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Case Study: Simple Cloud-Based Application Deployment

Aim:

- **Concepts Used:** AWS Cloud9, S3, and EC2.
- **Problem Statement:** "Develop a simple HTML page using AWS Cloud9 and deploy it to an S3 bucket for static website hosting. Then, set up an EC2 instance to serve as a backup server for the website."
- **Tasks:**
  - ○ Create a basic HTML page using AWS Cloud9.
  - ○ Deploy the HTML page to an S3 bucket and enable static website hosting.
  - ○ Launch an EC2 instance and configure it to serve the same HTML page as a backup.

Note: Due to an issue with AWS Cloud9, we were unable to use the Cloud9 IDE for this project. Instead, we used the AWS CLI (Command Line Interface) to perform the necessary tasks. The HTML page was developed locally and deployed to the S3 bucket and EC2 instance using the AWS CLI, which provided an efficient alternative for managing AWS resources directly from the command line. The overall deployment process remains the same, ensuring the functionality of the static website hosting and backup server setup.

1. Introduction:

A) Case Study Overview:

The chosen case study focuses on Simple Cloud-Based Application Deployment using AWS services. It demonstrates the process of developing and deploying a simple HTML page on AWS infrastructure. The goal is to utilize AWS Cloud9 for coding, S3 for static website hosting, and EC2 for creating a backup server. This scenario offers insights into using cloud-based tools for website deployment and disaster recovery solutions.

B) Key Feature and Application:

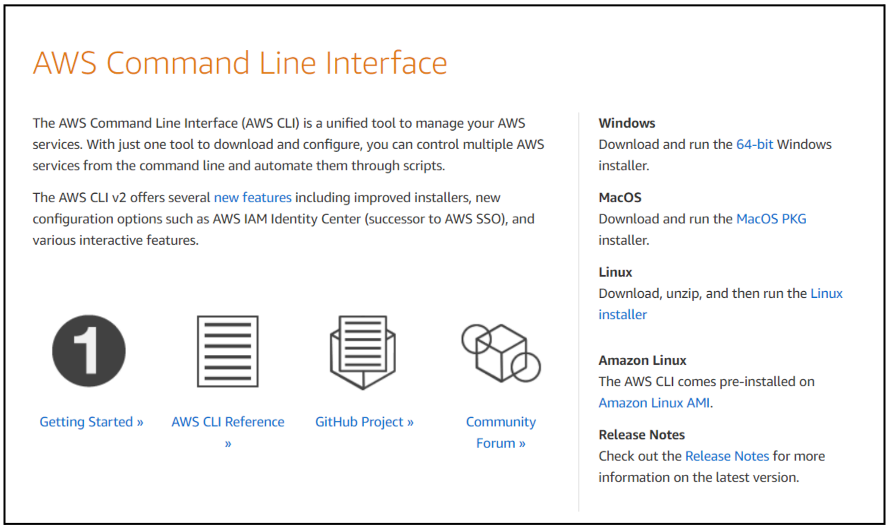
The unique feature of this case study is the dual-hosting setup using S3 for static website hosting and EC2 as a backup server. In case the S3 hosting fails, the EC2 instance ensures high availability by serving the website as a backup. This highlights a practical disaster recovery solution, which is essential for any robust web application architecture.

2. Step-by-Step Explanation:

Step 1: Install and Configure the AWS CLI.

(You will use the AWS CLI to interact with AWS services like S3 and EC2.)

If the AWS cli is not installed on the machine Download it from https://aws.amazon.com/cli



AWS Command Line Interface

The AWS Command Line Interface (AWS CLI) is a unified tool to manage your AWS services. With just one tool to download and configure, you can control multiple AWS services from the command line and automate them through scripts.

The AWS CLI v2 offers several new features including improved installers, new configuration options such as AWS IAM Identity Center (successor to AWS SSO), and various interactive features.

Windows
Download and run the 64-bit Windows installer.

MacOS
Download and run the MacOS PKG installer.

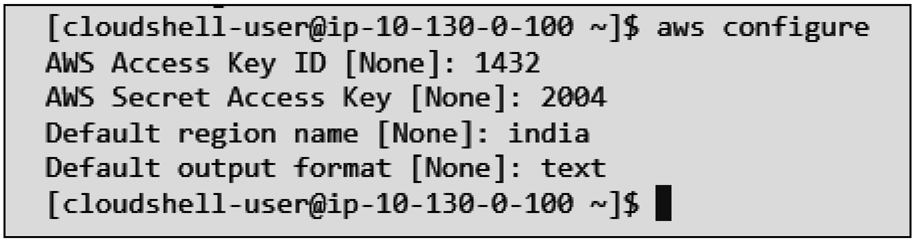
Linux
Download, unzip, and then run the Linux installer

Amazon Linux
The AWS CLI comes pre-installed on Amazon Linux AMI.

Release Notes
Check out the Release Notes for more information on the latest version.

Once the CLI is installed, configure the CLI by running the following command in your terminal or command prompt: aws configure

It will ask for information please fill it correctly.

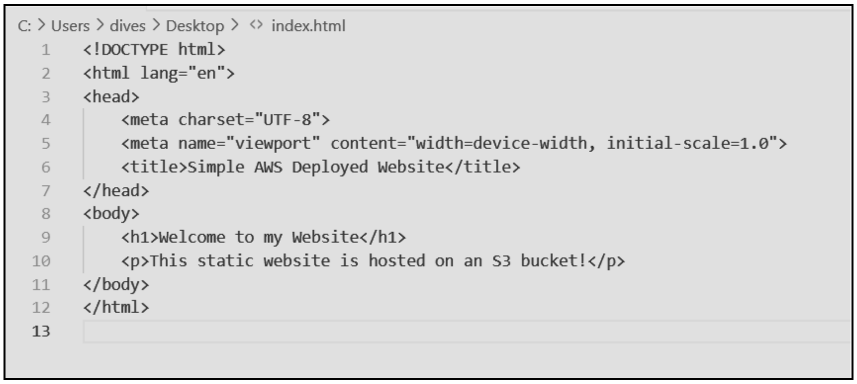


```
[cloudshell-user@ip-10-130-0-100 ~]$ aws configure
AWS Access Key ID [None]: 1432
AWS Secret Access Key [None]: 2004
Default region name [None]: india
Default output format [None]: text
[cloudshell-user@ip-10-130-0-100 ~]$
```

Step 2: Create a Basic HTML Page Locally.

A) On your local machine, create a new folder.

B) Inside that folder, create a simple HTML file.

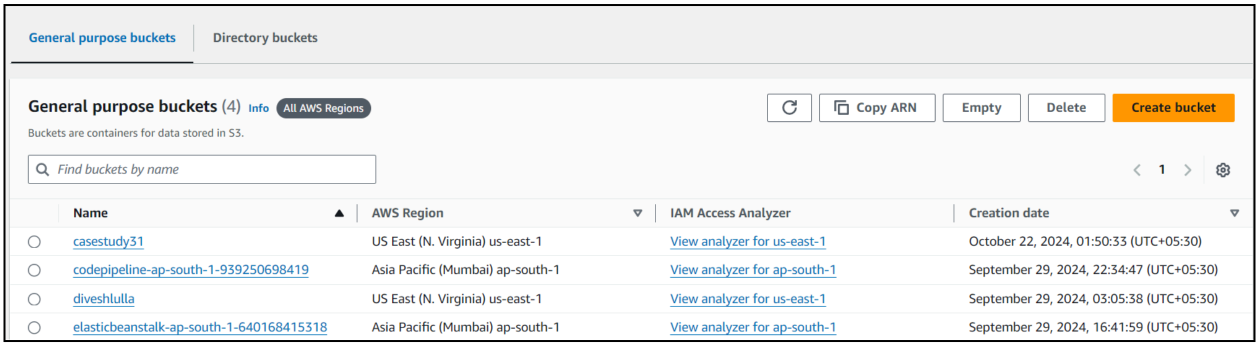


C: > Users > dives > Desktop > <> index.html

```html
<!DOCTYPE html>
<html lang="en">
<head>
    <meta charset="UTF-8">
    <meta name="viewport" content="width=device-width, initial-scale=1.0">
    <title>Simple AWS Deployed Website</title>
</head>
<body>
    <h1>Welcome to my Website</h1>
    <p>This static website is hosted on an S3 bucket!</p>
</body>
</html>
```

Step 3: Upload the HTML Page to an S3 Bucket and Enable Static Website Hosting

A) Create an S3 bucket:
   Go to the S3 Console in AWS.
   Click "Create Bucket."
   Create a S3 bucket and do the changes needed as per the requirements.

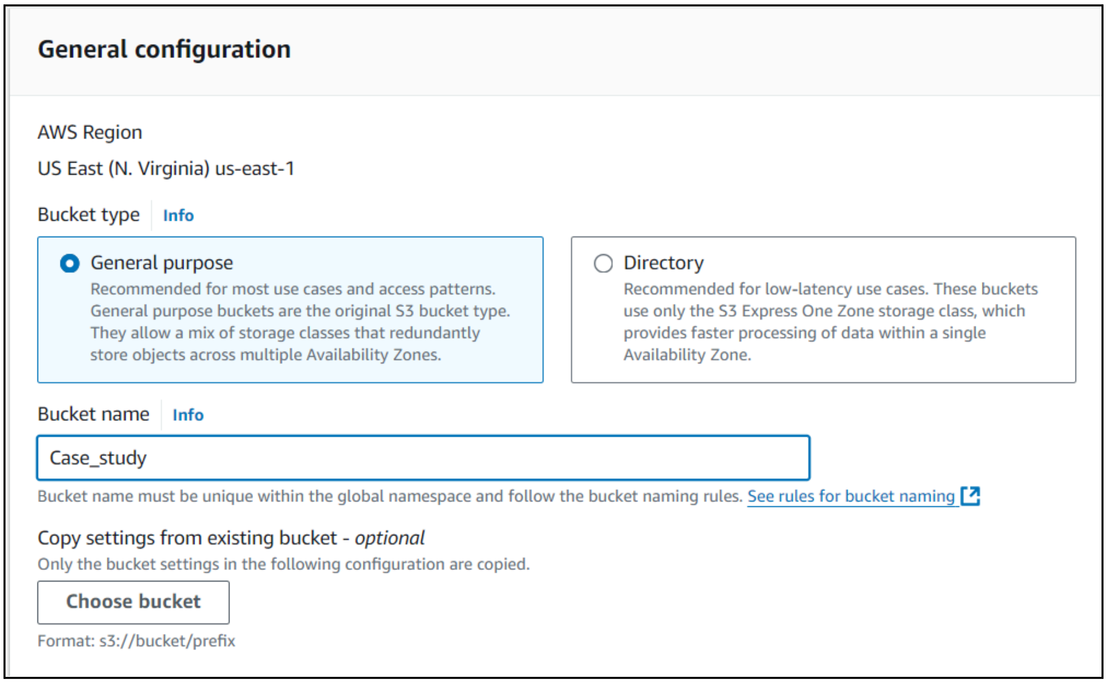


General purpose buckets (4) Info All AWS Regions

Buckets are containers for data stored in S3.

	Name ▲	AWS Region	IAM Access Analyzer	Creation date
○	casestudy31	US East (N. Virginia) us-east-1	View analyzer for us-east-1	October 22, 2024, 01:50:33 (UTC+05:30)
○	codepipeline-ap-south-1-939250698419	Asia Pacific (Mumbai) ap-south-1	View analyzer for ap-south-1	September 29, 2024, 22:34:47 (UTC+05:30)
○	diveshlulla	US East (N. Virginia) us-east-1	View analyzer for us-east-1	September 29, 2024, 03:05:38 (UTC+05:30)
○	elasticbeanstalk-ap-south-1-640168415318	Asia Pacific (Mumbai) ap-south-1	View analyzer for ap-south-1	September 29, 2024, 16:41:59 (UTC+05:30)

Click on the Create Bucket button and fill in the details.



General configuration

AWS Region
US East (N. Virginia) us-east-1

Bucket type Info

● General purpose
Recommended for most use cases and access patterns. General purpose buckets are the original S3 bucket type. They allow a mix of storage classes that redundantly store objects across multiple Availability Zones.

○ Directory
Recommended for low-latency use cases. These buckets use only the S3 Express One Zone storage class, which provides faster processing of data within a single Availability Zone.

Bucket name Info

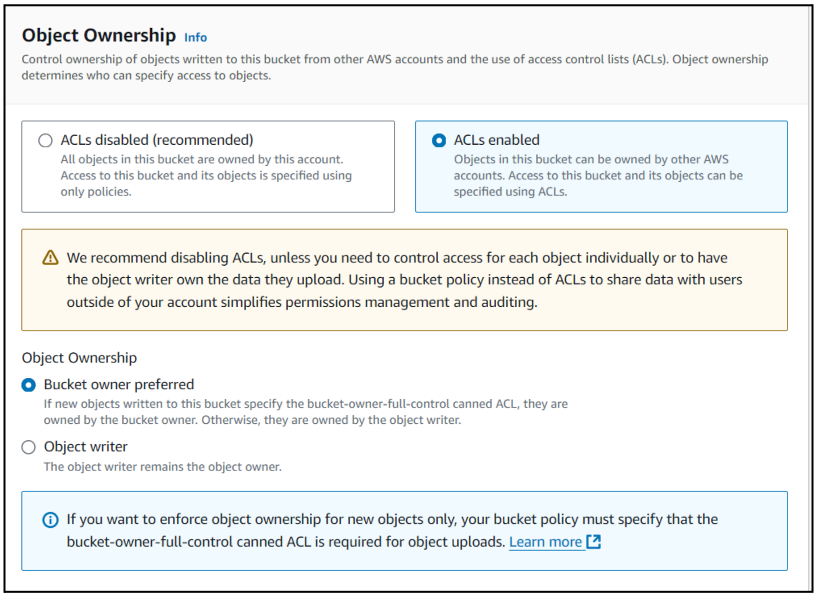
Case_study

Bucket name must be unique within the global namespace and follow the bucket naming rules. See rules for bucket naming

Copy settings from existing bucket - *optional*
Only the bucket settings in the following configuration are copied.

Format: s3://bucket/prefix

Scroll down and in Object Ownership, enable the ACL.



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.

○ 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.

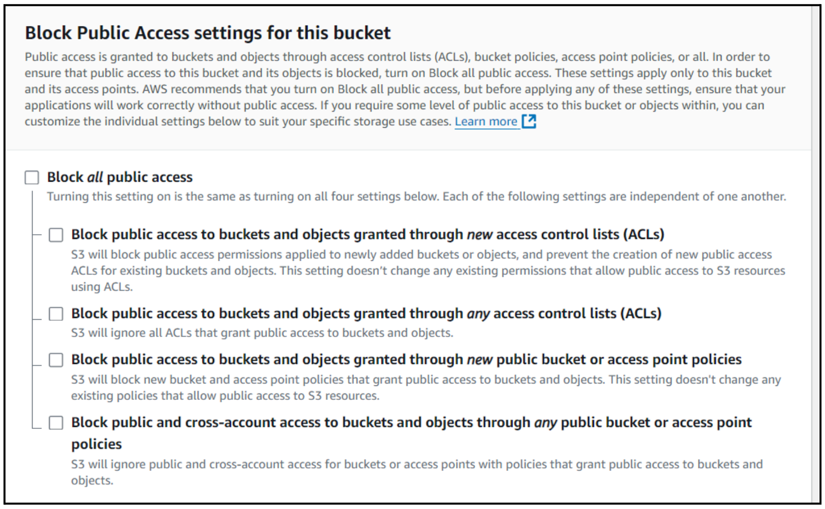
Object Ownership

● Bucket owner preferred
If new objects written to this bucket specify the bucket-owner-full-control canned ACL, they are owned by the bucket owner. Otherwise, they are owned by the object writer.

○ Object writer
The object writer remains the object owner.

ⓘ If you want to enforce object ownership for new objects only, your bucket policy must specify that the bucket-owner-full-control canned ACL is required for object uploads. Learn more

Disable the Block all public access as we want to host the website.



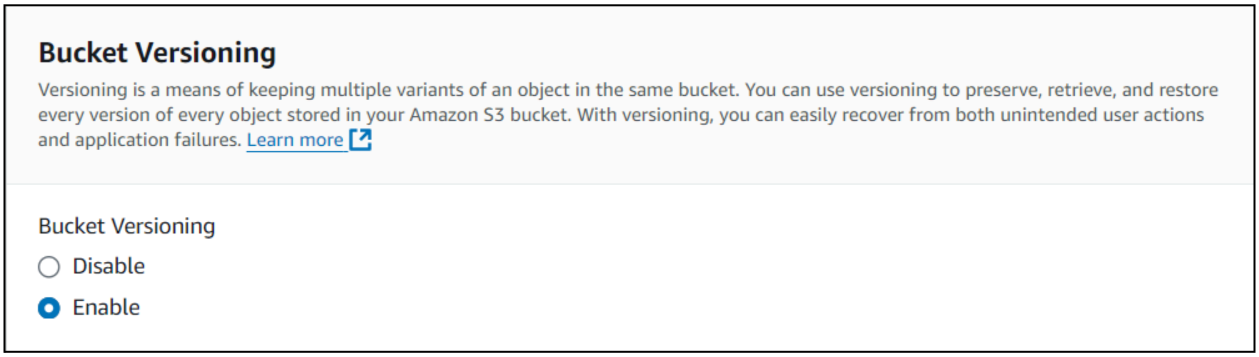
Block Public Access settings for this bucket

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 this bucket and its 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 this bucket 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.

In the next step click on enable the Bucket Versioning and then scroll down and click on Create Bucket.



Bucket Versioning

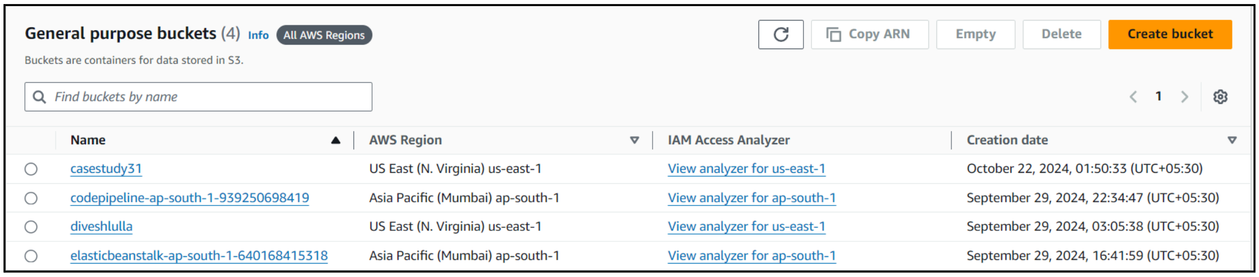
Versioning is a means of keeping multiple variants of an object in the same bucket. You can use versioning to preserve, retrieve, and restore every version of every object stored in your Amazon S3 bucket. With versioning, you can easily recover from both unintended user actions and application failures. Learn more

Bucket Versioning

○ Disable

● Enable

Once the Bucket is made it will be seen in the List.



General purpose buckets (4) Info

Buckets are containers for data stored in S3.

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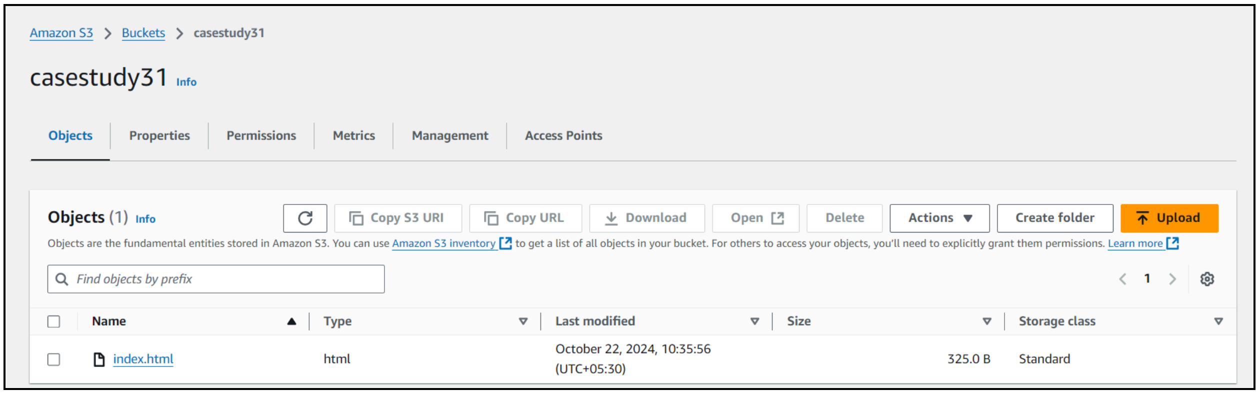
○	diveshlulla	US East (N. Virginia) us-east-1	View analyzer for us-east-1	September 29, 2024, 03:05:38 (UTC+05:30)
○	elasticbeanstalk-ap-south-1-640168415318	Asia Pacific (Mumbai) ap-south-1	View analyzer for ap-south-1	September 29, 2024, 16:41:59 (UTC+05:30)

Step 4: Uploading of the index.html file in the bucket.

Click on the Bucket and in the bucket you will get the option of uploading the files click on upload in it.



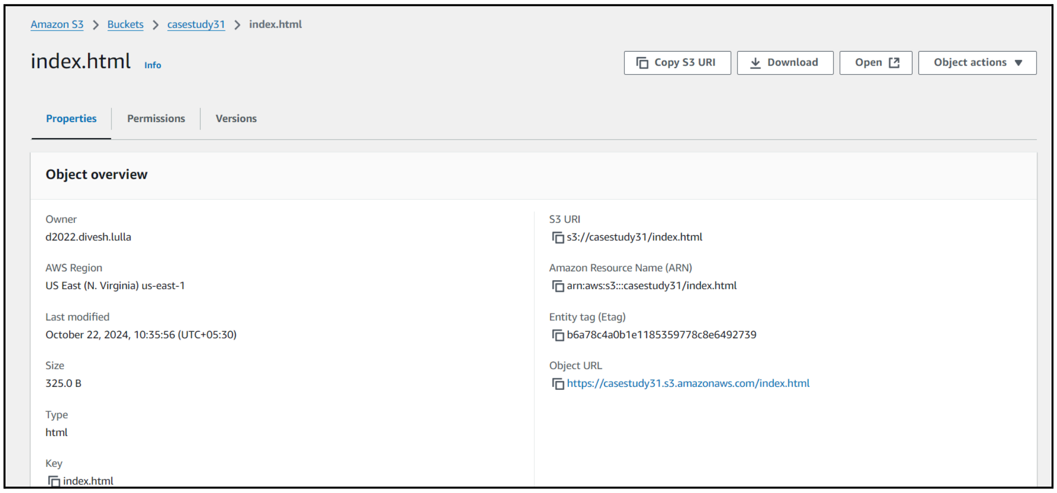
casestudy31 Info

Objects (1) Info

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

	Name	Type	Last modified	Size	Storage class
□	index.html	html	October 22, 2024, 10:35:56 (UTC+05:30)	325.0 B	Standard

After uploading of the files open that file and click on the Object URL to see weather the file is hosted through the Bucket.



index.html Info

Object overview

Owner
d2022.divesh.lulla

AWS Region
US East (N. Virginia) us-east-1

Last modified
October 22, 2024, 10:35:56 (UTC+05:30)

Size
325.0 B

Type
html

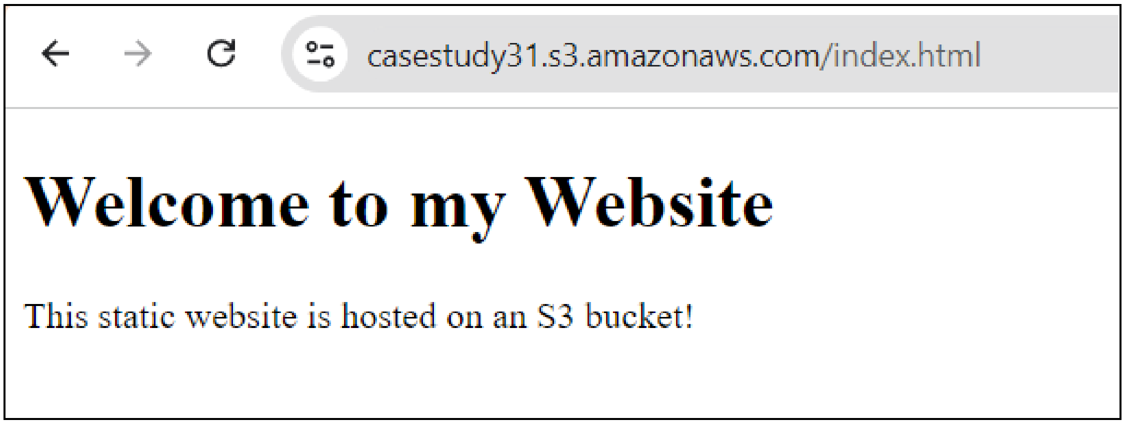
Key
index.html

S3 URI
s3://casestudy31/index.html

Amazon Resource Name (ARN)
arn:aws:s3:::casestudy31/index.html

Entity tag (Etag)
b6a78c4a0b1e1185359778c8e6492739

Object URL
https://casestudy31.s3.amazonaws.com/index.html

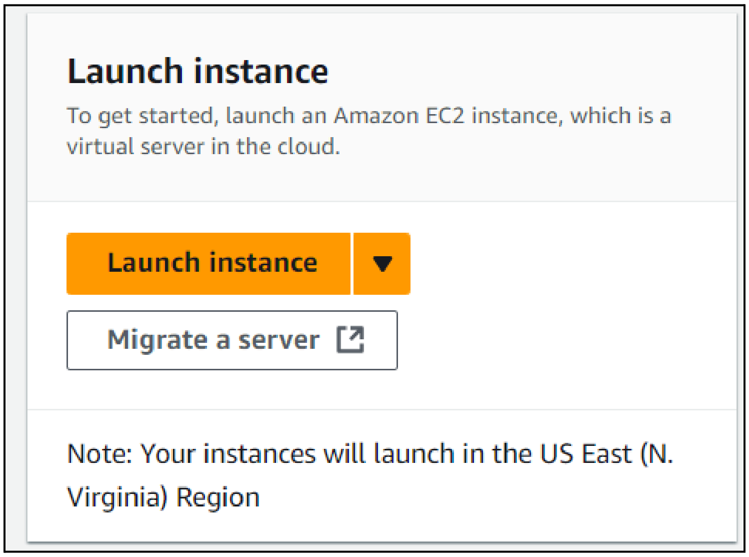


Welcome to my Website

This static website is hosted on an S3 bucket!

Step 5 : Set Up an EC2 Instance to Serve the Same HTML Page as a Backup.

A) Launch the EC2 instance.
Click on the Launch Instance button and create a new instance.

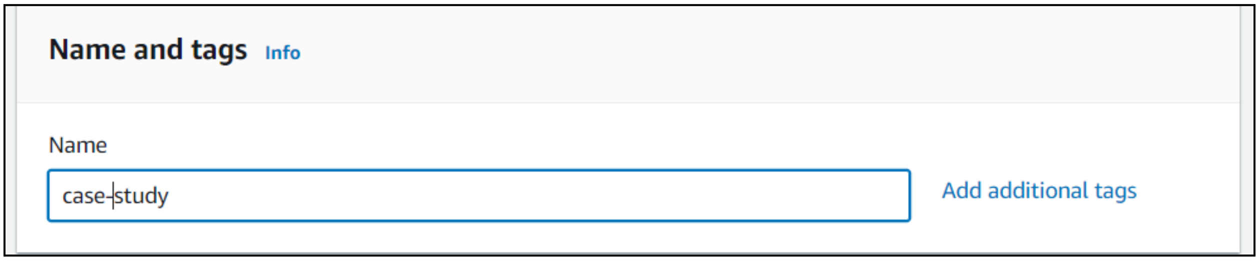


Launch instance

To get started, launch an Amazon EC2 instance, which is a virtual server in the cloud.

Note: Your instances will launch in the US East (N. Virginia) Region

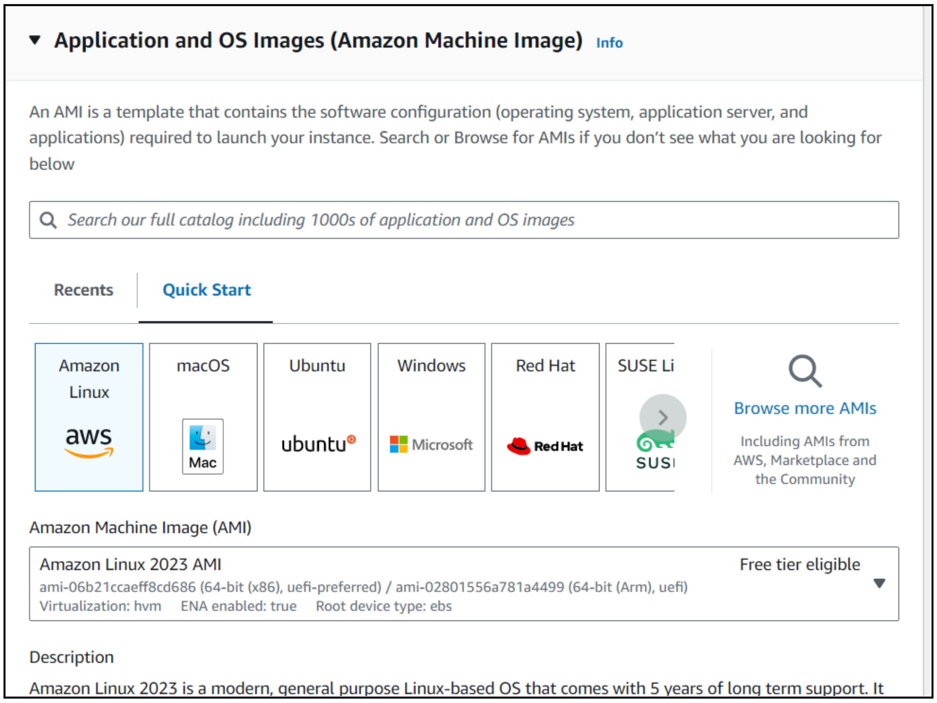
B) Fill the details of the instance as per the requirements.



Name and tags

Name: case-study

C) Select the Linux as the type of instance.



▼ **Application and OS Images (Amazon Machine Image)** Info

An AMI is a template that contains the software configuration (operating system, application server, and applications) required to launch your instance. Search or Browse for AMIs if you don't see what you are looking for below

Search our full catalog including 1000s of application and OS images

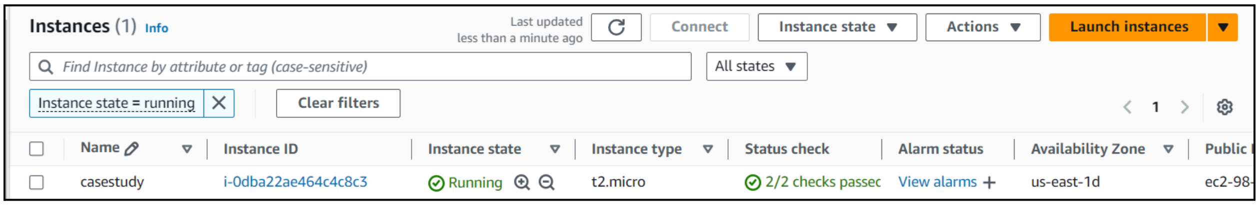
Amazon Machine Image (AMI)

Amazon Linux 2023 AMI — Free tier eligible
ami-06b21ccaeff8cd686 (64-bit (x86), uefi-preferred) / ami-02801556a781a4499 (64-bit (Arm), uefi)
Virtualization: hvm ENA enabled: true Root device type: ebs

Description

Amazon Linux 2023 is a modern, general purpose Linux-based OS that comes with 5 years of long term support. It

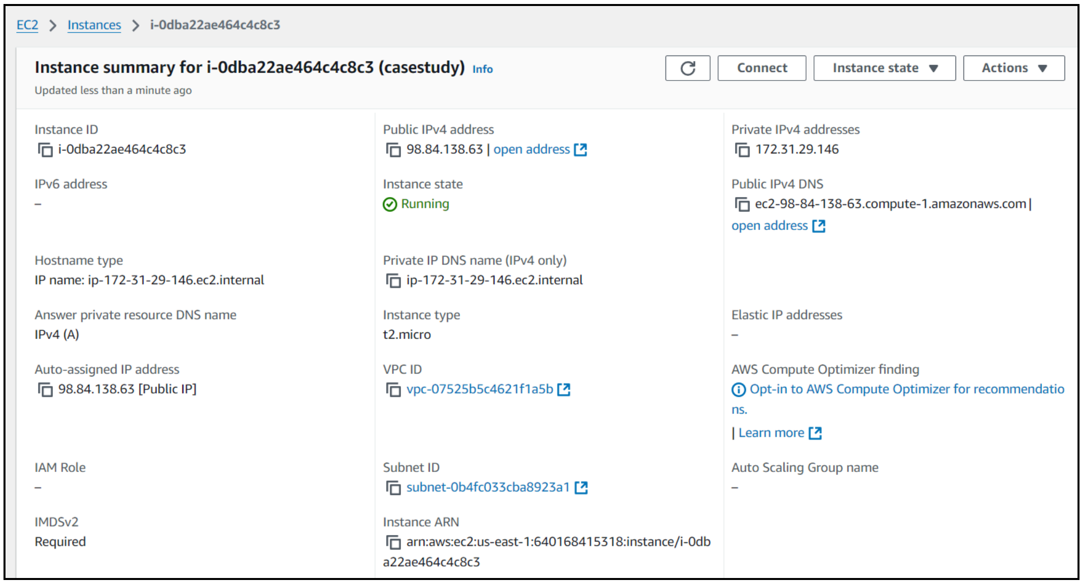
D) After the instance is made connect to your EC2 instance.
Go to the instances dashboard and click on the Instance Id after page is redirected copy the public id.



Instances (1) Info

Instance state = running ✕

□	Name	Instance ID	Instance state	Instance type	Status check	Alarm status	Availability Zone	Public I
□	casestudy	i-0dba22ae464c4c8c3	✓ Running	t2.micro	✓ 2/2 checks passec	View alarms +	us-east-1d	ec2-98-



EC2 > Instances > i-0dba22ae464c4c8c3

Instance summary for i-0dba22ae464c4c8c3 (casestudy) Info

Updated less than a minute ago

Instance ID
i-0dba22ae464c4c8c3

Public IPv4 address
98.84.138.63 | open address

Private IPv4 addresses
172.31.29.146

IPv6 address
–

Instance state
Running

Public IPv4 DNS
ec2-98-84-138-63.compute-1.amazonaws.com | open address

Hostname type
IP name: ip-172-31-29-146.ec2.internal

Private IP DNS name (IPv4 only)
ip-172-31-29-146.ec2.internal

Answer private resource DNS name
IPv4 (A)

Instance type
t2.micro

Elastic IP addresses
–

Auto-assigned IP address
98.84.138.63 [Public IP]

VPC ID
vpc-07525b5c4621f1a5b

AWS Compute Optimizer finding
Opt-in to AWS Compute Optimizer for recommendations.
| Learn more

IAM Role
–

Subnet ID
subnet-0b4fc033cba8923a1

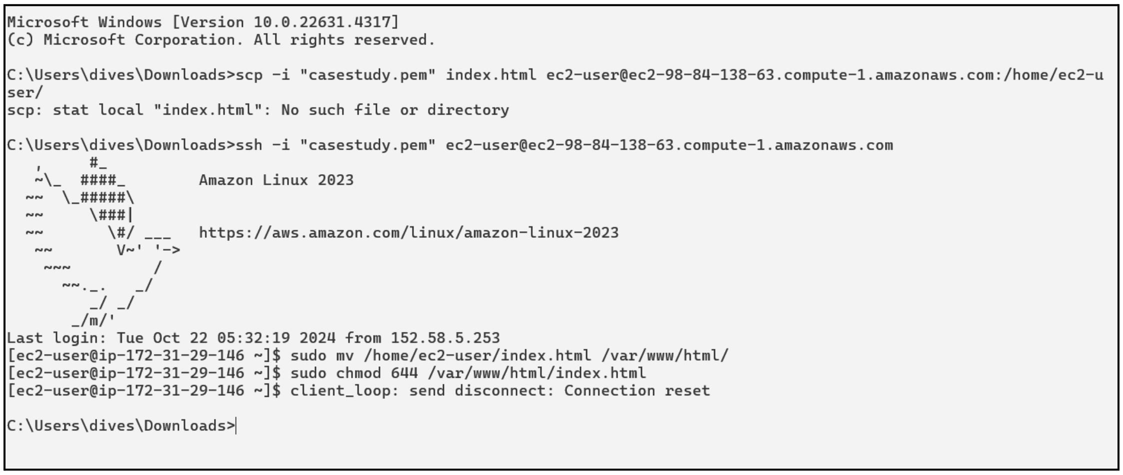
Auto Scaling Group name
–

IMDSv2
Required

Instance ARN
arn:aws:ec2:us-east-1:640168415318:instance/i-0dba22ae464c4c8c3

E) Open the Cmd and write down the following command.

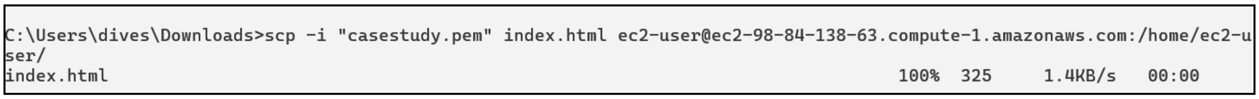
scp -i "casestudy.pem" index.html ec2-user@ec2-98-84-138-63.compute-1.amazonaws.com:/home/ec2-user/



```
Microsoft Windows [Version 10.0.22631.4317]
(c) Microsoft Corporation. All rights reserved.

C:\Users\dives\Downloads>scp -i "casestudy.pem" index.html ec2-user@ec2-98-84-138-63.compute-1.amazonaws.com:/home/ec2-u
ser/
scp: stat local "index.html": No such file or directory

C:\Users\dives\Downloads>ssh -i "casestudy.pem" ec2-user@ec2-98-84-138-63.compute-1.amazonaws.com
   ,     #_
   ~\_  ####_        Amazon Linux 2023
  ~~  \_#####\
  ~~     \###|
  ~~       \#/ ___   https://aws.amazon.com/linux/amazon-linux-2023
   ~~       V~' '->
    ~~~         /
      ~~._.   _/
         _/ _/
       _/m/'
Last login: Tue Oct 22 05:32:19 2024 from 152.58.5.253
[ec2-user@ip-172-31-29-146 ~]$ sudo mv /home/ec2-user/index.html /var/www/html/
[ec2-user@ip-172-31-29-146 ~]$ sudo chmod 644 /var/www/html/index.html
[ec2-user@ip-172-31-29-146 ~]$ client_loop: send disconnect: Connection reset

C:\Users\dives\Downloads>
```

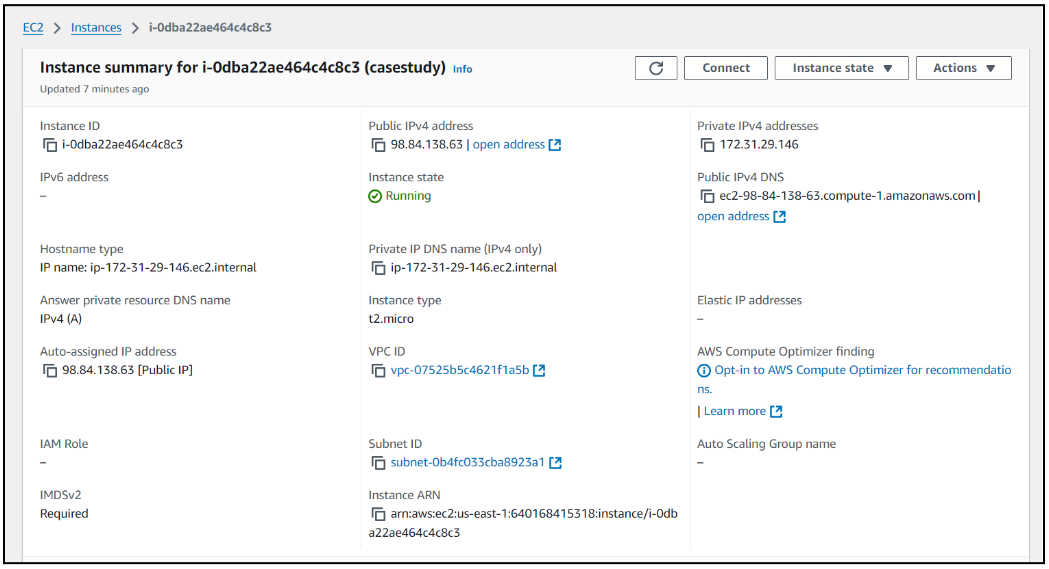
F) Move the index.html on the directory of the PEM file after that restart the terminal and write down the following command.

scp -i "casestudy.pem" index.html ec2-user@ec2-98-84-138-63.compute-1.amazonaws.com:/home/ec2-user/



```
C:\Users\dives\Downloads>scp -i "casestudy.pem" index.html ec2-user@ec2-98-84-138-63.compute-1.amazonaws.com:/home/ec2-u
ser/
index.html                                                                            100%  325     1.4KB/s   00:00
```

G) After this command is done go on the instance page and click on open address in the Public IPv4 address.



EC2 > Instances > i-0dba22ae464c4c8c3

Instance summary for i-0dba22ae464c4c8c3 (casestudy) Info

Updated 7 minutes ago

Instance ID
i-0dba22ae464c4c8c3

Public IPv4 address
98.84.138.63 | open address

Private IPv4 addresses
172.31.29.146

IPv6 address
–

Instance state
Running

Public IPv4 DNS
ec2-98-84-138-63.compute-1.amazonaws.com | open address

Hostname type
IP name: ip-172-31-29-146.ec2.internal

Private IP DNS name (IPv4 only)
ip-172-31-29-146.ec2.internal

Answer private resource DNS name
IPv4 (A)

Instance type
t2.micro

Elastic IP addresses
–

Auto-assigned IP address
98.84.138.63 [Public IP]

VPC ID
vpc-07525b5c4621f1a5b

AWS Compute Optimizer finding
Opt-in to AWS Compute Optimizer for recommendations.
| Learn more

IAM Role
–

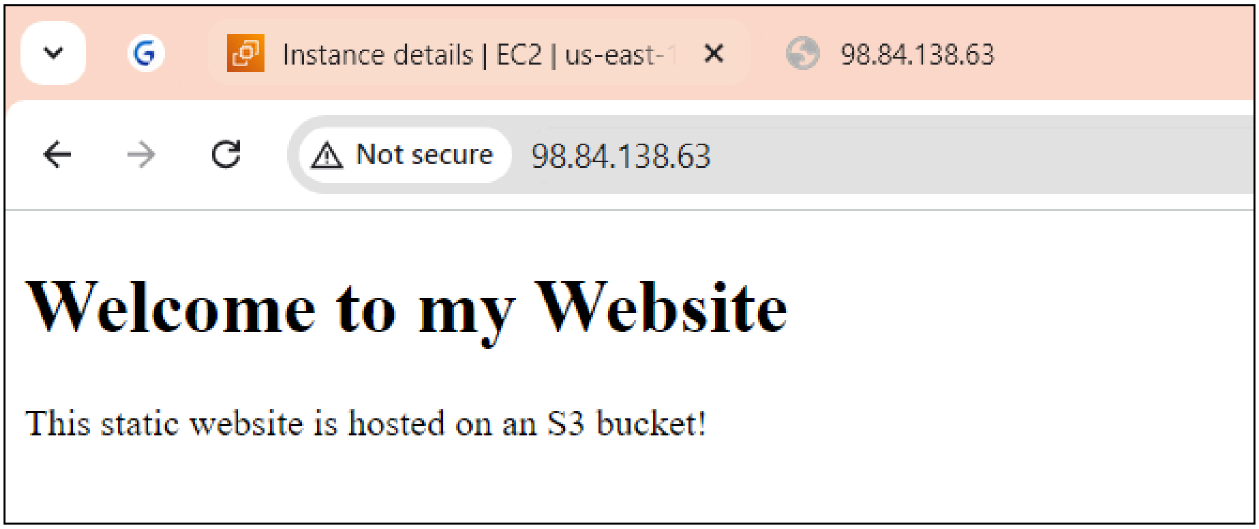
Subnet ID
subnet-0b4fc033cba8923a1

Auto Scaling Group name
–

IMDSv2
Required

Instance ARN
arn:aws:ec2:us-east-1:640168415318:instance/i-0dba22ae464c4c8c3

The page will redirected to the html file uploaded.



Welcome to my Website

This static website is hosted on an S3 bucket!

Note: We can see the output of this project on any device by searching its address: 98.84.138.63.

3. Demonstration Preparation:

Key Points to Cover

1. Overview of the Architecture
2. S3 Static Website Hosting Setup
3. EC2 Web Server Configuration
4. Backup Web Server
5. Security and IAM Roles

Practics:

- **Identify and Troubleshoot Issues**: You can identify potential technical issues (e.g., permission errors, connection problems) and resolve them in advance, avoiding unexpected disruptions.

- **Familiarity with Tools**: By practicing, you become more comfortable with the AWS Management Console, CLI commands, and navigating through various AWS services.

- **Time Management**: Practicing helps you gauge the time needed for each step, ensuring the demonstration stays within the allocated time.

Question:

Q**. What are the benefits of using S3 for static website hosting?**

A. S3 is scalable, cost-effective, secure, and supports fast content delivery via CloudFront.

Q. **How does the EC2 instance serve as a backup?**

A. It mirrors the S3 content and provides service continuity if S3 is unavailable.

Q. **Why did you choose Apache as the web server on EC2?**

A. Apache is widely used, easy to configure, and works well on Linux-based EC2 instances.

Q.**How do you handle security for the EC2 instance?**

A. Security is managed through SSH key pairs and security groups that restrict access to necessary ports only.