status Summary, both updated at 2021-10-05 05:09:55. The bottom footer includes links for About, Legal, and Copyright information.

Host Group Status

Summary View

Host Status

Service Status

Hostgroup Summary

Servicegroup Summary

Metrics

Graphs

Maps

Incident Management

Host Status Summary

| Up | Down | Unreachable | Pending |
|-----------|----------|-------------|---------|
| 50 | 1 | 0 | 6 |
| Unhandled | Problems | All | |
| 3 | 3 | 59 | |

Last Updated: 2021-10-05 05:09:55

Service Status Summary

| Ok | Warning | Unknown | Critical | Pending |
|-----------|----------|---------|----------|---------|
| 261 | 99 | 5 | 135 | 7 |
| Unhandled | Problems | All | | |
| 239 | 239 | 1007 | | |

Last Updated: 2021-10-05 05:09:55

Status Summary For All Host Groups

| Host Group | Hosts | Services |
|---|-------|--|
| Monitoring Servers (Monitoring Servers) | 5 Up | 93 Ok 14 Warning 2 Critical |
| Hostgroup Two (hg2) | 11 Up | 11 Ok 4 Warning 2 Unknown 3 Critical |
| Some Other Hostgroup (hg3) | 2 Up | 11 Ok 1 Warning 2 Critical |
| Linux Servers (linux-servers) | 11 Up | 318 Ok 27 Warning 2 Unknown 15 Critical |
| Network Devices (network-devices) | 7 Up | 215 Ok 35 Warning 62 Critical |

6) Now we click on BBMap

In this we can see status of following stuff in each host-

7) Now we have Network status map which is graphical representation of the network status



Conclusion:-

Continuous monitoring with Nagios enables proactive detection of system issues, ensuring minimal downtime and enhanced operational efficiency. Through customizable alerts and comprehensive reporting, Nagios empowers administrators to maintain optimal performance across diverse IT environments. Its scalable architecture and robust community support make it an invaluable tool for streamlined and centralized monitoring.

Roll No.:44
Name: Atharva Jadhav
Batch: T13
DATE: 13/10/23

ADVANCE DEVOPS ASSIGNMENT-9

AIM:- To understand AWS Lambda functions

LO MAPPED: LO1, LO5 THEORY:

AWS Lambda is a serverless compute service provided by Amazon Web Services (AWS) that enables you to run code in response to various events without the need to manage servers. It's a key component of AWS's serverless computing offerings. To understand the theory behind AWS Lambda functions, let's break it down into its core concepts:

Serverless Computing:

Serverless computing is a cloud computing model where cloud providers (like AWS) manage the infrastructure for you, allowing you to focus solely on your code.

Lambda Function:

A Lambda function is the fundamental unit of execution in AWS Lambda. It is a piece of code that can be executed in response to events such as HTTP requests, file uploads, database changes, etc. Lambda supports multiple programming languages, including Node.js, Python, Java, and more.

Event Sources:

Lambda functions are triggered by events. These events can come from various AWS services, like Amazon S3, Amazon DynamoDB, Amazon API Gateway, or custom events from your applications. Lambda listens to these event sources and automatically executes the code you've configured.

Stateless Execution:

Lambda functions are stateless, meaning they don't maintain any server-specific state between invocations. Each invocation of a Lambda function is independent and isolated from the others.

Scaling and Concurrency:

AWS Lambda automatically scales based on the number of incoming events. If there are more events, AWS will create more instances of your Lambda function to handle the load, and if there are fewer events, it will scale down accordingly. You pay only for the compute time your code consumes.

Execution Environment:

Each Lambda function runs in an execution environment provided by AWS. You can't control or manage this environment, but you can specify its configuration, including the amount of memory allocated to the function.

Function Versioning and Aliases:

You can create multiple versions of a Lambda function. This is useful for deploying and managing different versions of your code. You can also create aliases to point to specific versions, allowing you to easily switch between them.

IAM Roles:

Lambda functions can assume AWS Identity and Access Management (IAM) roles. These roles define what AWS services and resources the function can interact with, ensuring proper security and access control.

Logging and Monitoring:

AWS Lambda provides built-in logging to capture function execution details. You can also integrate it with AWS CloudWatch for monitoring and creating custom metrics.

Triggers and Destinations:

Lambda can be triggered by various event sources and can send the results to destinations such as other AWS services, like S3, DynamoDB, SNS, and more.

STEPS:

Login to Aws account- Search S3 ,click on the option below shown-

The screenshot shows the AWS Management Console search results for the query 's3'. The search bar at the top contains 's3'. Below it, there are two main sections: 'Services' and 'Features'. The 'Services' section lists 'S3' (Scalable Storage in the Cloud), 'S3 Glacier' (Archive Storage in the Cloud), and 'Athena' (Query Data in S3 using SQL). The 'Features' section lists 'Amazon S3 File Gateway' (Storage Gateway feature) and 'Datasets' (IoT Analytics feature). A sidebar on the right provides information about the AWS mobile app and location maps.

Create an S3 bucket by giving it a name

The screenshot shows the 'Create bucket' wizard in the Amazon S3 console. The first step, 'General configuration', is displayed. It includes fields for 'Bucket name' (set to 'myawsbucket'), 'AWS Region' (set to 'Asia Pacific (Mumbai) ap-south-1'), and a 'Copy settings from existing bucket - optional' section with a 'Choose bucket' button. The second step, 'Block Public Access settings for this bucket', is partially visible below. At the bottom, there is a checkbox for 'Block all public access' which is checked, and a note explaining that public access is granted through ACLs, policies, and access points.

Tags (0) - optional
Track storage cost or other criteria by tagging your bucket. [Learn more](#)

No tags associated with this bucket.

Add tag

Default encryption
Automatically encrypt new objects stored in this bucket. [Learn more](#)

Server-side encryption

Disable
 Enable

Advanced settings

ⓘ After creating the bucket you can upload files and folders to the bucket, and configure additional bucket settings.

Create bucket

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Click on upload button after the s3 bucket is created in the object section

Amazon S3 > neel-patel-t21-82 > Upload

Upload [Info](#)

Add the files and folders you want to upload to S3. To upload a file larger than 160GB, use the AWS CLI, AWS SDK or Amazon S3 REST API. [Learn more](#)

Drag and drop files and folders you want to upload here, or choose **Add files**, or **Add folders**.

Files and folders (0)

All files and folders in this table will be uploaded.

| | Name | Folder | Type | Size |
|---------------------|------|--------|------|------|
| No files or folders | | | | |

You have not chosen any files or folders to upload.

Destination

Destination

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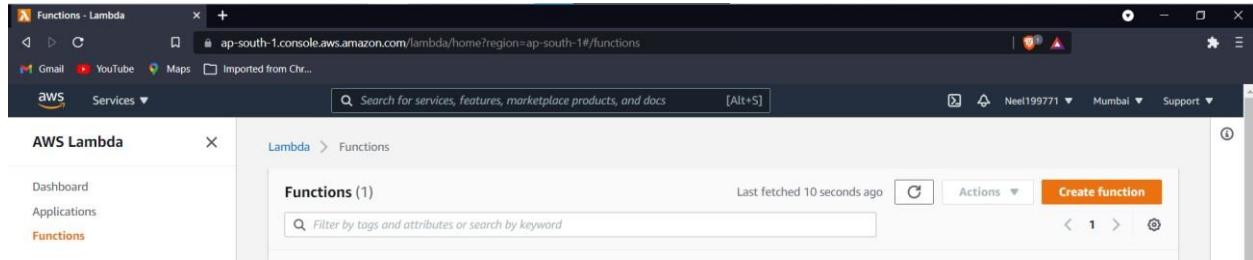
Add any .py or .java extenstion file and click on upload

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Now search Lamda

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Click create function

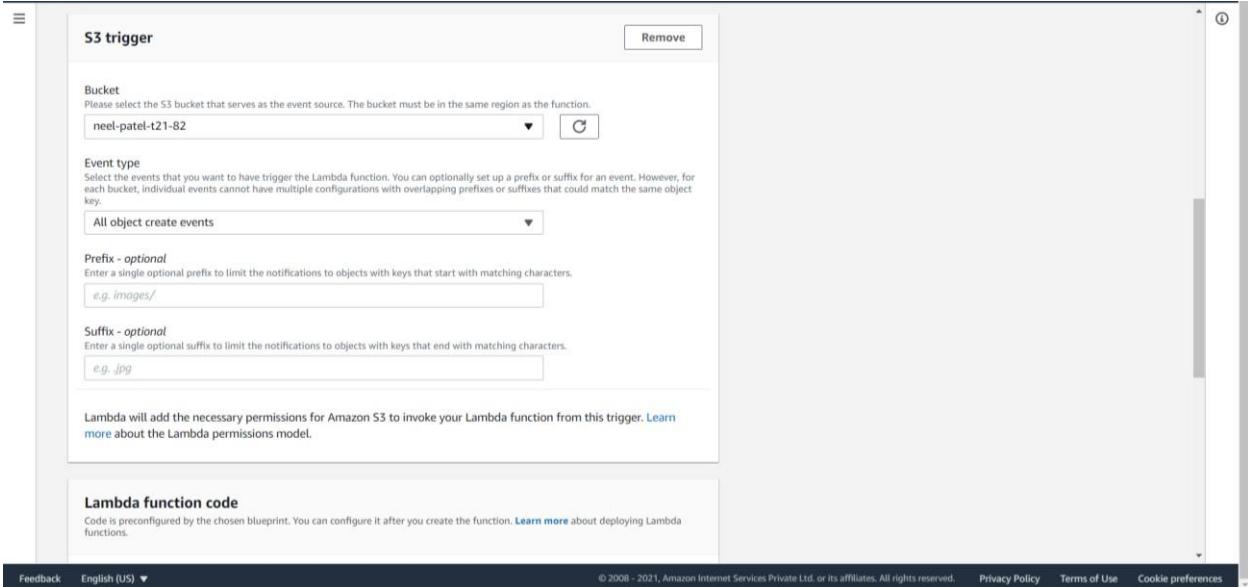


Click on below options and click on configure

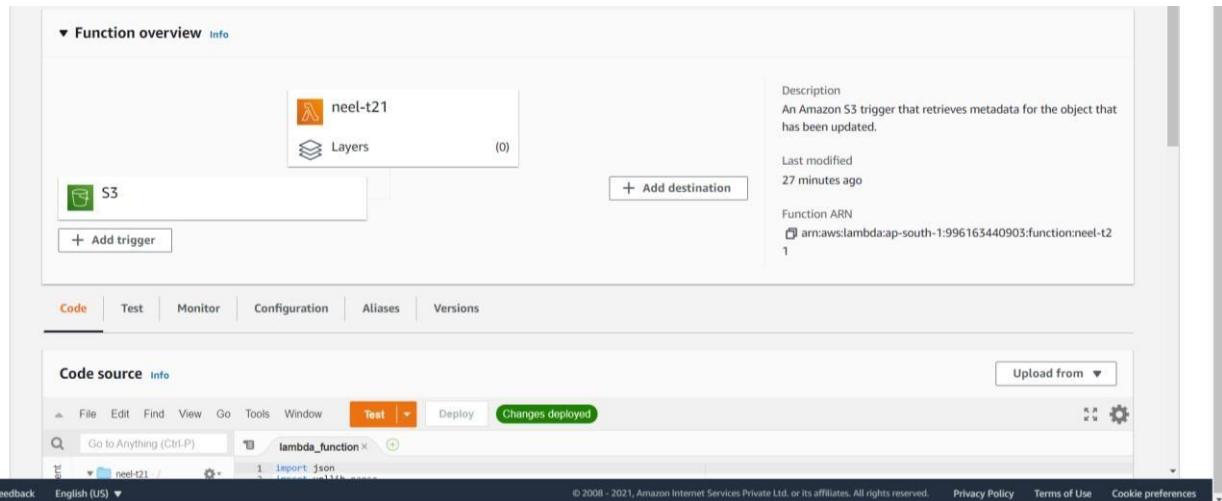
A screenshot of the 'Create function' wizard. The current step is 'Blueprints'. It shows a grid of blueprint options. One option, 's3-get-object-python', is highlighted with a blue border. Other options include 'kinesis-firehose-syslog-to-json', 'config-rule-change-triggered', 'lex-book-trip-python', 'dynamodb-process-stream', 'microservice-http-endpoint', 'kinesis-analytics-output', and 'node-exec'. Each option has a brief description and a small preview image.

A screenshot of the 'Configure blueprint s3-get-object-python' step. Under 'Basic information', the 'Function name' field is set to 'Neelt21'. The 'Execution role' section shows 'Create a new role from AWS policy templates' selected. A note says 'Role creation might take a few minutes. Please do not delete the role or edit the trust or permissions policies in this role.' Below this, the 'Role name' field is 'myRoleName' and the 'Policy templates - optional' dropdown contains 'Amazon S3 object read-only permissions'. The bottom of the page includes standard AWS footer links.

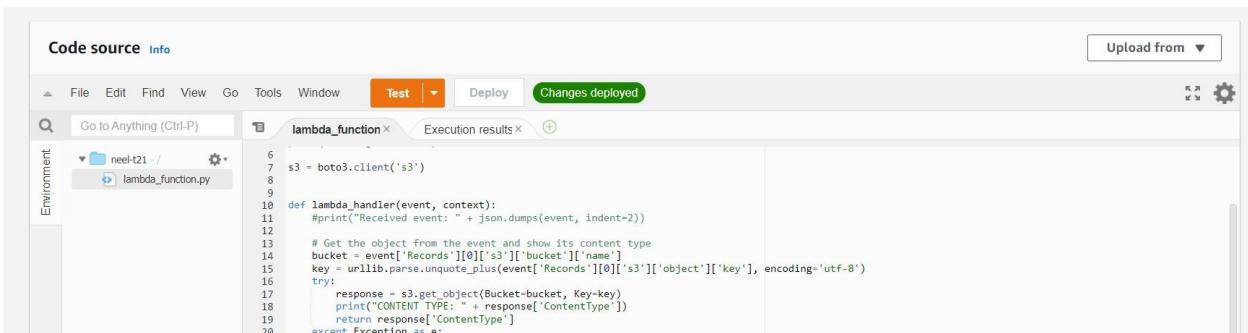
Select the bucket created and create trigger ,click on create function-



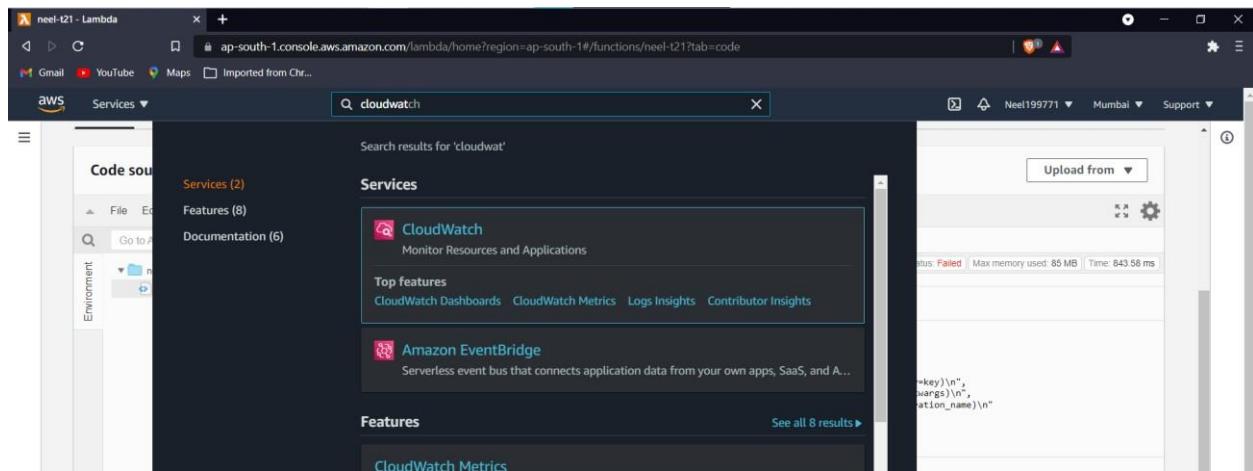
Check the given trigger is created



Click on the orange test button-



Now,



Check the logs of the test-

Now terminate-

Click on delete function.

The screenshot shows the AWS Lambda Function Overview page for a function named 'neel-t21'. The function has one trigger, 'S3', which is an Amazon S3 trigger that retrieves metadata for objects updated in a bucket. There are no layers associated with this function. The function was last modified 31 minutes ago. The ARN is arn:aws:lambda:ap-south-1:1996163440903:function:neel-t21. The 'Code source' tab is selected, showing the code editor interface with tabs for File, Edit, Find, View, Go, Tools, Window, Test, Deploy, and Changes deployed. The 'Changes deployed' tab is active. The code editor shows a single file named 'lambda_function.py' with the following content:

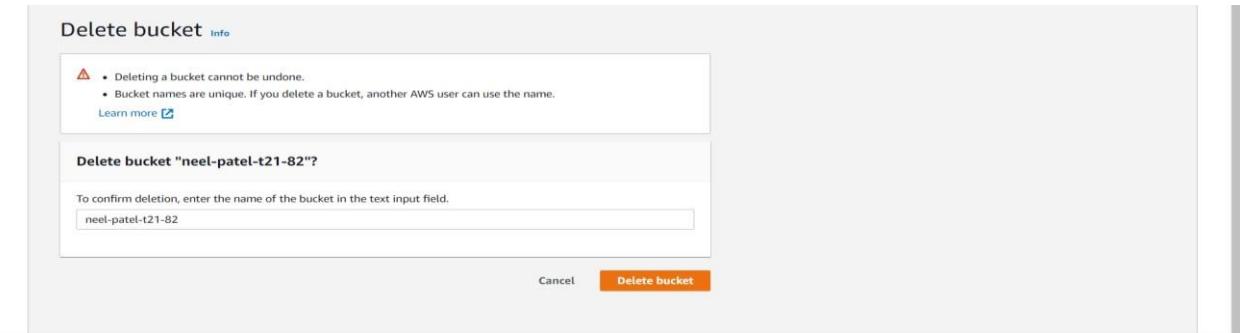
```
def lambda_handler(event, context):
```

The screenshot shows a confirmation dialog box titled 'Delete function neel-t21'. The message inside the box states: 'Deleting a function permanently removes the function code. The related logs and roles are retained in your account.' At the bottom right of the dialog are two buttons: 'Cancel' and a prominent orange 'Delete' button.

Empty bucket

The screenshot shows a confirmation dialog box for emptying an S3 bucket. The title is 'Empty bucket neel-patel-t21-82'. It contains a warning message: 'Emptying the bucket deletes all objects in the bucket and cannot be undone. Objects added to the bucket while the empty bucket action is in progress might be deleted. To prevent new objects from being added to this bucket while the empty bucket action is in progress, you might need to update your bucket policy to stop objects from being added to the bucket.' Below this is a 'Learn more' link. Another section provides information about lifecycle rules: 'If your bucket contains a large number of objects, creating a lifecycle rule to delete all objects in the bucket might be a more efficient way of emptying your bucket.' A 'Go to lifecycle rule configuration' link is provided. The main action button is 'Empty', which is highlighted in orange. A 'Cancel' button is also present.

Delete bucket-



CONCLUSION:

In this assignment, we covered the core concepts and terminologies of AWS Lambda, explored its practical applications, and gained an understanding of how it integrates with various AWS services.

Name :- Atharva Jadhav

Roll No:- 2105044

Batch:- T13

Date Of Performance :- 05/09/2023

Experiment 10

Aim:-

To create a Lambda function using Python for adding data to Dynamo DB database.

Theory:-

DYNAMO DB

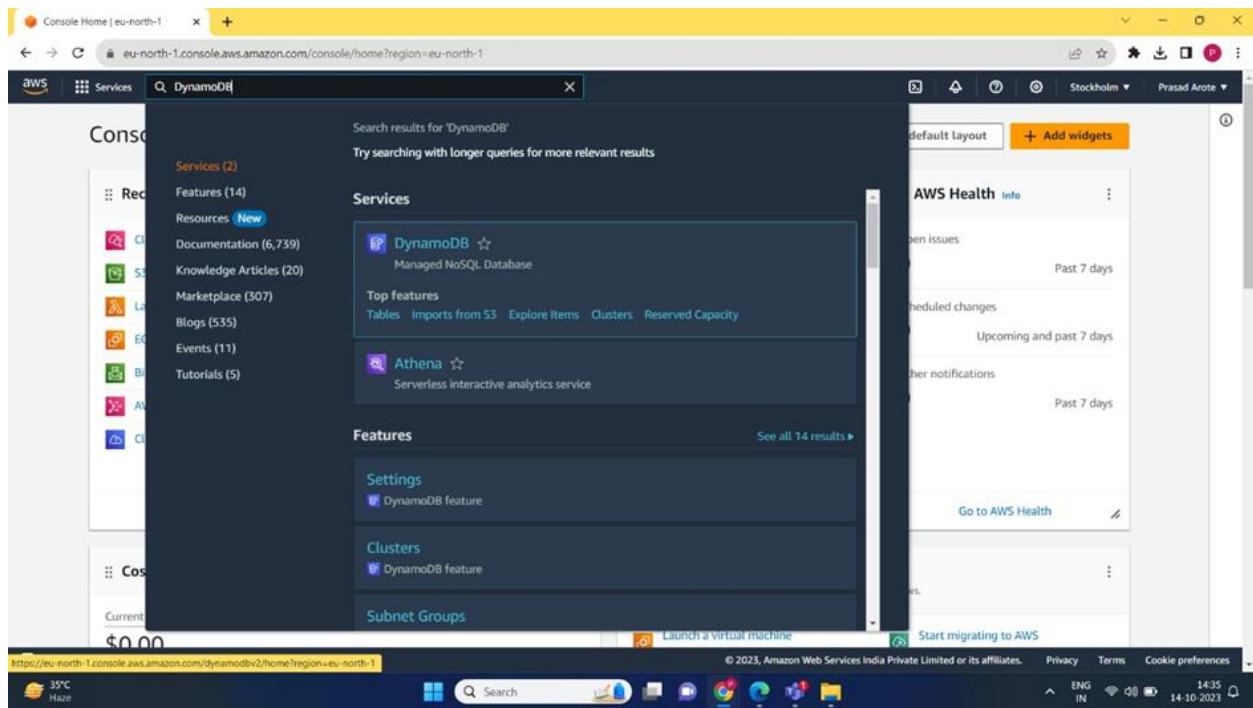
Amazon DynamoDB is a fully managed NoSQL database service that provides fast and predictable performance with seamless scalability. DynamoDB lets you offload the administrative burdens of operating and scaling a distributed database so that you don't have to worry about hardware provisioning, setup and configuration, replication, software patching, or cluster scaling. DynamoDB also offers encryption at rest, which eliminates the operational burden and complexity involved in protecting sensitive data.

With DynamoDB, you can create database tables that can store and retrieve any amount of data and serve any level of request traffic. You can scale up or scale down your tables' throughput capacity without downtime or performance degradation. You can use the AWS Management Console to monitor resource utilization and performance metrics

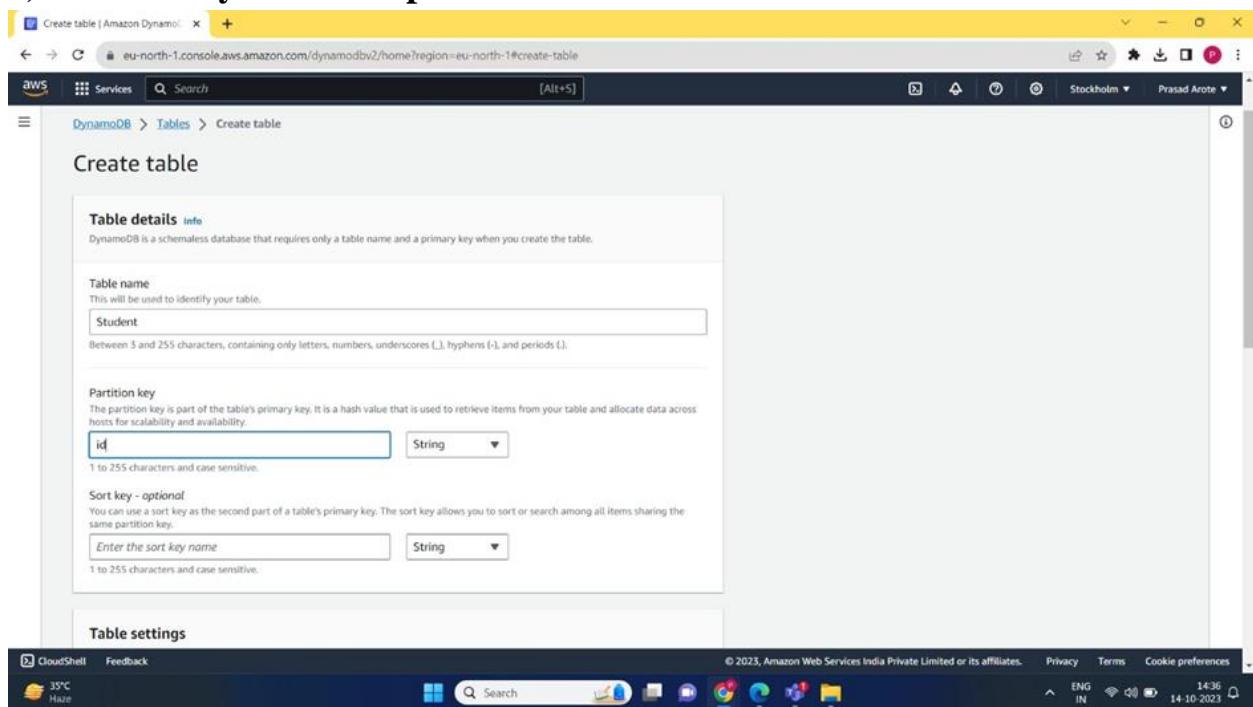
DynamoDB provides on-demand backup capability. It allows you to create full backups of your tables for long-term retention and archival for regulatory compliance needs.

Steps :-

1) Login to AWS account and search for DynamoDB in search bar



2) Click on DynamoDB option shown above and then click on create table



3) Then search IAM in the search box above and create a new role , give AmazonDynamoFullAccess permission to created user

Screenshot of the AWS IAM 'Create role' wizard - Step 1: Select trusted entity.

The 'Trusted entity type' section shows five options:

- AWS service: Allow AWS services like EC2, Lambda, or others to perform actions in this account.
- AWS account: Allow entities in other AWS accounts belonging to you or a 3rd party to perform actions in this account.
- Web identity: Allows users federated by the specified external web identity provider to assume this role to perform actions in this account.
- SAML 2.0 federation: Allow users federated with SAML 2.0 from a corporate directory to perform actions in this account.
- Custom trust policy: Create a custom trust policy to enable others to perform actions in this account.

The 'Use case' section shows a dropdown menu set to 'Lambda'. The 'Service or use case' dropdown also has 'Lambda' selected.

Screenshot of the AWS IAM 'Create role' wizard - Step 2: Add permissions.

The 'Permissions policies (1/887)' section shows a list of AWS managed policies:

| Policy name | Type | Description |
|--|-------------|---|
| <input checked="" type="checkbox"/> AmazonDynamoDBFullAccess | AWS managed | Provides full access to Amazon DynamoDB. |
| <input type="checkbox"/> AmazonDynamoDBReadOnlyAccess | AWS managed | Provides read only access to Amazon DynamoDB. |
| <input type="checkbox"/> AWSLambdaDynamoDBExecutionRole | AWS managed | Provides list and read access to DynamoDB. |
| <input type="checkbox"/> AWSLambdaInvocation-DynamoDB | AWS managed | Provides read access to DynamoDB Stream. |

A search bar at the top of the list allows filtering by policy name, and a 'Filter by Type' dropdown is present.

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

Step 2: Add permissions

Role name: prasad_admin

Description: Allows Lambda functions to call AWS services on your behalf.

Step 1: Select trusted entities

Trust policy:

```

1- [
2-   "Version": "2012-10-17",
3-   "Statement": [
4-     {
5-       "Effect": "Allow",
6-       "Action": [
7-         "sts:AssumeRole"
8-       ],
9-       "Principal": [
10-         "lambda.amazonaws.com"
11-       ]
12-     }
  ]

```

Identity and Access Management (IAM) - Roles (9) Info

| Role name | Trusted entities | Last activity |
|---|--|---------------|
| AWSCloud9SSMAccessRole | AWS Service: ec2, and 1 more | 75 days ago |
| AWSServiceRoleForApplicationAutoScaling_DynamoDBTable | AWS Service: dynamodb.application- | - |
| AWSServiceRoleForAWSCloud9 | AWS Service: cloud9 (Service-Linked) | 75 days ago |
| AWSServiceRoleForSupport | AWS Service: support (Service-Linked) | - |
| AWSServiceRoleForTrustedAdvisor | AWS Service: trustedadvisor (Service-Linked) | - |
| lambdafunc1-role-11c5j6u | AWS Service: lambda | 1 hour ago |
| prasad_admin | AWS Service: lambda | - |
| PyRole | AWS Service: lambda | 68 days ago |
| Runpython | AWS Service: lambda | 68 days ago |

4) Search Lambda in search box and click on it , then create a new lambda function

The screenshot shows two windows from the AWS Management Console.

Top Window: A search results page for 'lambda'. The search bar at the top contains 'lambda'. Below it, a heading says 'Search results for "lambda"' followed by the instruction 'Try searching with longer queries for more relevant results'. A sidebar on the left lists 'Services (7)' under 'Features (3)' and 'Resources (New)'. The main area shows a list of services: Lambda (selected), CodeBuild, AWS Signer, and Amazon Inspector. To the right is a sidebar titled 'AWS Health Info' with sections for 'Open issues' (Past 7 days), 'Scheduled changes' (Upcoming and past 7 days), and 'Other notifications' (Past 7 days). At the bottom right of the main area is a link 'Go to AWS Health'.

Bottom Window: A 'Create function' wizard. The title bar says 'eu-north-1.console.aws.amazon.com/lambda/home?region=eu-north-1'. The main content area is titled 'Create function' with a sub-link 'info'. It asks 'Choose one of the following options to create your function.' Four options are shown in boxes: 'Author from scratch' (selected), 'Use a blueprint', 'Container image', and 'Browse serverless app repository'. Below this is a section titled 'Basic information'.

Basic Information Section:

- Function name:** addstudentdata
- Runtime:** Python 3.9
- Architecture:** x86_64
- Permissions:** (Info)

At the bottom of the window, there are links for 'CloudShell', 'Feedback', and the AWS footer with copyright information and language/region settings.

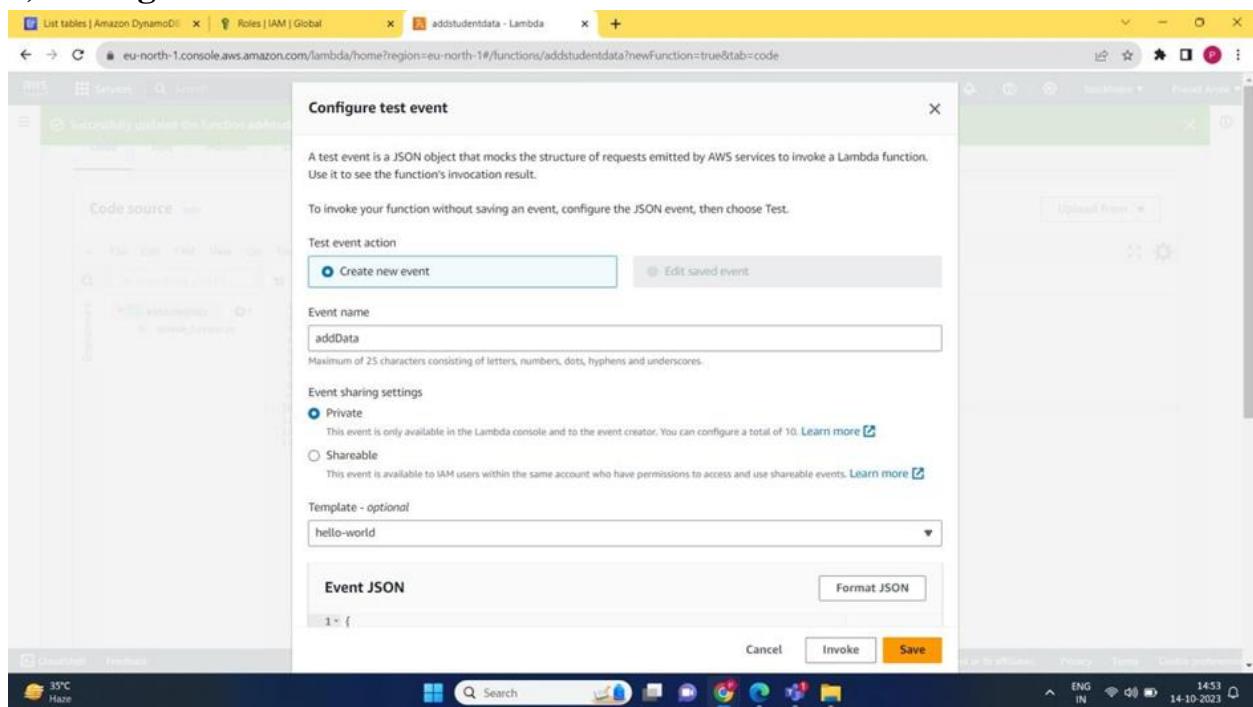
The screenshot shows the AWS Lambda 'Create function' wizard. In the 'Function name' step, the user has entered 'addstudentdata'. The 'Runtime' dropdown is set to 'Python 3.9'. In the 'Architecture' section, 'x86_64' is selected. Under 'Permissions', the 'Execution role' is set to 'Use an existing role' with 'prasad_admin' selected. The 'Existing role' dropdown also shows 'prasad_admin'. The 'Advanced settings' section is collapsed.

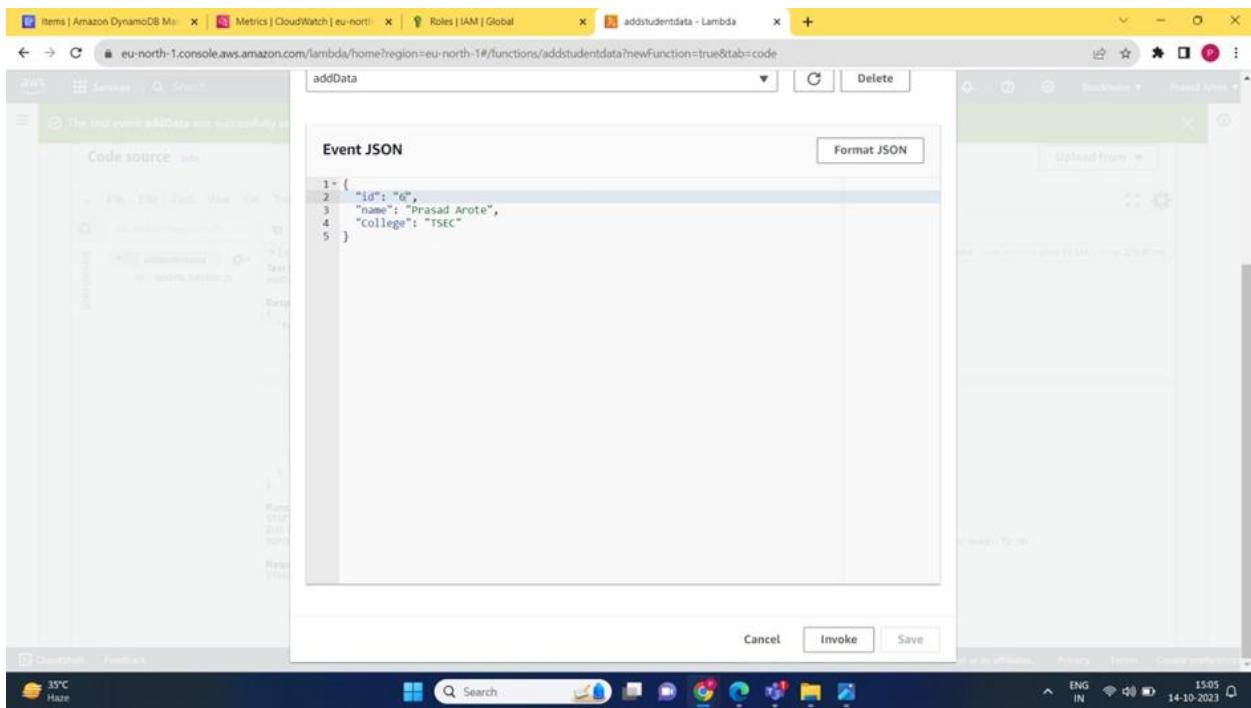
The screenshot shows the 'Permissions' step of the Lambda creation wizard. It displays the same configuration as the previous step, including the 'Execution role' set to 'Use an existing role' with 'prasad_admin' selected. The 'Existing role' dropdown also shows 'prasad_admin'. The 'Advanced settings' section is collapsed.

5) Write the following code in code source

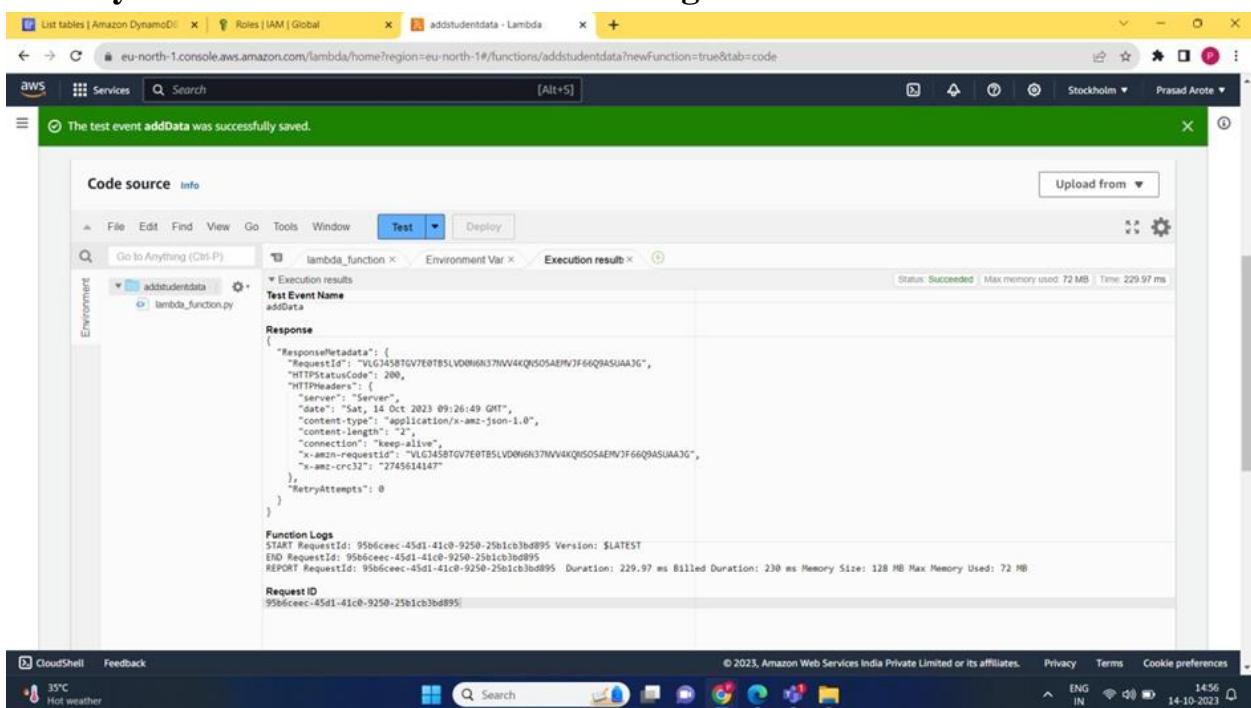
```
import json
import boto3
client_dynamo = boto3.resource('dynamodb')
table=client_dynamo.Table('Student')
def lambda_handler(event, context):
    # TODO implement
    response=table.put_item(Item=event)
    return response
```

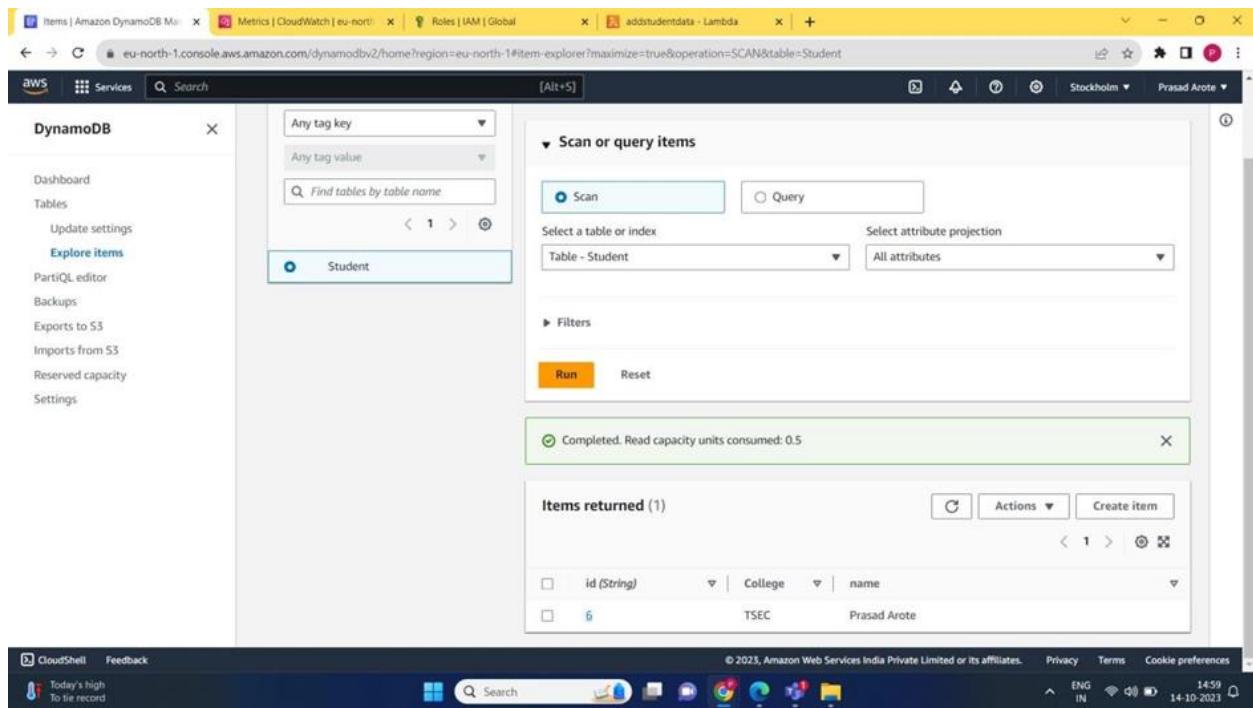
6) Configure the test event and save





7) Run the test and afterwards go to the DynamoDB>Explore items> Student where you can see the record inserted using lambda function.





Conclusion:-

Learnt about Amazon DynamoDB database service and inserted data into DynamoDB database by creating a new user , granting him permissions and then using a lambda function

Name :- Atharva Jadhav

RollNo :- 2105044

Batch :- T13

Date Of Performance :- 13/10/2023

Written Assignment 1:Study of Kubernetes

Q1) What security measures can be taken while using kubernetes ?

There are a number of security measures that can be taken while using Kubernetes. Some of the most important include:

- 1)Use Role-Based Access Control (RBAC):** RBAC allows you to define who has access to the Kubernetes API and what permissions they have. This is essential for preventing unauthorized access to your cluster and its resources.
- 2)Use third-party authentication for the API server:** This allows you to integrate Kubernetes with an existing identity provider, such as GitHub or Okta. This can make it easier to manage user accounts and permissions.
- 3)Protect etcd with TLS and a firewall:** etcd is a distributed key-value store that stores the state of your Kubernetes cluster. It is a critical component, so it is important to protect it from unauthorized access.
- 4)Isolate Kubernetes nodes:** Kubernetes nodes are the machines that run your containerized applications. It is important to isolate them from the rest of your network to prevent attackers from gaining access to your cluster.
- 5)Monitor network traffic to limit communications:** Kubernetes workloads can communicate with each other over the network. It is important to monitor this traffic and limit it to only the necessary communication paths.
- 6)Use process whitelisting:** Process whitelisting allows you to define which processes are allowed to run on your Kubernetes nodes. This can help to prevent attackers from running malicious code on your cluster.
- 7)Turn on audit logging:** Audit logging records all activity on your Kubernetes cluster. This can help you to detect and investigate security incidents.
- 8)Keep Kubernetes up to date:** The Kubernetes team regularly releases security updates. It is important to keep your Kubernetes cluster up to date to protect against known vulnerabilities.
- 9)Lock down the Kubelet:** The Kubelet is a service that runs on each Kubernetes node and is responsible for managing pods. It is important to lock down the Kubelet to prevent attackers from gaining control of your nodes.

In addition to these general security measures, there are a number of other specific things you can do to secure your Kubernetes cluster, such as:

- 10) Use Kubernetes namespaces to isolate your workloads:** Namespaces allow you to group your workloads together and isolate them from each other. This can help to prevent attackers from moving laterally between your workloads.
- 11) Use Pod Security Policies (PSPs) to restrict the privileges of your pods:** PSPs allow you to define what resources and privileges your pods are allowed to use. This can help to prevent attackers from gaining access to sensitive data or running malicious code on your cluster.
- 12) Use a service mesh to manage network traffic between your workloads:** A service mesh can help you to secure and manage the network traffic between your workloads. This can help to prevent attackers from communicating with your workloads or eavesdropping on their traffic.
- 13) Use a security scanner to scan your container images for vulnerabilities:** A security scanner can help you to identify and fix vulnerabilities in your container images before they are deployed to your cluster.
- 14) Implement a security incident response plan:** A security incident response plan will help you to respond to security incidents in a timely and effective manner.

By following these security measures, you can help to protect your Kubernetes cluster and its workloads from attack.

Q2) What are the three security techniques used to protect data ?

The three most important security techniques used to protect data are:

- 1) Encryption**
- 2) Access control**
- 3) Backup and recovery**

Encryption is the process of converting data into a format that cannot be read without a secret key. This makes data unreadable to unauthorized individuals, even if they have access to it. Encryption can be used to protect data at rest, in transit, and in use.

Access control is the process of restricting access to data to authorized individuals. This can be done using a variety of methods, such as passwords, multi-factor authentication, and role-based access control (RBAC). Access control is important for preventing unauthorized individuals from accessing and modifying data.

Backup and recovery is the process of creating copies of data and storing them in a secure location. This is important for protecting data from loss or corruption. Backup and recovery plans should be regularly tested to ensure that they are working properly.

In addition to these three core security techniques, there are a number of other security measures that can be used to protect data, such as network security, physical security, and security awareness training.

Here are some examples of how these three security techniques can be used to protect data:

Encryption: A company can encrypt its customer database to protect it from unauthorized access, even if the database is compromised.

Access control: A hospital can use RBAC to restrict access to patient medical records to authorized personnel, such as doctors and nurses.

Backup and recovery: A government agency can regularly back up its financial data to a secure location in case of a cyberattack or natural disaster.

By using these security techniques, organizations can help to protect their data from unauthorized access, modification, and loss.

Q3) How do you expose a service using ingress in Kubernetes?

To expose a service using Ingress in Kubernetes, you need to create an **Ingress resource**. An Ingress resource specifies the rules for routing traffic to your services.

To create an Ingress resource, you can use the following command:

kubectl create ingress <ingress-name>

The Ingress resource must specify the following:

- 1) **The rules for routing traffic to your services.**
- 2) **The hostname or IP address that traffic will be routed to.**
- 3) **The port that traffic will be routed to.**

For example, the following Ingress resource exposes a service named my-service on port 80:

apiVersion: networking.k8s.io/v1

kind: Ingress

metadata:

name: my-ingress

spec:

rules:

- http:

paths:

- path: /

pathType: Prefix

```
backend:
service:
name: my-service
port: 80
```

Once you have created the Ingress resource, you can access the service at the hostname or IP address specified in the Ingress resource. For example, if the Ingress resource specifies the hostname my-service.example.com, you can access the service at my-service.example.com on port 80.

You can also use Ingress to expose multiple services on the same hostname or IP address. To do this, you can specify multiple rules in the Ingress resource. For example, the following Ingress resource exposes two services, my-service and my-other-service, on port 80:

```
apiVersion: networking.k8s.io/v1
kind: Ingress
metadata:
name: my-ingress
spec:
rules:
- http:
  paths:
  - path: /
  pathType: Prefix
  backend:
    service:
      name: my-service
      port: 80
- http:
  paths:
  - path: /other
  pathType: Prefix
  backend:
    service:
      name: my-other-service
      port: 80
```

Ingress is a powerful tool for exposing services in Kubernetes. It allows you to expose services on a specific hostname or IP address, and to expose multiple services on the same hostname or IP address

Q4) Which service protocol does Kubernetes ingress expose ?

Ingress is a Kubernetes resource that allows you to expose services running in a cluster to external traffic. **Ingress can expose services through either HTTP or HTTPS.**

To expose a service using Ingress, you need to create an Ingress resource. An Ingress resource specifies the rules for routing traffic to your services.

When you create an Ingress resource, you need to specify the following:

- 1) The rules for routing traffic to your services.**
- 2) The hostname or IP address that traffic will be routed to.**
- 3) The port that traffic will be routed to.**

The Ingress resource also specifies the service protocol, which can be either HTTP or HTTPS.

To expose a service using HTTP, you need to specify the http protocol in the Ingress resource. For example, the following Ingress resource exposes a service named my-service on port 80 using HTTP:

```
apiVersion: networking.k8s.io/v1
kind: Ingress
metadata:
  name: my-ingress
spec:
  rules:
  - http:
      paths:
      - path: /
        pathType: Prefix
        backend:
          service:
            name: my-service
            port: 80
```

To expose a service using HTTPS, you need to specify the https protocol in the Ingress resource. For example, the following Ingress resource exposes a service named my-service on port 443 using HTTPS:

```
apiVersion: networking.k8s.io/v1
kind: Ingress
```

```
metadata:
  name: my-ingress
spec:
  tls:
    - hosts:
      - my-service.example.com
        secretName: my-tls-secret
  rules:
    - http:
      paths:
        - path: /
      pathType: Prefix
      backend:
        service:
          name: my-service
          port: 443
```

Once you have created the Ingress resource, you can access the service at the hostname or IP address specified in the Ingress resource. For example, if the Ingress resource specifies the hostname my-service.example.com, you can access the service at my-service.example.com on port 80.

You can also use Ingress to expose multiple services on the same hostname or IP address. To do this, you can specify multiple rules in the Ingress resource.

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ADVANCE DEVOPS WRITTEN ASSIGNMENT-2

Q.1 How to deploy Lambda function on AWS?

=>Deploying a Lambda function on AWS involves several steps. Here's a detailed guide on how to deploy a Lambda function:

Prerequisites:

An AWS account.

The AWS Command Line Interface (CLI) installed and configured with appropriate permissions.

Your Lambda function code packaged as a ZIP archive or uploaded to an Amazon S3 bucket.

Familiarity with the programming language and runtime you're using for your Lambda function (e.g., Node.js, Python, Java, etc.).

Step-by-Step Guide to Deploying a Lambda Function: Create or Prepare Your Lambda Function Code:

Write your Lambda function code or prepare it if you haven't already. Ensure it follows the AWS Lambda function structure, including the handler function. Package Your Code:

If your function code consists of multiple files or dependencies, package it as a ZIP archive. Make sure that the primary function handler is at the top level of the archive. Create an Execution Role (if needed):

Lambda functions often need permissions to interact with other AWS services. Create an AWS Identity and Access Management (IAM) role that grants the necessary permissions to your Lambda function. The role should have policies attached that allow access to AWS resources, like S3, DynamoDB, or others. Upload Code to Amazon S3 (if needed):

If your deployment package is larger than 3 MB, you will need to upload it to an Amazon S3 bucket. Make sure your Lambda function has permissions to access this bucket.

Deploy the Lambda Function:

You can deploy a Lambda function using the AWS Management Console, AWS CLI, AWS SDKs, or AWS CloudFormation. Here's how to deploy using the AWS CLI:

Open a terminal and run the following AWS CLI command to create your Lambda function:

```
aws lambda create-function --function-name MyFunctionName --runtime nodejs14.x  
role arn:aws:iam::123456789012:role/MyRole --handler index.handler --zip-file  
fileb://function.zip
```

Replace MyFunctionName with your desired function name.

Specify the correct runtime for your function (e.g., nodejs14.x for Node.js 14).

Use the --role option with the ARN of the IAM role you created. Specify the --handler option with the name of your handler function. Use --zip-file to reference your deployment package.

Test Your Lambda Function:

After creating your Lambda function, you can test it using the AWS Management Console, AWS CLI, or an SDK. Make sure it works as expected.

Configure Event Sources (if needed):

If your Lambda function is triggered by events from other AWS services (e.g., S3, SNS, API Gateway), configure these event sources in the AWS Management Console.

Set Up Environment Variables (if needed):

If your function relies on environment variables, configure these in the Lambda function's configuration.

Deploy Updates (if needed):

If you make changes to your function code or configuration, you can update the Lambda function by uploading a new deployment package, and the changes will be applied.

Monitor and Troubleshoot:

Use AWS CloudWatch and other monitoring tools to track the performance and behavior of your Lambda function. You can also view logs and error messages in CloudWatch Logs to troubleshoot issues.

Scale and Manage Your Function:

AWS Lambda automatically scales your function to handle incoming requests. You can configure concurrency limits, timeout settings, and other properties to manage its behavior.

Cost Management:

Keep an eye on the costs associated with your Lambda function, as you'll be billed based on the number of requests and duration of execution. Utilize cost management tools and set up billing alerts to avoid unexpected charges.

Deploying a Lambda function on AWS is a straightforward process, but it's important to pay attention to configuration, permissions, and monitoring to ensure your function operates as expected in a production environment.

Q.2 What are the deployment options for AWS Lambda?

AWS Lambda offers several deployment options, each suited for different use cases and development workflows. Here are the primary deployment options for AWS Lambda, explained in detail:

Upload Deployment Package:

This is the simplest deployment option. You create a ZIP archive that contains your function code and dependencies. Then, you manually upload it when creating or updating your Lambda function. This approach is suitable for small functions or when you need full control over your deployment process.

Steps:

Create a ZIP archive containing your function code and dependencies.

Use the AWS Management Console, AWS CLI, or AWS SDKs to create or update your Lambda function, providing the ZIP archive as the deployment package. S3 Bucket Deployment:

For larger deployment packages or for separating the deployment process from the Lambda function creation or update, you can store your deployment package in an Amazon S3 bucket. When you create or update a Lambda function, you specify the S3 bucket location for your deployment package.

Steps:

Upload your deployment package to an S3 bucket.

Use the AWS Management Console, AWS CLI, or AWS SDKs to create or update your Lambda function, specifying the S3 bucket location. AWS Serverless Application Model (SAM):

SAM is an open-source framework for building serverless applications. It extends AWS CloudFormation to provide a simplified way to define the Amazon API Gateway APIs, AWS Lambda functions, and Amazon DynamoDB tables needed by your serverless application. You can define your Lambda function configurations and deployment details in a template.yaml file, which SAM uses to create and deploy the function. Steps:

Create a template.yaml file that defines your Lambda function and its dependencies. Use the AWS SAM CLI to package and deploy your serverless application to AWS. This CLI tool simplifies packaging and deployment, including the creation of Amazon S3 buckets for deployment. Lambda Layers:

Lambda Layers allow you to separate your function code from its dependencies. You can create a custom Layer with your dependencies and then reference it in your Lambda function. When updating the dependencies, you only need to update the Layer, reducing the size and complexity of the deployment package. Steps:

Create a Lambda Layer containing your dependencies.

Reference the Layer in your Lambda function configuration.

When updating dependencies, update the Layer without changing your function code.

Container Images (AWS Lambda for Containers):

AWS Lambda added support for running functions in container images. With this option, you build a container image with your function code, dependencies, and any runtime environment you need. You can use your preferred container registry to store the image. Lambda manages the container execution, scaling, and resource allocation. Steps:

Build a Docker container image with your function code and dependencies.

Push the image to a container registry (e.g., Amazon ECR, Docker Hub).

Create a Lambda function using the image from your container registry. Continuous Deployment Tools:

You can integrate AWS Lambda deployment into your continuous deployment pipelines using tools like AWS CodePipeline, AWS CodeBuild, Jenkins, or any other CI/CD solution. This approach automates the deployment process, allowing you to push changes to your function code in a version-controlled manner. Steps:

Set up a CI/CD pipeline that monitors your code repository.

Configure the pipeline to build and deploy your Lambda function when changes are detected.

Each of these deployment options has its own advantages and is suitable for different scenarios. The choice depends on factors such as the size and complexity of your

function, your development workflow, and whether you require more granular control over your deployments.

Q.3 What are the 3 full deployment modes that can be used for AWS?

In the context of AWS, there are three primary full deployment modes, each offering a distinct approach to deploying and managing applications. These modes are designed to accommodate different use cases and operational requirements. Let's explore each of them in detail:

EC2-Based Deployment:

Description:

EC2-based deployment is the traditional deployment mode in AWS where you provision and manage virtual machines (EC2 instances) to run your applications. In this mode, you have full control over the underlying infrastructure, including the choice of instance types, operating systems, and configuration. This mode is ideal for applications that require a high degree of customization or when you have legacy systems that need to run in a traditional virtualized environment.

Use Cases:

Running legacy applications or software that can't be containerized.

Applications with complex network configurations or specific hardware requirements.

When you need to manage the entire stack from the operating system up.

Key Components:

Amazon Elastic Compute Cloud (EC2) instances.

Amazon Virtual Private Cloud (VPC) for network isolation.

Elastic Load Balancers for distributing traffic.

Amazon RDS or other database services for data storage.

Benefits:

Complete control over infrastructure.

Compatibility with a wide range of software. Ability to run non-containerized or legacy applications.

Challenges:

Manual scaling and management of EC2 instances.

More operational overhead compared to serverless or container-based solutions.
Limited automation compared to other deployment modes.

Serverless Deployment:

Description:

Serverless deployment is a modern cloud computing paradigm in which you focus solely on writing code (usually in the form of functions) and let the cloud provider manage all the underlying infrastructure. AWS Lambda is a key component of this approach, allowing you to run code in response to events without provisioning or managing servers. Serverless computing is highly scalable and event-driven.

Use Cases:

Building scalable, event-driven applications.

Microservices architecture.

Real-time data processing and analysis.

Reducing operational overhead by offloading infrastructure management.

Key Components:

AWS Lambda for running code in response to events.

Amazon API Gateway for exposing APIs.

Various AWS services for data storage and processing. Amazon EventBridge or Amazon S3 event triggers for event-driven applications.

Benefits:

Auto-scaling and high availability.

Minimal operational overhead.

Pay-per-use pricing.

Easy integration with other AWS services.

Challenges:

Stateless execution, which may require workarounds for stateful applications.

Limited runtime options compared to EC2 instances. Function duration and resource limits.

Container-Based Deployment:

Description:

Container-based deployment leverages containerization technology to package applications and their dependencies into a consistent and portable format. AWS offers Amazon Elastic Container Service (ECS) and Amazon Elastic Kubernetes Service (EKS) for managing containers in a scalable, automated, and highly available manner.

This deployment mode is ideal for containerized applications, microservices, and orchestrating container workloads.

Use Cases:

Microservices architecture.

Porting and running containerized applications.

Managing applications that need to scale and have dependencies isolated in containers.

Key Components:

Amazon ECS or Amazon EKS for managing containers.

Amazon ECR for container registry.

Docker for building and running containers.

Kubernetes for container orchestration (EKS).

Benefits:

Scalability and flexibility of containerization.

Portability and consistency of containers.

Advanced orchestration and management features in Kubernetes.

Challenges:

Container management complexity.

Learning curve for orchestrators like Kubernetes. Ongoing operational overhead.

These three full deployment modes represent different approaches to deploying and managing applications in AWS. Your choice should be based on your specific requirements, including the nature of your applications, your scalability needs, and your desired level of operational control. It's not uncommon for organizations to use a combination of these deployment modes, depending on their application portfolio and use cases.

Q.4 What are the 3 components of AWS Lambda?

AWS Lambda is a serverless computing service provided by Amazon Web Services (AWS) that allows you to run code in response to events without the need to manage servers. AWS Lambda has three core components that work together to enable serverless compute capabilities:

Lambda Function:

Description: A Lambda function is the core unit of execution in AWS Lambda. It represents your code, which can be written in various programming languages such as Node.js, Python, Java, Go, and more. A Lambda function is a small, self-contained piece of code that can perform a specific task when triggered by an event. It can be as simple as a few lines of code or more complex, and it typically follows a specific structure, including a handler function that AWS Lambda invokes when an event occurs.

Use Cases: Lambda functions are used for a wide range of purposes, including data processing, automation, real-time file processing, API endpoints, and more. They are particularly well-suited for building serverless applications and microservices.

Key Characteristics:

Small, single-purpose code.

Stateless (no persistent storage of data between invocations).

Event-driven execution.

Automatic scaling and resource allocation.

Event Source:

Description: Event sources are triggers that initiate the execution of a Lambda function. These sources can be various AWS services or external systems that generate events. When an event occurs, AWS Lambda is automatically invoked, and the event data is passed to the Lambda function for processing. AWS Lambda supports a wide range of event sources, including AWS services like Amazon S3, Amazon DynamoDB, AWS SNS, and custom event sources using AWS Step Functions.

Use Cases: Event sources enable Lambda functions to respond to changes in data, incoming requests, system events, and more. This makes them suitable for building event-driven applications and automating workflows.

Key Characteristics:

Diverse sources, including AWS services and custom events.

Real-time event triggering.

Integration with various AWS services.

Execution Environment:

Description: The execution environment is the runtime environment where Lambda functions run. AWS Lambda manages and provisions these environments dynamically as needed, and it abstracts the underlying infrastructure from developers. The execution

environment includes the compute resources (CPU, memory) and the network configuration necessary for the function's execution. The environment automatically scales with incoming event load.

Use Cases: The execution environment is responsible for ensuring that Lambda functions can run in a scalable and highly available manner without the need for manual provisioning or management. It enables the on-demand execution of code.

Key Characteristics:

Automatic provisioning and scaling.

Abstracts infrastructure management.

Resource allocation (memory and CPU) defined per function. Isolation between concurrent executions.

Together, these three components form the foundation of AWS Lambda. A Lambda function processes events from various event sources within an execution environment provided by AWS Lambda. The serverless nature of Lambda, where you focus on code rather than infrastructure, allows you to build applications that are highly scalable and responsive to real-time events with minimal operational overhead. This serverless model is particularly valuable for organizations looking to optimize resource utilization and reduce infrastructure management complexities.