ADV DEVOPS CASE STUDY PRACTICAL

AIM:

Cloud Deployment with Automation
● Concepts Used: AWS CodePipeline, EC2, and S3.
● Problem Statement: "Build a simple web application using AWS CodeBuild and deploy it to an S3 bucket. Then, automate the deployment process using AWS CodePipeline, ensuring the application is deployed on an EC2 instance. Use a sample index.html page for demonstration."
● Tasks:
    ○ Set up AWS CodeBuild for the web app.
    ○ Create a pipeline that deploys to an S3 bucket.
    ○ Use AWS CodeDeploy to push updates to an EC2 instance.

THEORY:

1. Overview of AWS Services Involved

Before diving into the technical process, it is essential to understand the AWS services used in this experiment and how they interact with each other. The experiment will use the following AWS services:

- **Amazon EC2 (Elastic Compute Cloud)**: EC2 is a cloud-based service that provides scalable compute capacity. It enables users to rent virtual machines (VMs) to host web applications and services. These virtual machines can be configured with various operating systems and software environments.
- **Amazon S3 (Simple Storage Service)**: S3 is an object storage service that allows users to store and retrieve large amounts of data over the web. It can be used to store build artifacts, such as code, static files, and other resources required by the application.
- **AWS CodePipeline**: CodePipeline is a fully managed continuous integration and delivery service that helps automate the process of releasing applications. It builds, tests, and deploys code whenever there is a change in the source code repository (such as GitHub).
- **AWS CodeBuild**: CodeBuild is a fully managed build service that compiles source code, runs tests, and produces software artifacts that are ready for deployment.
- **AWS CodeDeploy**: CodeDeploy automates the process of deploying applications to various compute platforms, such as EC2 instances, Lambda functions, or on-premises servers.

Each of these services plays a crucial role in the automation pipeline, and understanding their function and how they interact is key to building a successful deployment system.

2. Detailed Explanation of AWS CodePipeline

AWS CodePipeline acts as the backbone of this experiment, automating the movement of code from a version control repository (like GitHub or S3) through the stages of building, testing, and deployment. Each step in the pipeline is responsible for specific actions such as pulling the code from the repository, compiling it using CodeBuild, and deploying it using CodeDeploy.

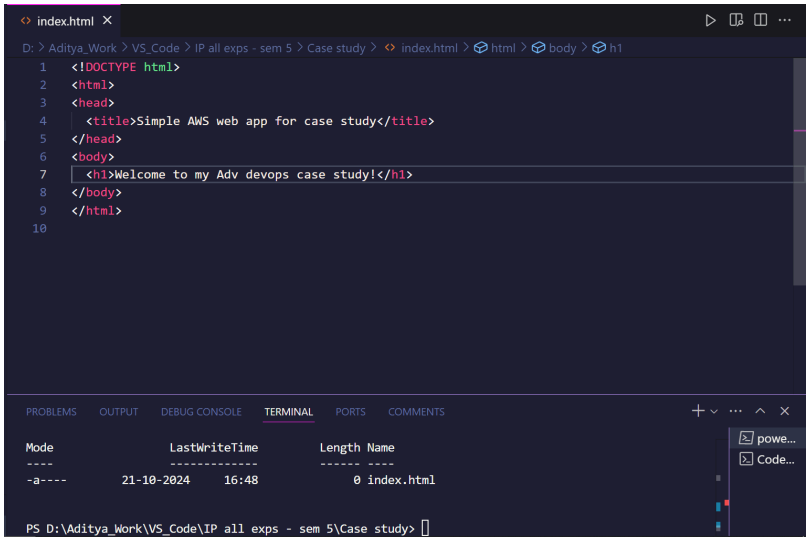
Pipeline Stages:

1. **Source Stage**: The pipeline begins with the source stage, which pulls the latest version of the code from the specified repository (GitHub, Bitbucket, or S3). In this case, the source is a simple HTML file (`index.html`) that needs to be updated and deployed onto an EC2 instance.
2. **Build Stage**: This stage uses AWS CodeBuild to compile and package the application. For static websites or simple HTML files, this stage may not perform heavy compilation, but it will still produce an output artifact (such as an updated `index.html` file) that will be deployed to an EC2 instance.
3. **Deploy Stage**: In the final stage, AWS CodeDeploy pushes the build artifacts (e.g., `index.html`) to the EC2 instance. During this stage, the application is installed, and the EC2 instance is updated to reflect the latest changes in the code.

PROCEDURE & SCREENSHOTS:

Create a Simple Web App

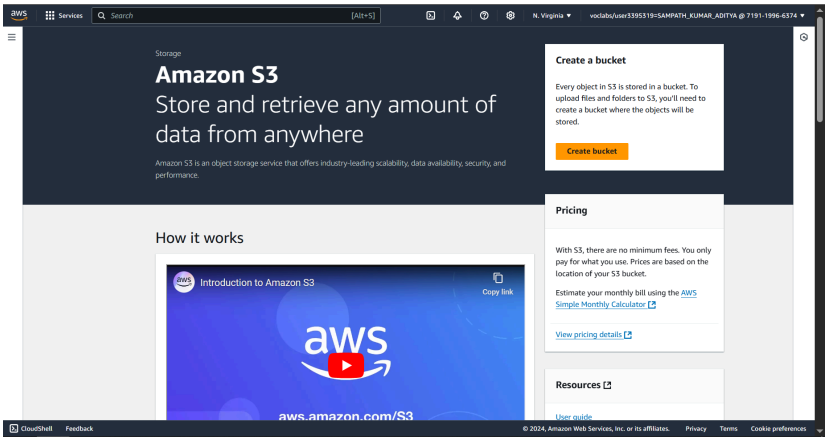
1. First, create a simple web app with an `index.html` file:



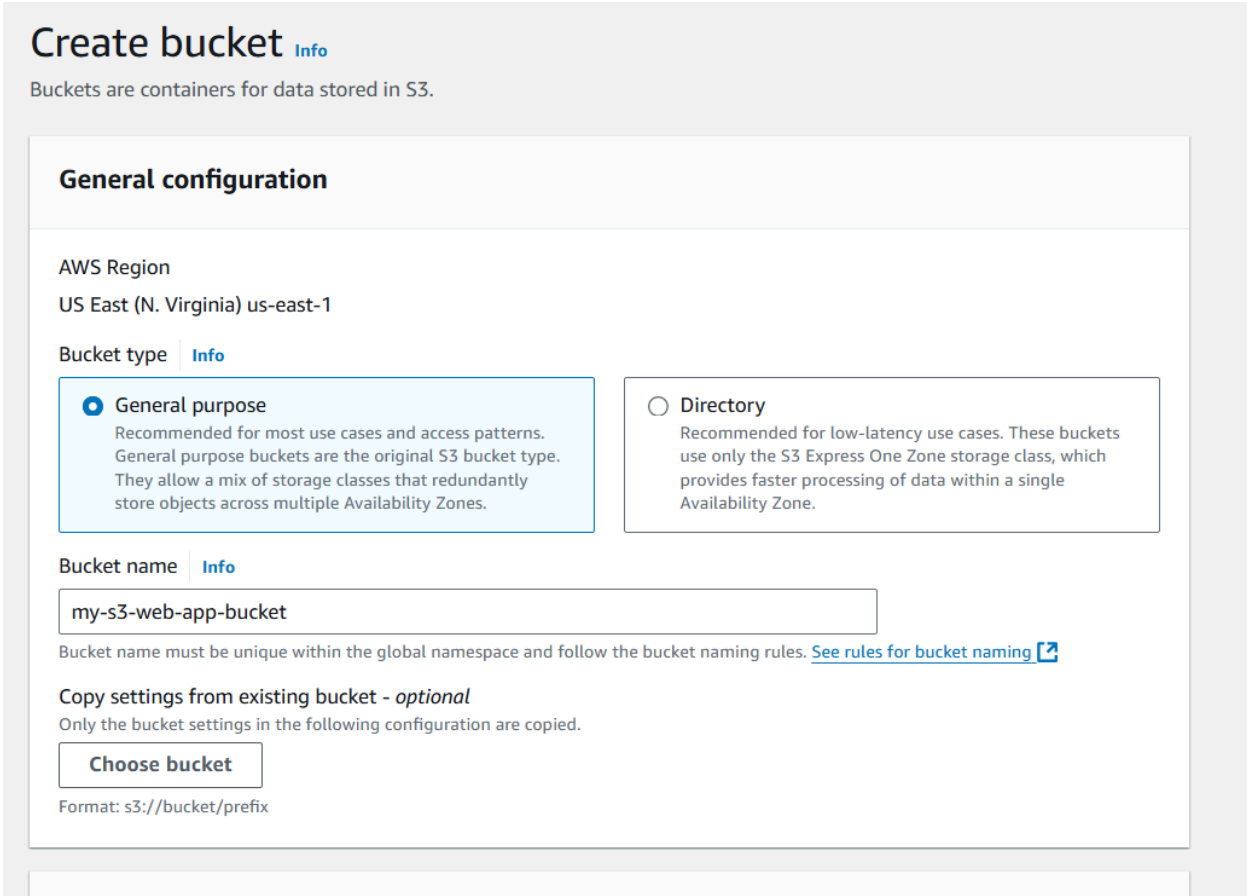
This file will serve as the web page deployed to your S3 bucket and later to the EC2 instance.

2. Set Up S3 Bucket for Web App Hosting

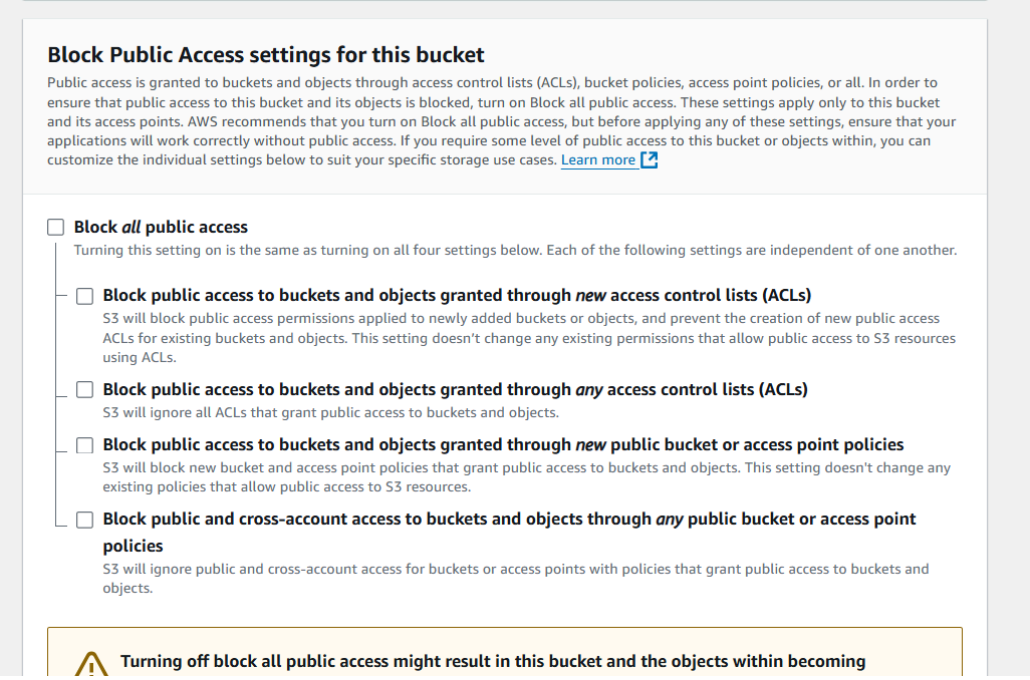
1. **Go to the AWS S3 Console**:
   - Open the S3 console.



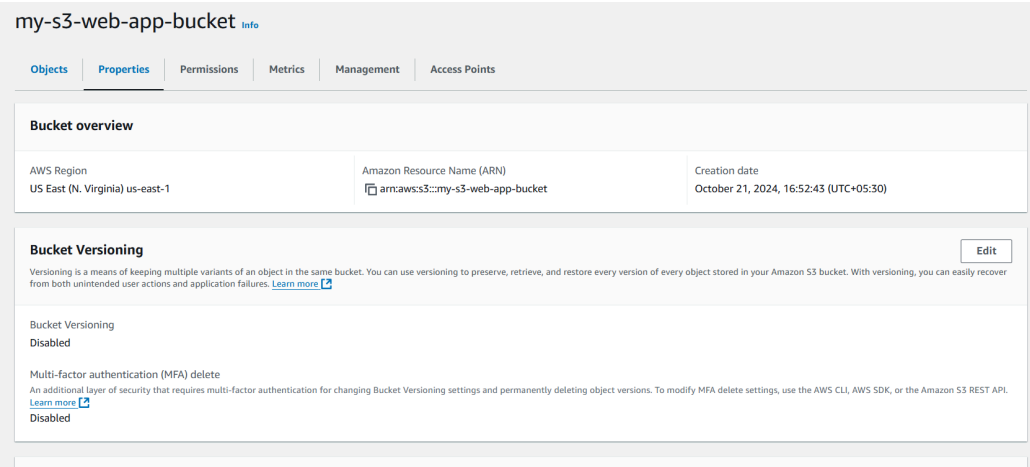
   - Create a new S3 bucket, giving it a unique name (e.g., `my-s3-web-bucket`).



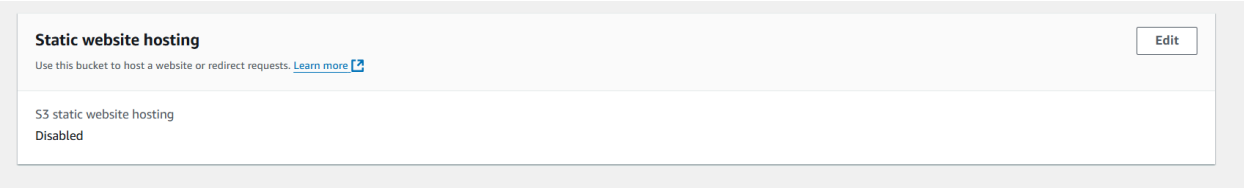
   - Under **Permissions**, uncheck the "Block all public access" option, allowing public access for web hosting.



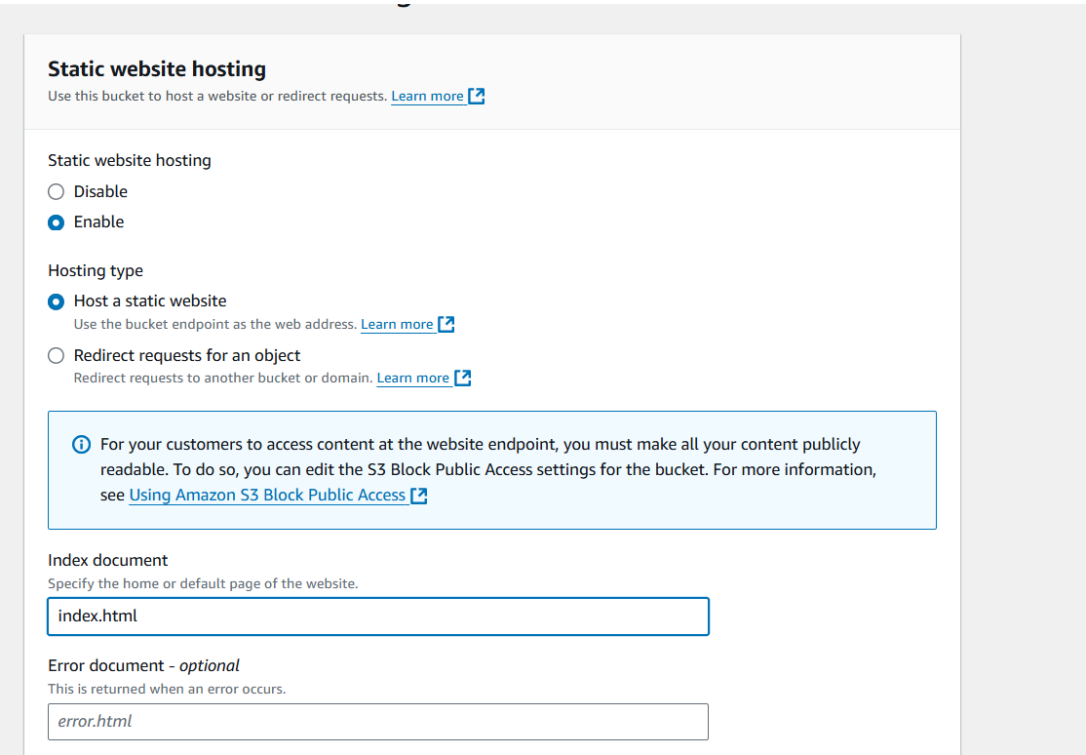
2. **Configure the Bucket for Website Hosting**:
   - Go to the **Properties** tab of your S3 bucket.



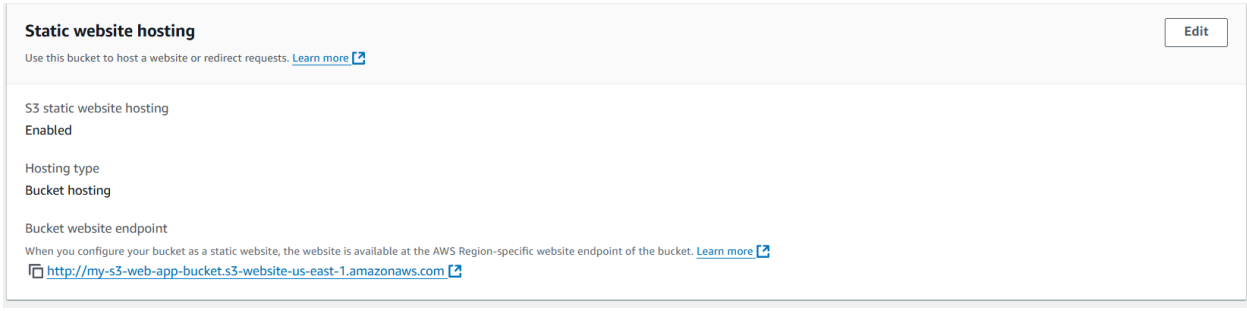
   - Scroll down to **Static website hosting**.



- Enable it, and set the **Index document** as `index.html`.



- Copy the bucket website URL for testing the web app later.



  in my case it is:
  http://my-s3-web-bucket.s3-website-ap-southeast-2.amazonaws.com
- if s3 website shows 403 forbidden, its a IAM permission issue.

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3. Set Up CodeBuild for Your Web App

Create a Buildspec File: In your project directory (where `index.html` resides), create a `buildspec.yml` file. This file tells AWS CodeBuild what to do during the build.

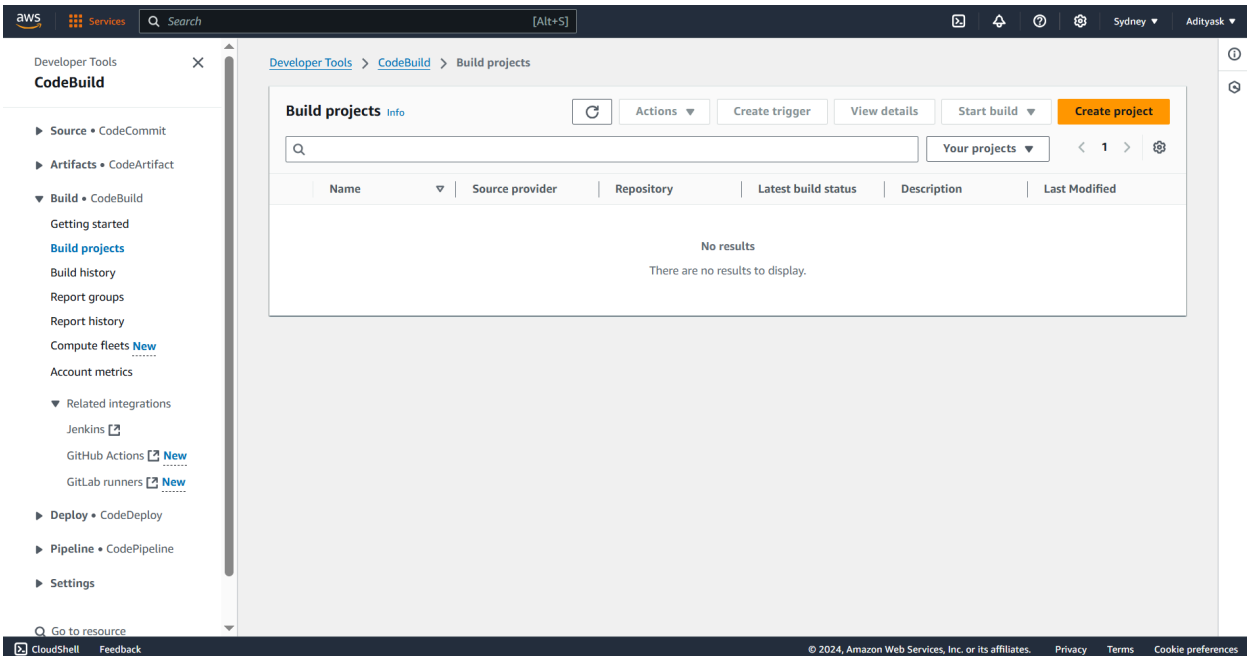
Adityacodesinpython Update buildspec.yml

Code | Blame | 14 lines (14 loc) · 382 Bytes

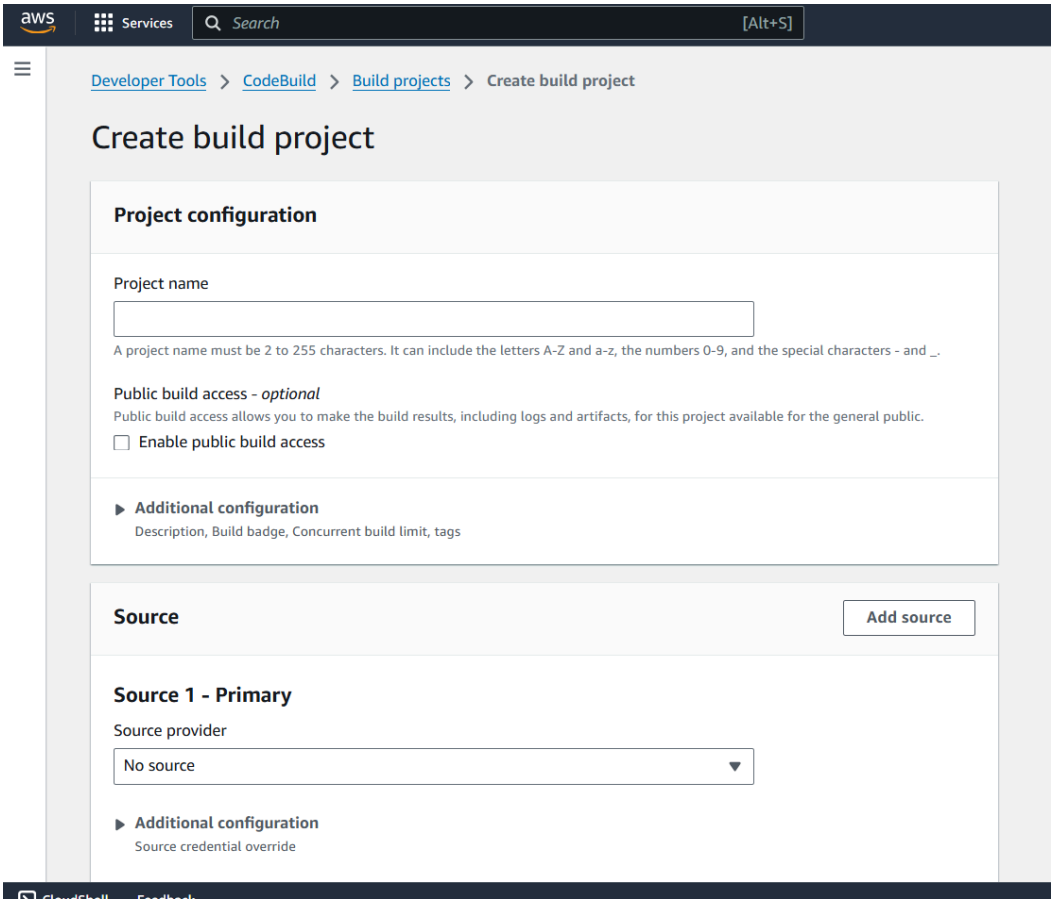
```yaml
version: 0.2
phases:
  build:
    commands:
      - echo "Building the application..."
  post_build:
    commands:
      - aws s3 cp index.html s3://my-s3-web-bucket/index.html --content-type "text/html"
artifacts:
  files:
    - index.html
    - appspec.yml
    - scripts/**/*  # Include the entire scripts directory
  discard-paths: no  # Important! Maintains directory structure
```

Go to AWS CodeBuild:

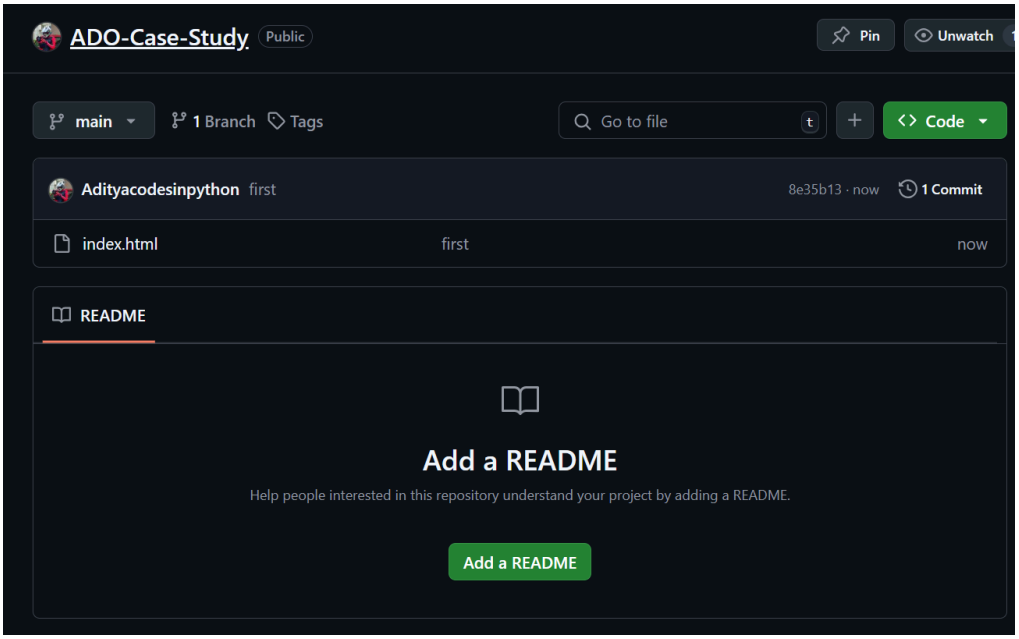
- Open the AWS CodeBuild console.

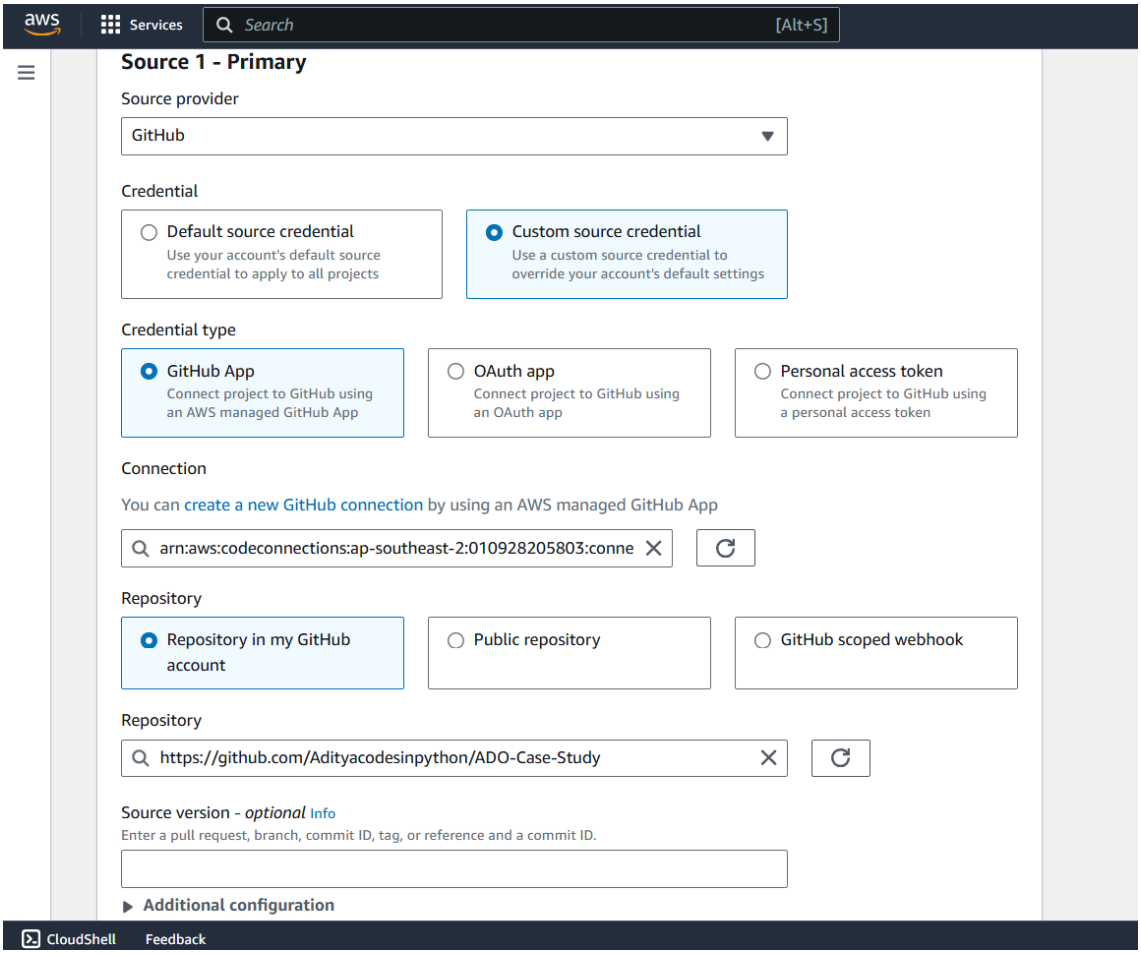


- Create a new build project.

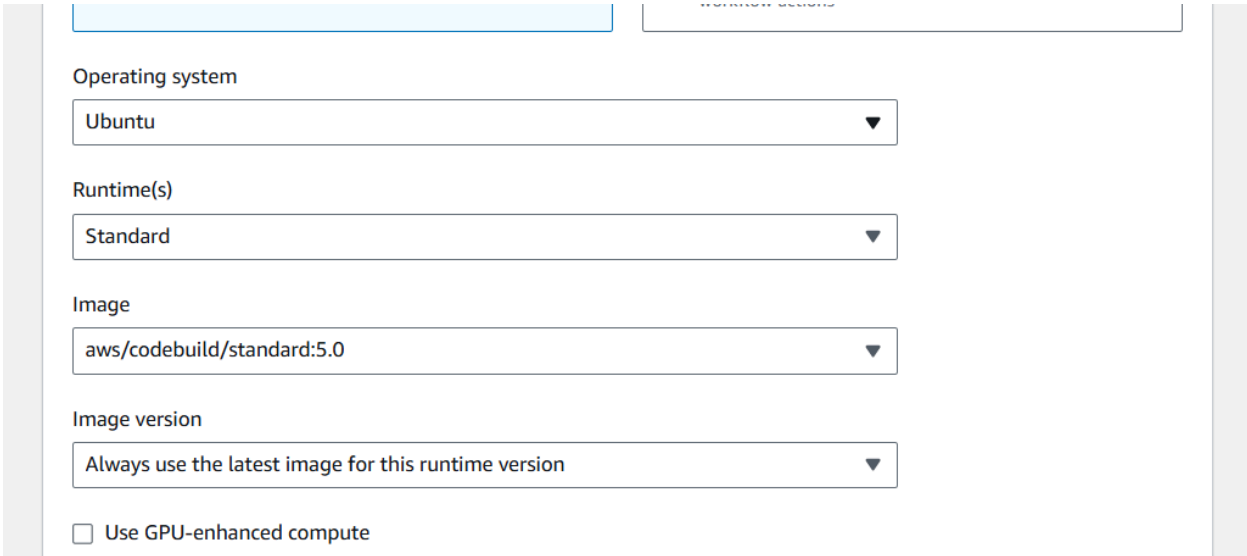


- For **Source**, choose your source repository (e.g., GitHub, Bitbucket, or S3).

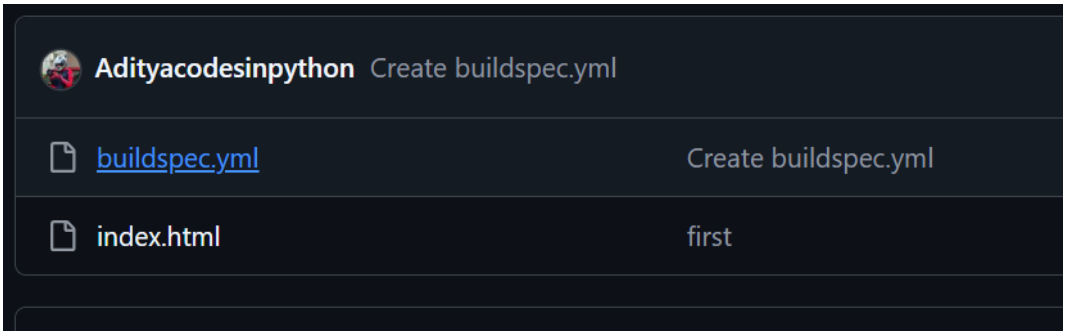


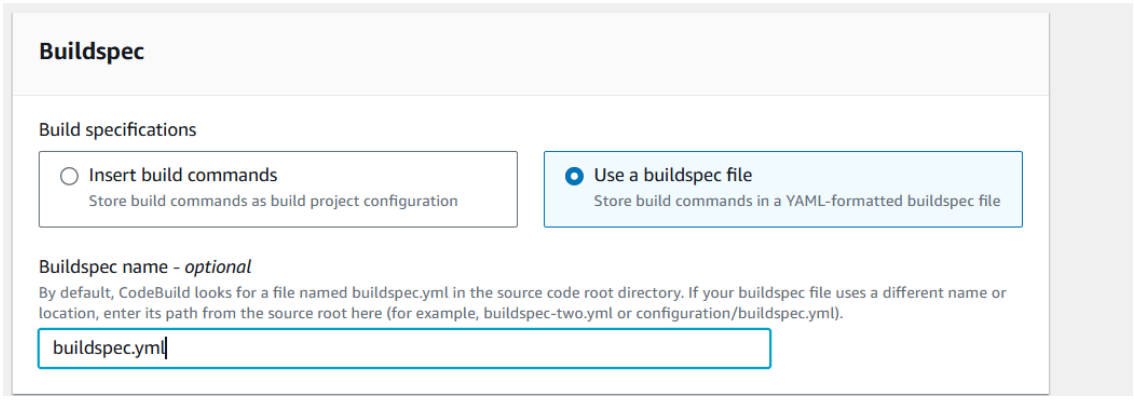


- Under **Environment**, choose **Managed Image** with **Ubuntu**, and select **Runtime: Standard**.

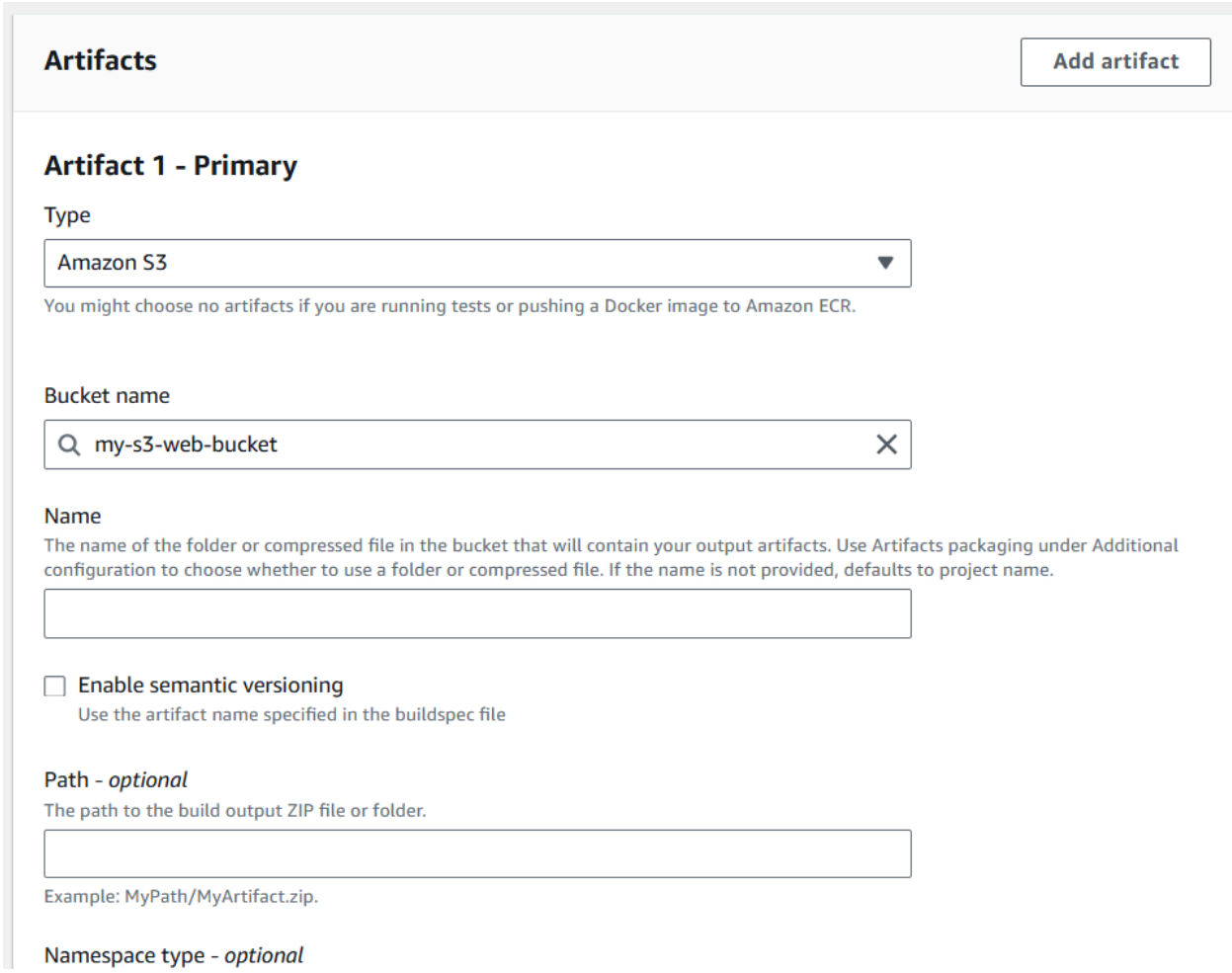


- specify the `buildspec.yml` file you created. before this add it to your git repo

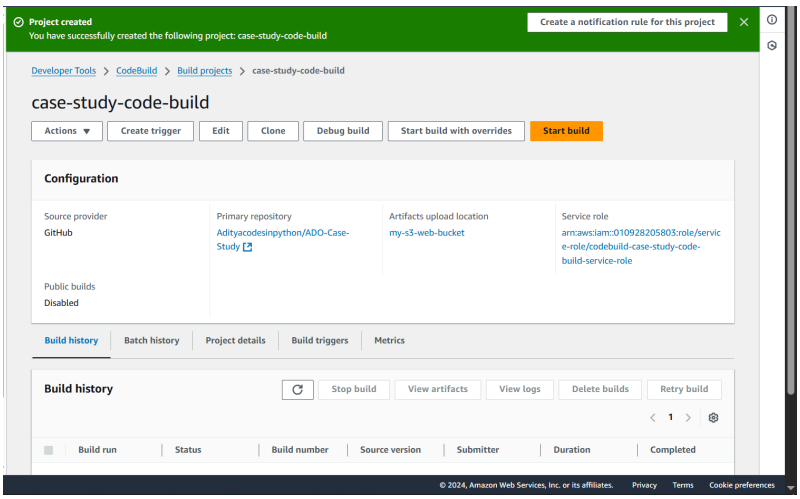


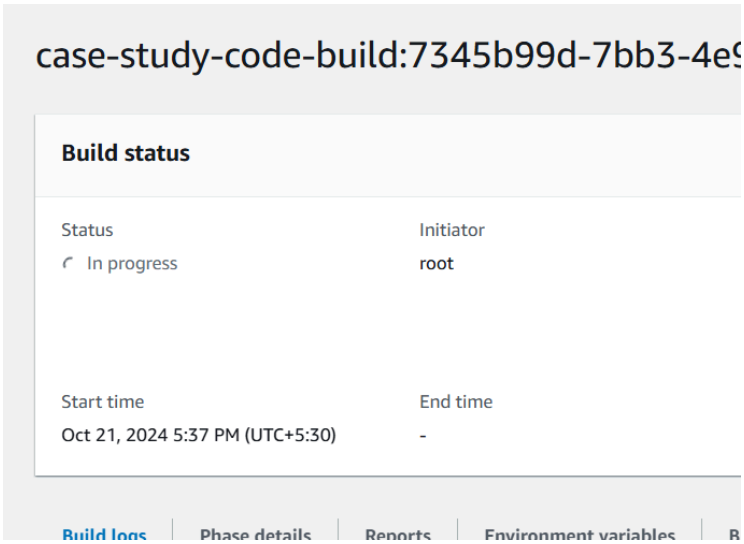


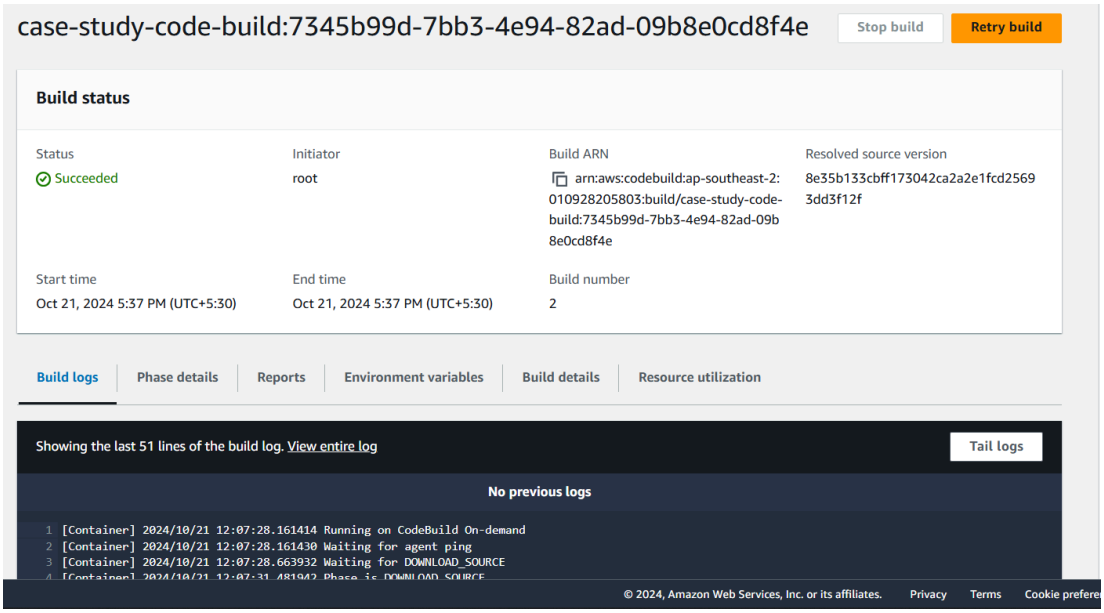
- Set **Artifacts** to "S3", and choose the bucket you created earlier.



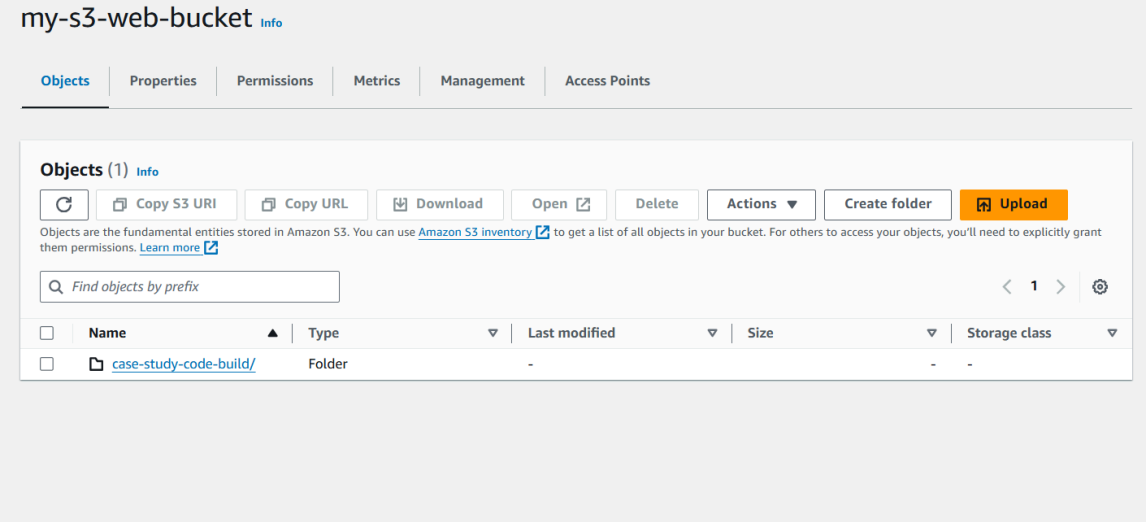
- Create the build project and start the build to ensure it uploads `index.html` to the S3 bucket.




case-study-code-build:7345b99d-7bb3-4e
Build status
Status
In progress
Initiator
root
Start time
Oct 21, 2024 5:37 PM (UTC+5:30)
End time
-
Build logs
Phase details
Reports
Environment variables

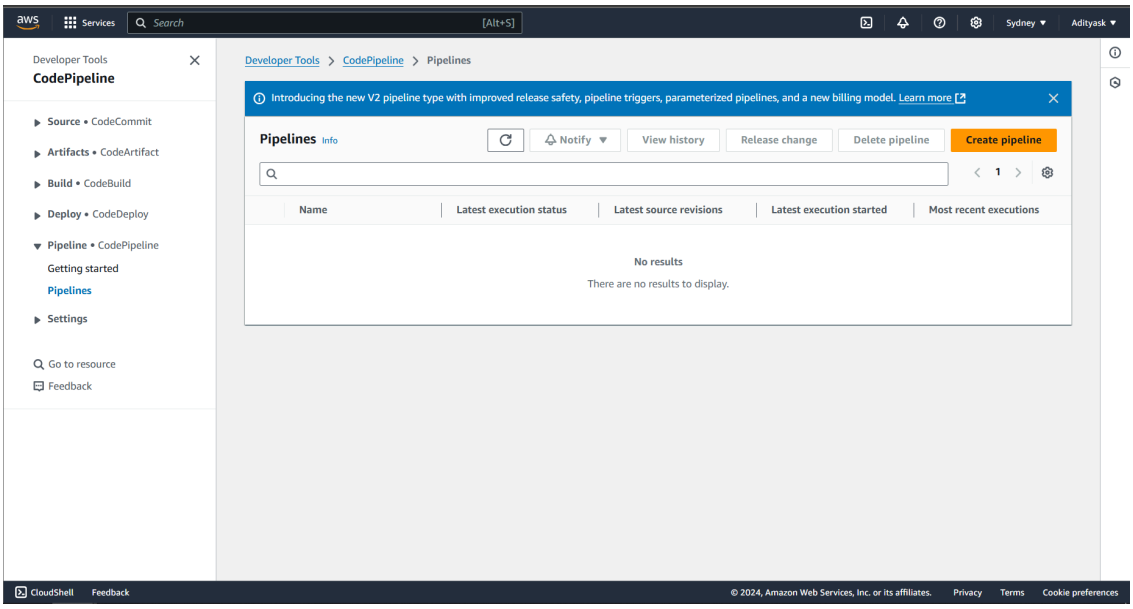

case-study-code-build:7345b99d-7bb3-4e94-82ad-09b8e0cd8f4e
Stop build
Retry build
Build status
Status
Succeeded
Initiator
root
Build ARN
arn:aws:codebuild:ap-southeast-2:010928205803:build/case-study-code-build:7345b99d-7bb3-4e94-82ad-09b8e0cd8f4e
Resolved source version
8e35b133cbff173042ca2a2e1fcd25693dd3f12f
Start time
Oct 21, 2024 5:37 PM (UTC+5:30)
End time
Oct 21, 2024 5:37 PM (UTC+5:30)
Build number
2
Build logs
Phase details
Reports
Environment variables
Build details
Resource utilization
Showing the last 51 lines of the build log. View entire log
Tail logs
No previous logs
1 [Container] 2024/10/21 12:07:28.161414 Running on CodeBuild On-demand
2 [Container] 2024/10/21 12:07:28.161430 Waiting for agent ping
3 [Container] 2024/10/21 12:07:28.663932 Waiting for DOWNLOAD_SOURCE
© 2024, Amazon Web Services, Inc. or its affiliates.
Privacy
Terms

s3 bucket was updated:

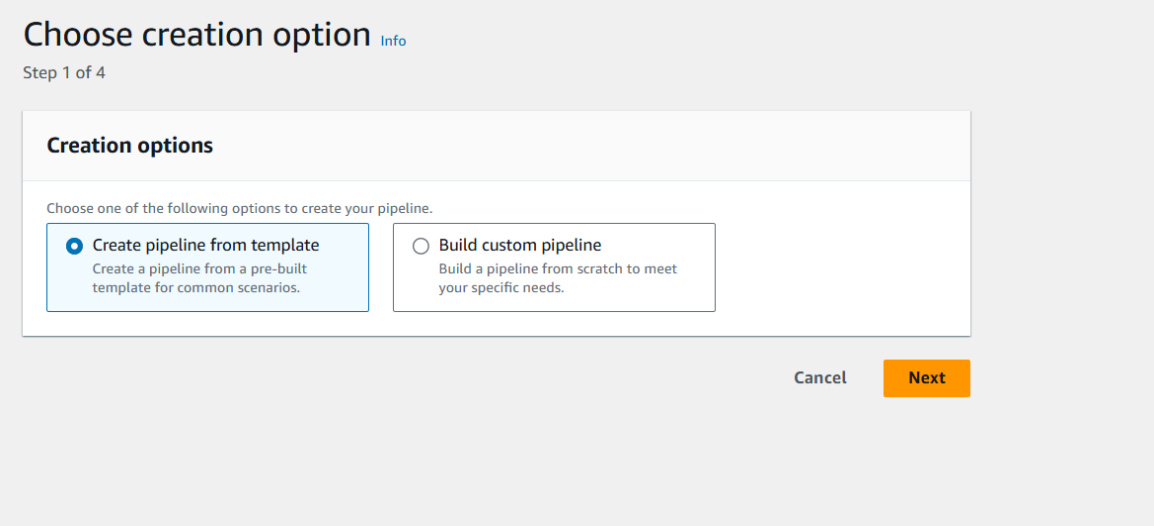


4. Set Up AWS CodePipeline

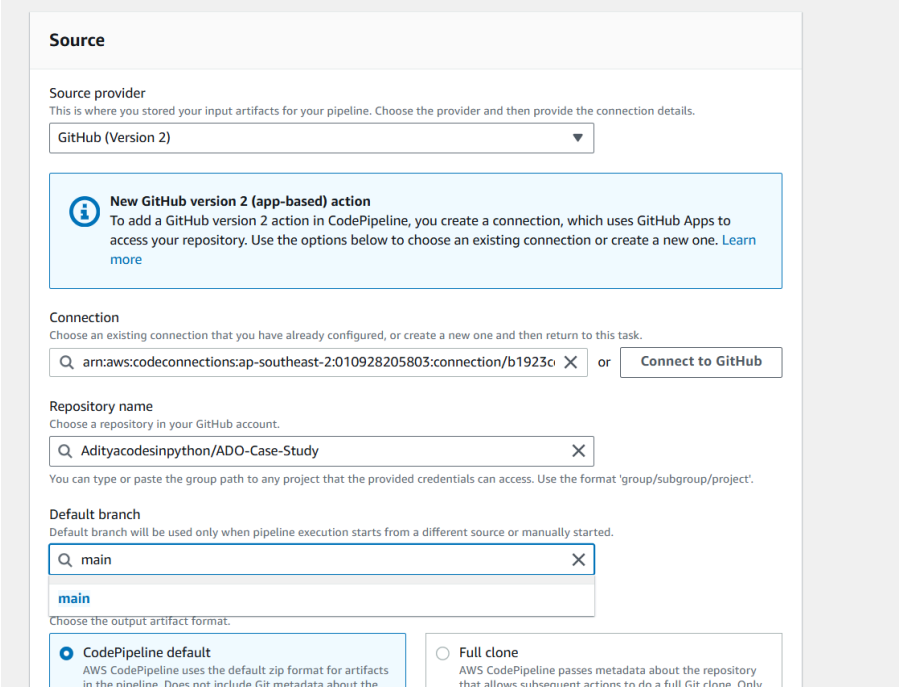
1. **Go to AWS CodePipeline**:
   - Open the CodePipeline console.



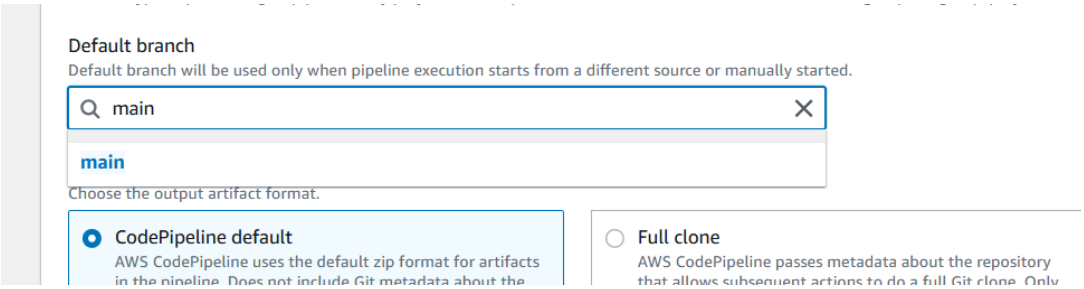
- Create a new pipeline.



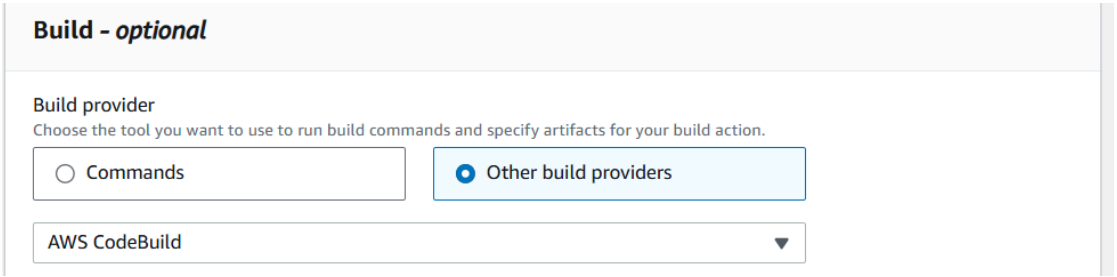
- For **Source**:
  - Select your repository (e.g., GitHub, Bitbucket).



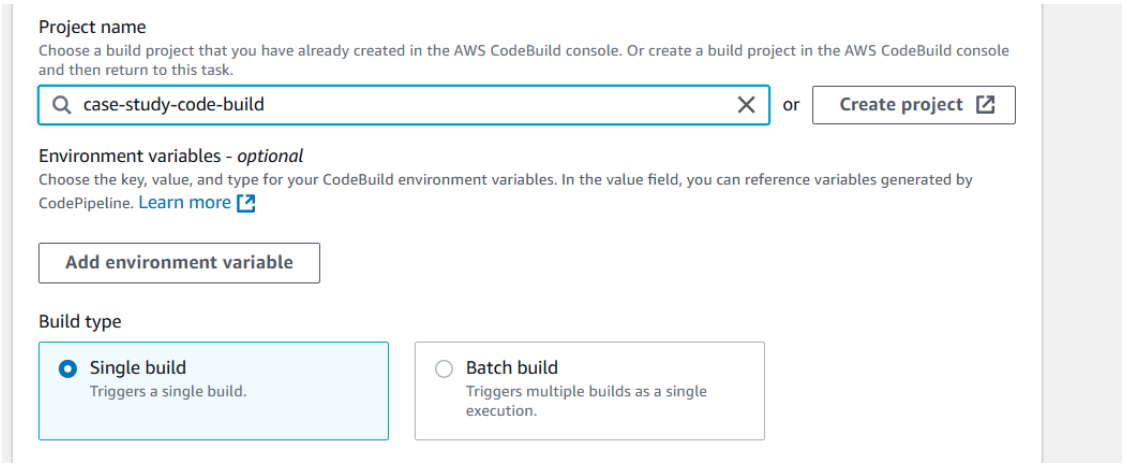
- Connect and choose the appropriate branch where the `index.html` and `buildspec.yml` files are.



2. **Add Build Stage**:
   - In the **Build stage**, choose **AWS CodeBuild** as the build provider.

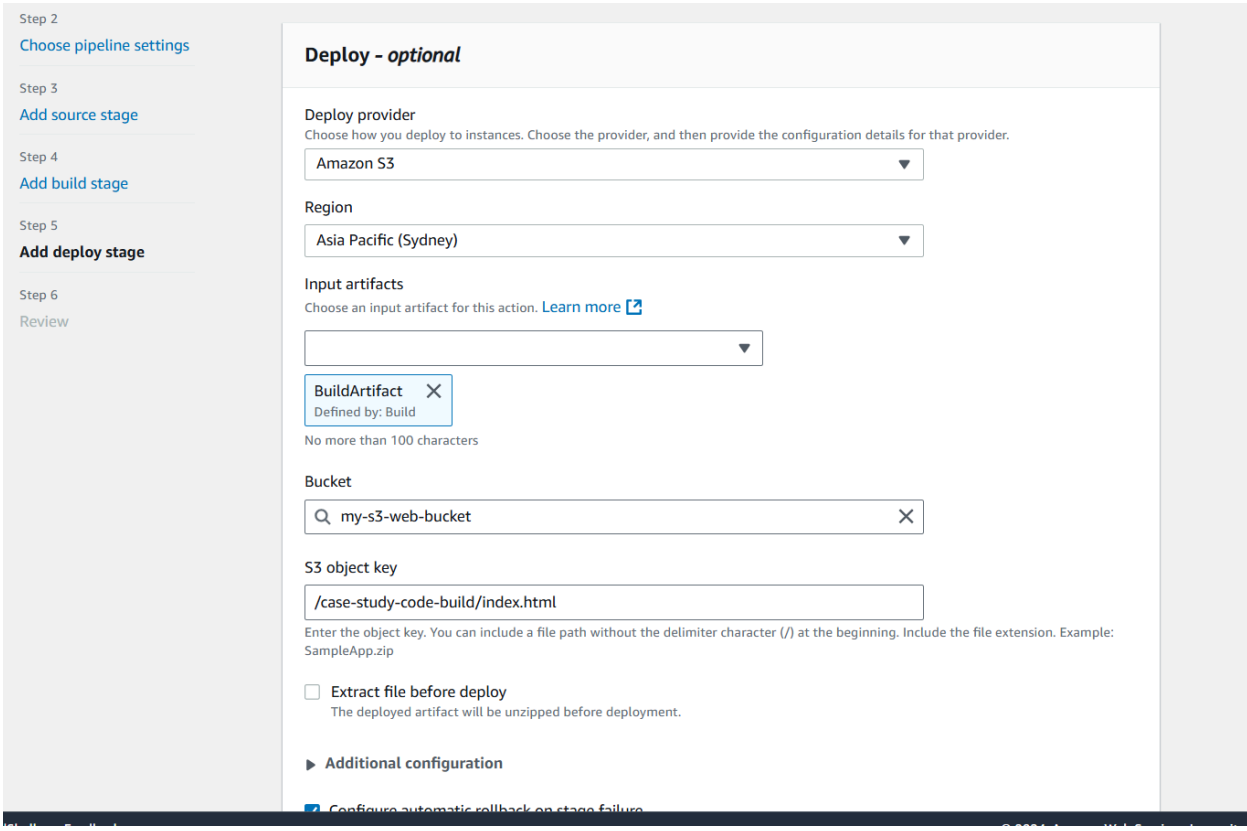


   - Select the CodeBuild project you created earlier.



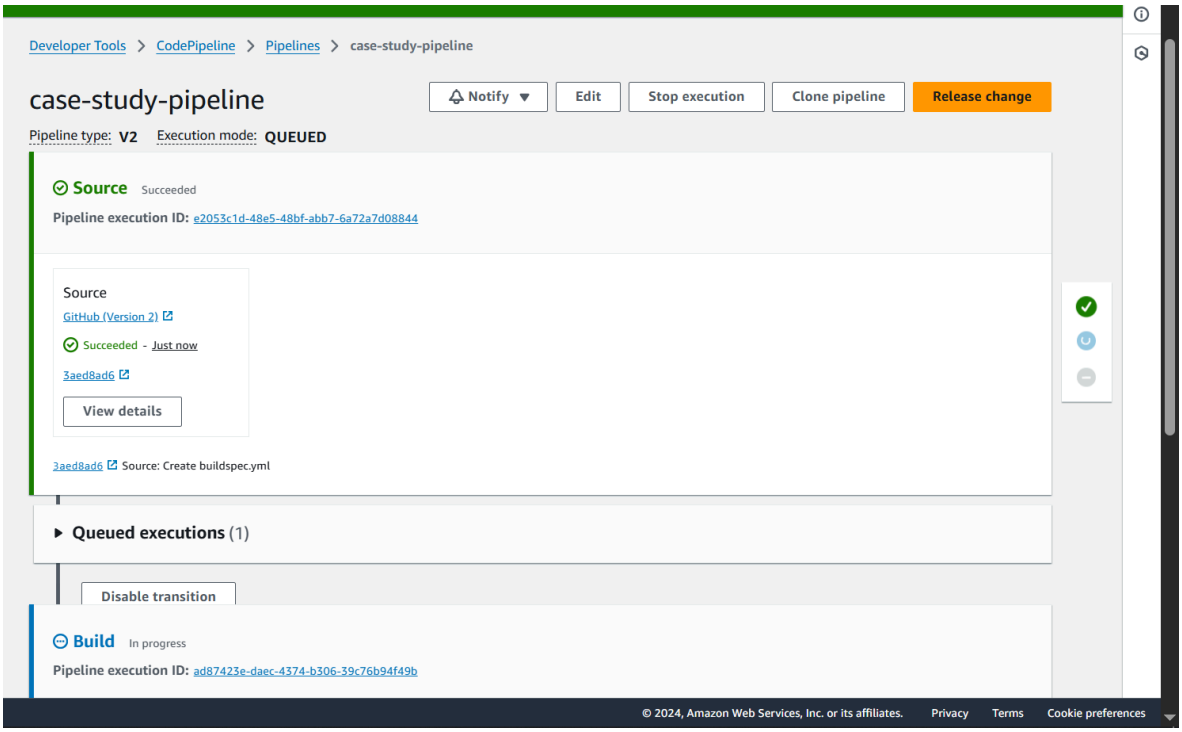
3. **Deploy to S3**:

- In the next stage, choose **Deploy**. Select **Amazon S3**. Choose your S3 bucket (`my-s3-bucket`) where the `index.html` file will be deployed.

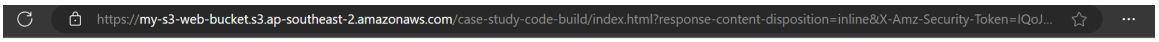


4. **Test the Pipeline**:

- Once the pipeline is set up, click **Release Change** to start the pipeline. This should fetch the latest code, build it, and upload `index.html` to the S3 bucket.



- Visit the S3 bucket's website URL to verify that the `index.html` page is live.



Welcome to my Adv devops case study!

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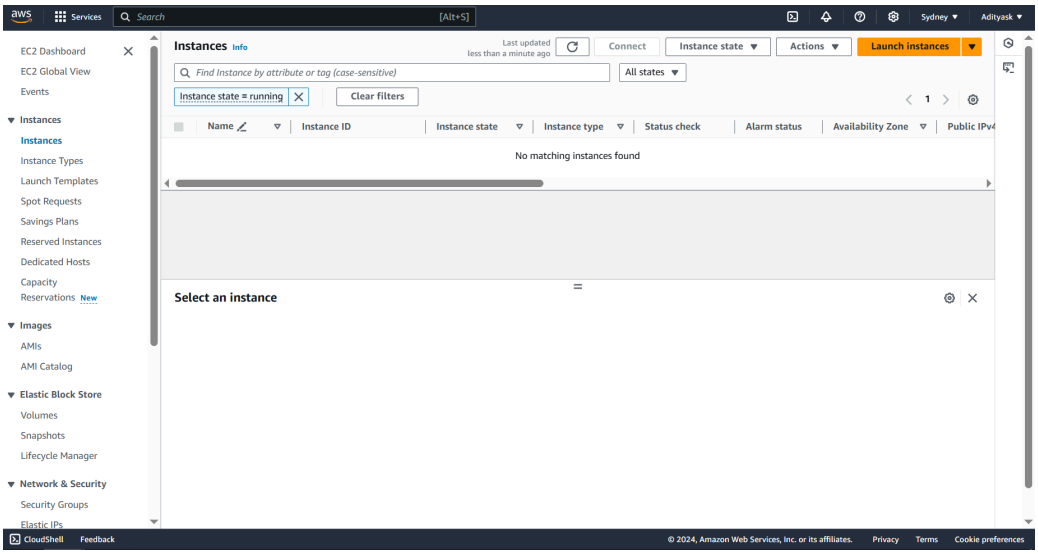
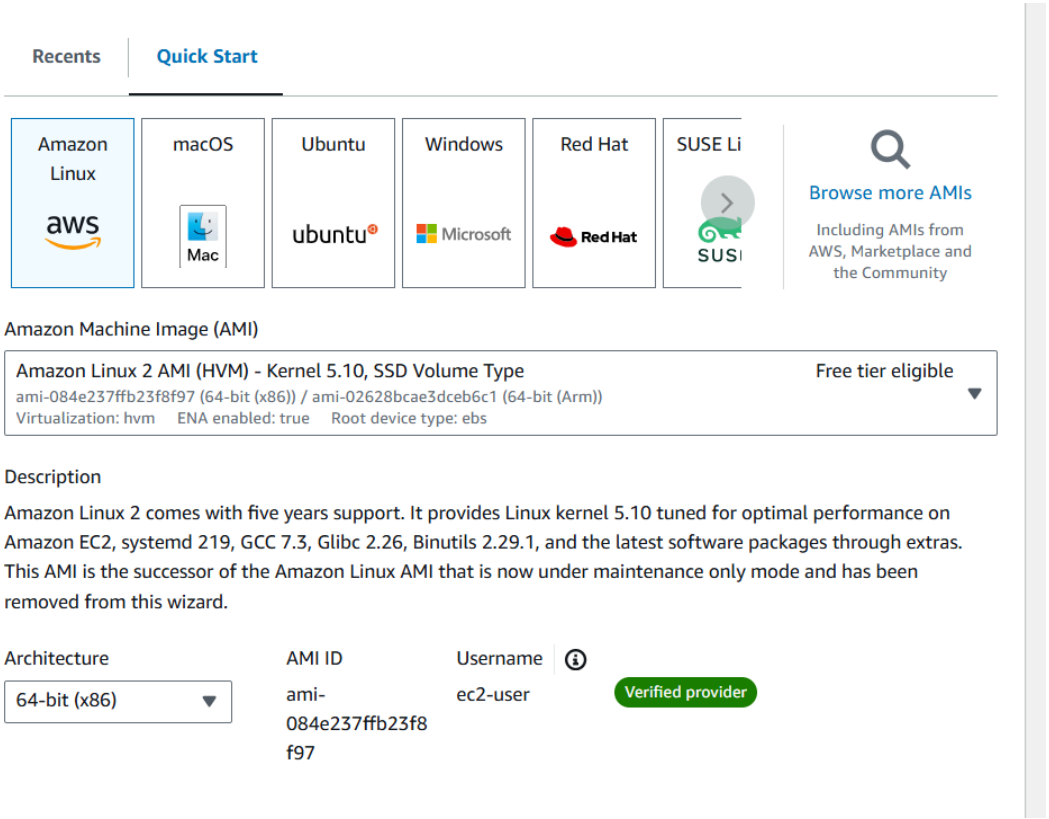
5. Set Up EC2 Instance for Web Hosting

1. **Launch an EC2 Instance**:
   - Open the EC2 console.

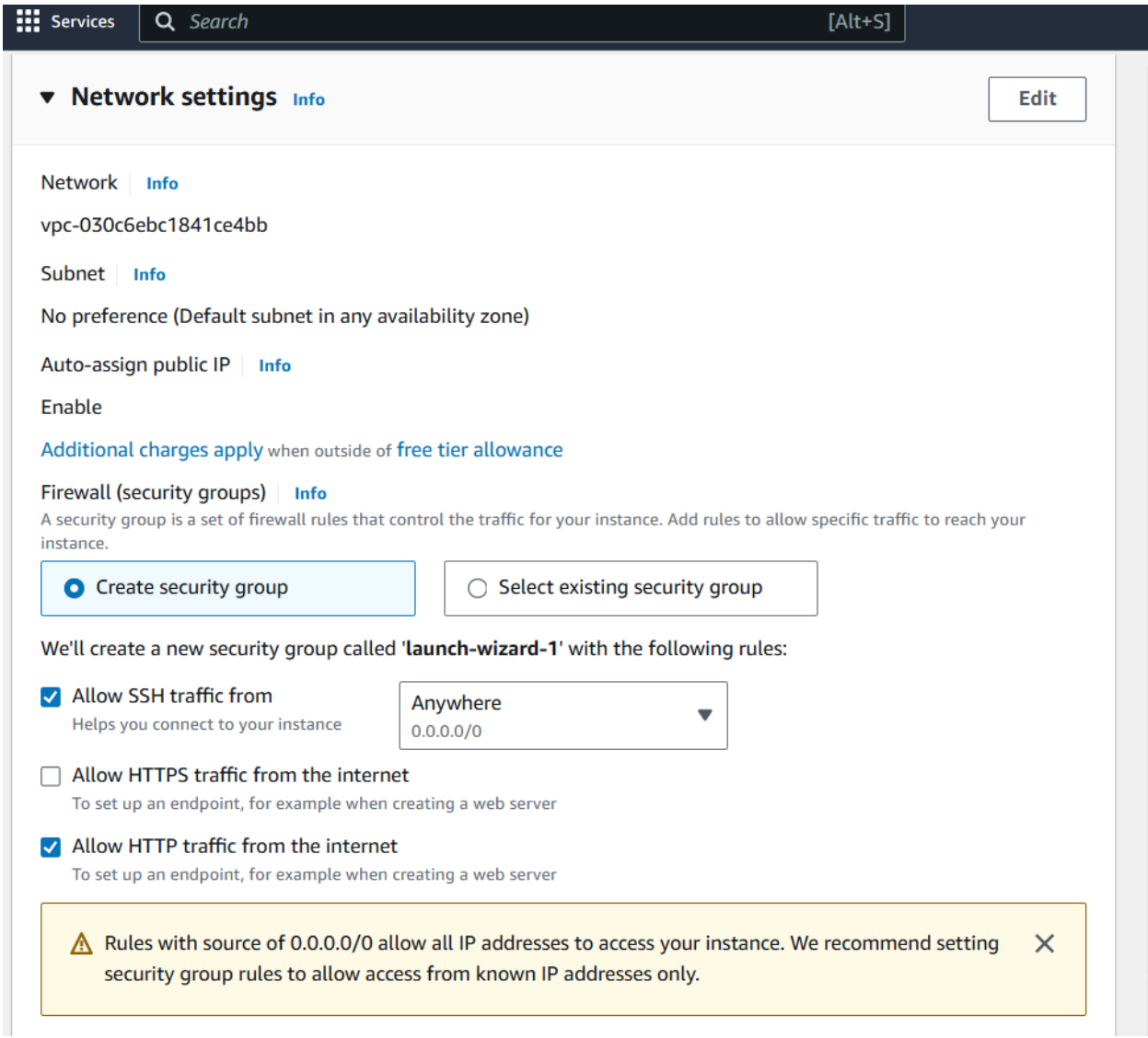


   - Launch a new instance, selecting an Amazon Linux 2 AMI.



   - Choose the default t2.micro instance type.
   - Configure instance settings and storage (use defaults for now).

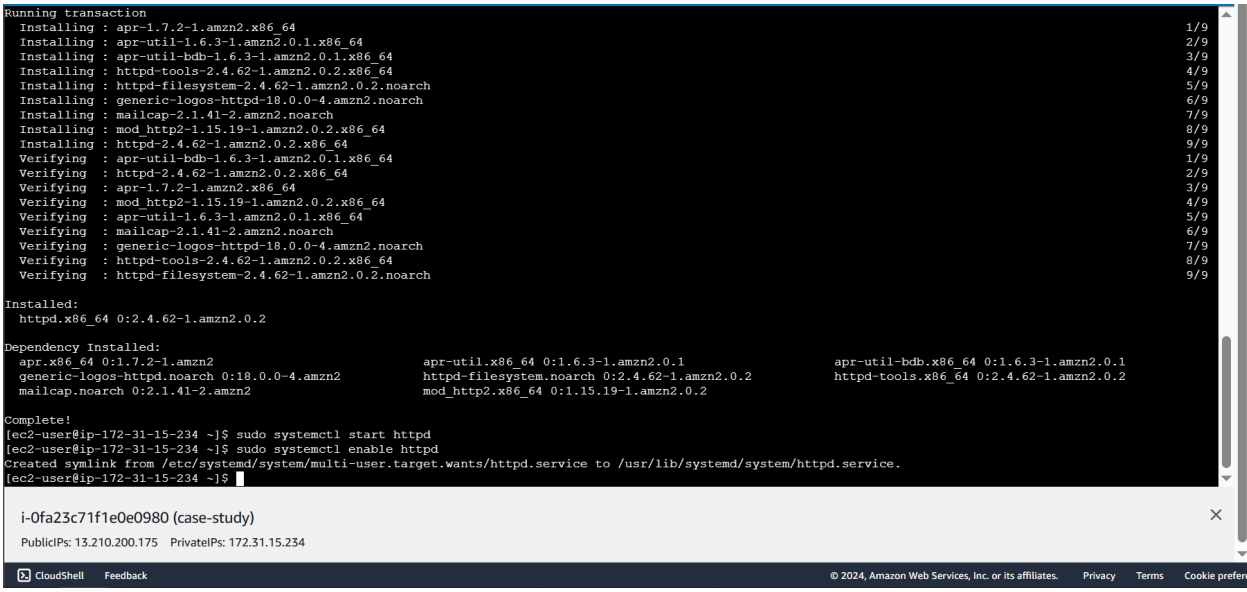
- In **Configure Security Group**, allow HTTP traffic by adding a rule to open port 80.



2. **Connect to the EC2 Instance**:
   - Once the instance is running, connect via SSH.

Install the required web server (Apache) on your instance:

```
sudo yum update -y
sudo yum install httpd -y
sudo systemctl start httpd
sudo systemctl enable httpd
```



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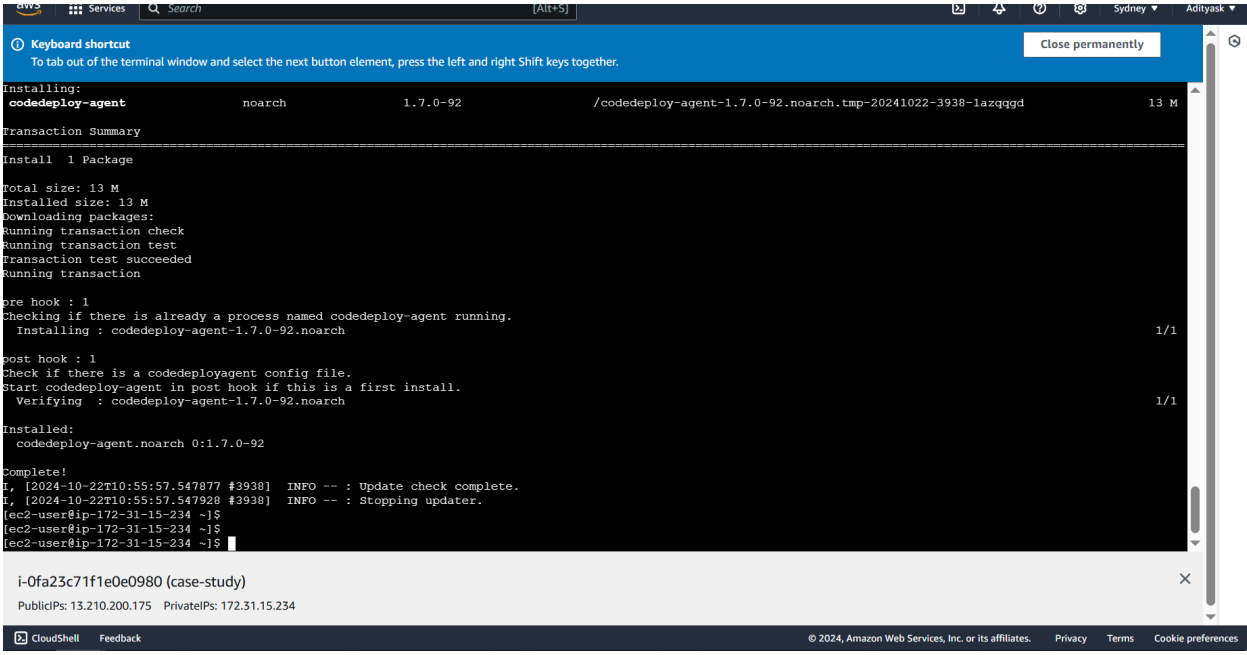
6. Set Up AWS CodeDeploy to Push Updates to EC2

1. **Install CodeDeploy Agent on EC2**:
   - Connect to the EC2 instance and Install the CodeDeploy agent:

```
sudo yum update -y
sudo yum install -y ruby wget
wget https://aws-codedeploy-us-east-1.s3.amazonaws.com/latest/install
chmod +x ./install
```

```
sudo ./install auto
```



2. **Set Up CodeDeploy Application**:

3.1 Create Application

1. **Using AWS CLI from Local Terminal on pc (not ec2, use your own pc's command line)**:

   ```
   # First ensure AWS CLI is installed
   aws --version
   ```

   if not installed, install from https://awscli.amazonaws.com/AWSCLIV2.msi

   ```
   aws configure
   ```

2. Create application:

   ```
   aws deploy create-application --application-name my-webapp
   ```

3.2 Create Deployment Group

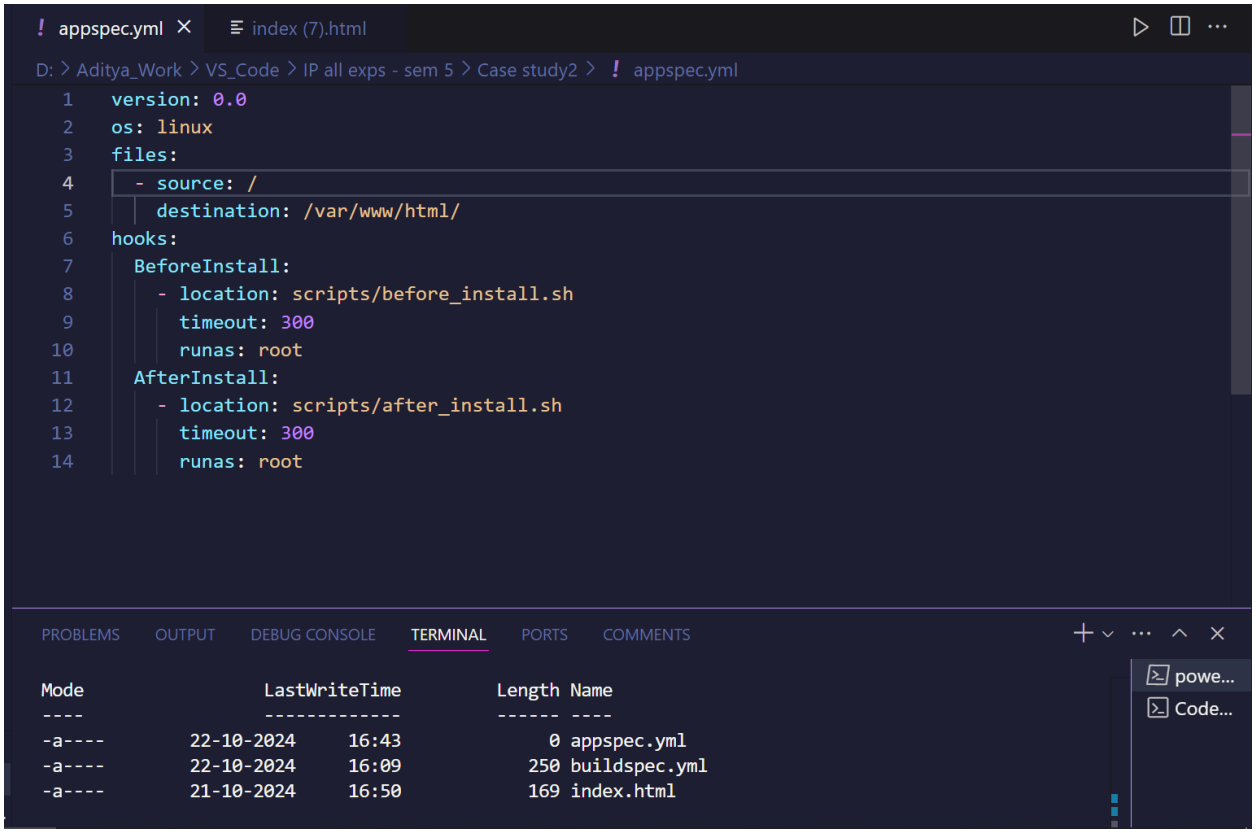
- Create deployment group:

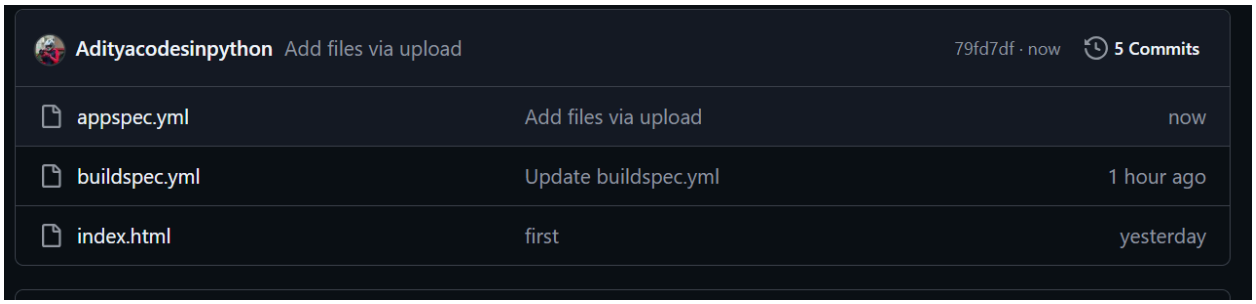
  ```
  aws deploy create-deployment-group --application-name
  my-webapp --deployment-group-name my-webapp-group
  ```

```
--service-role-arn
arn:aws:iam::ACCOUNT_ID:role/CodeDeployServiceRole
```

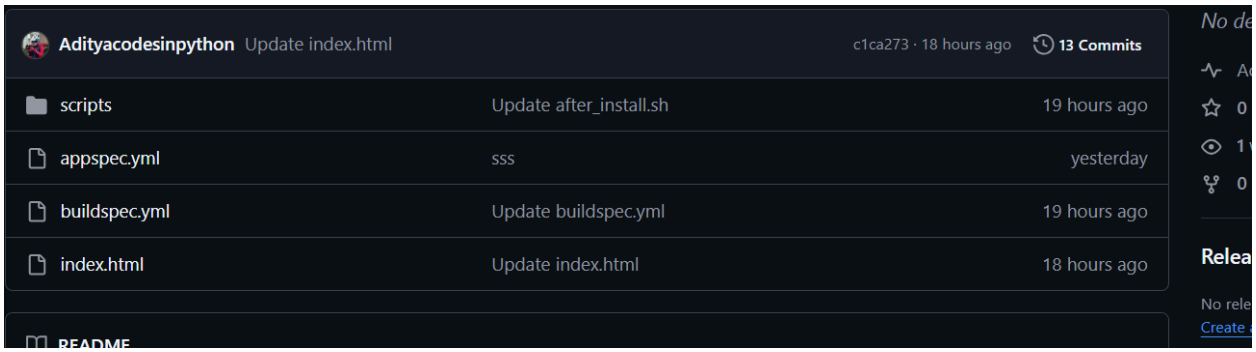
- enter your ACCOUNT_ID above!!

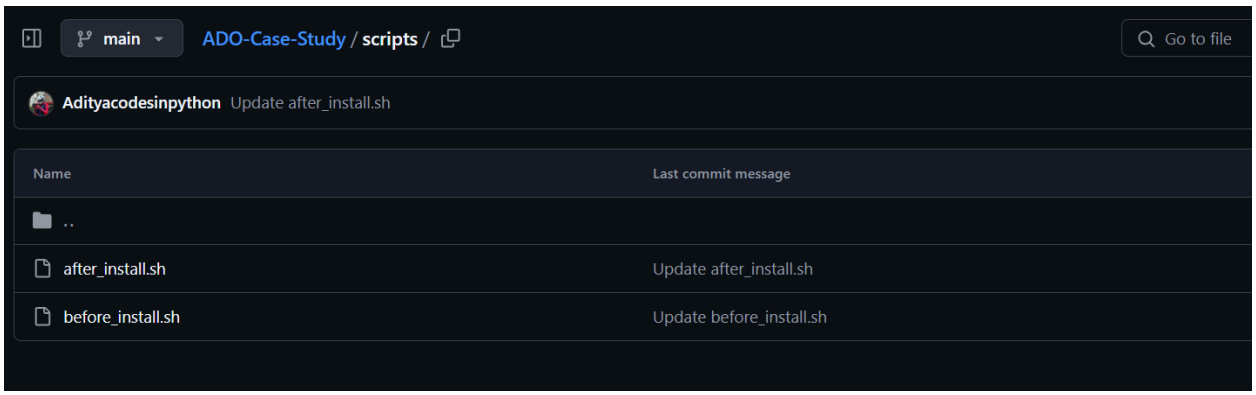
Create `appspec.yml` for CodeDeploy: In your project folder, create an `appspec.yml` file to specify how CodeDeploy should handle the deployment:

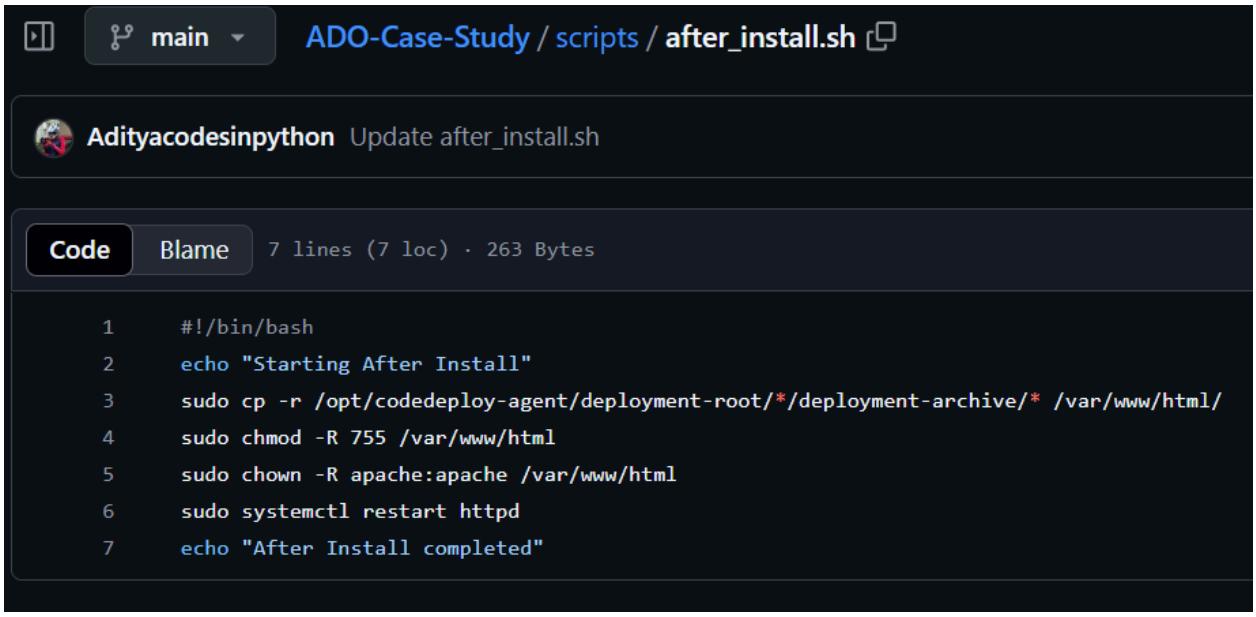




Now create a scripts folder inside your repo which will contain 2 files: before_install.sh and after_install.sh







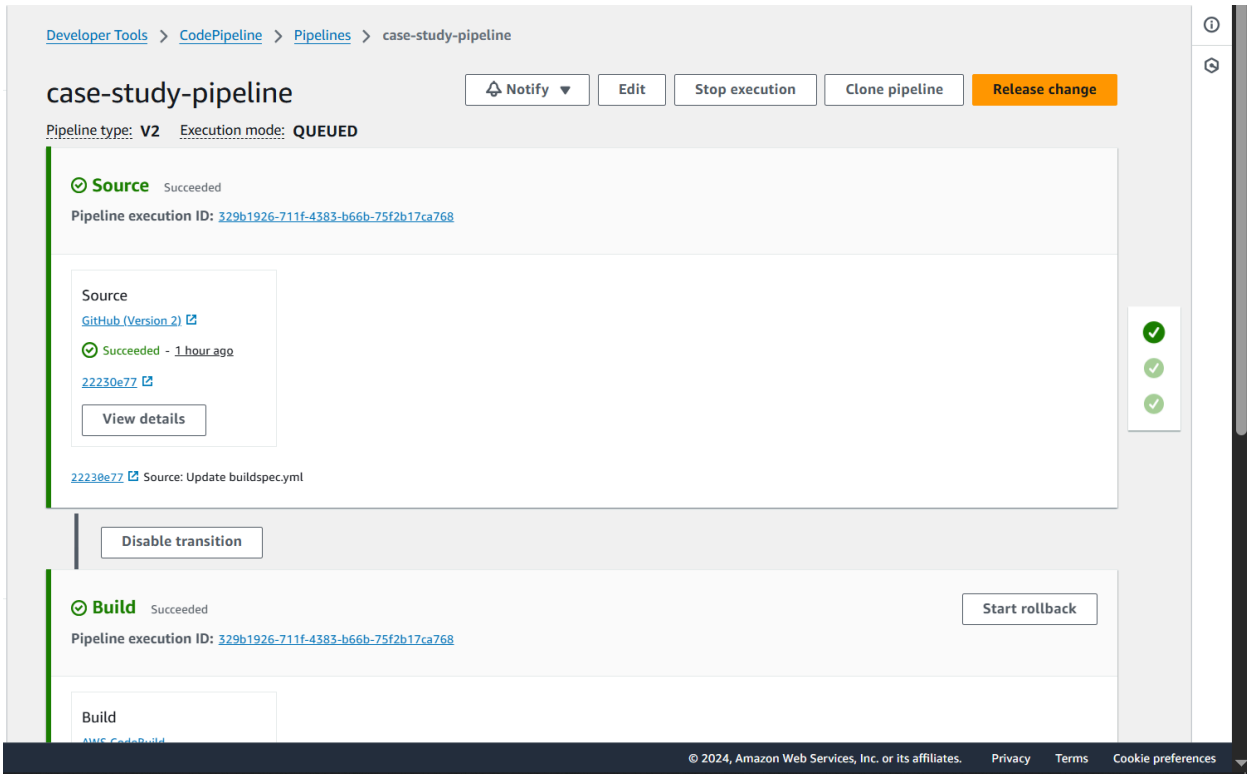
main ADO-Case-Study / scripts / before_install.sh

Adityacodesinpython Update before_install.sh

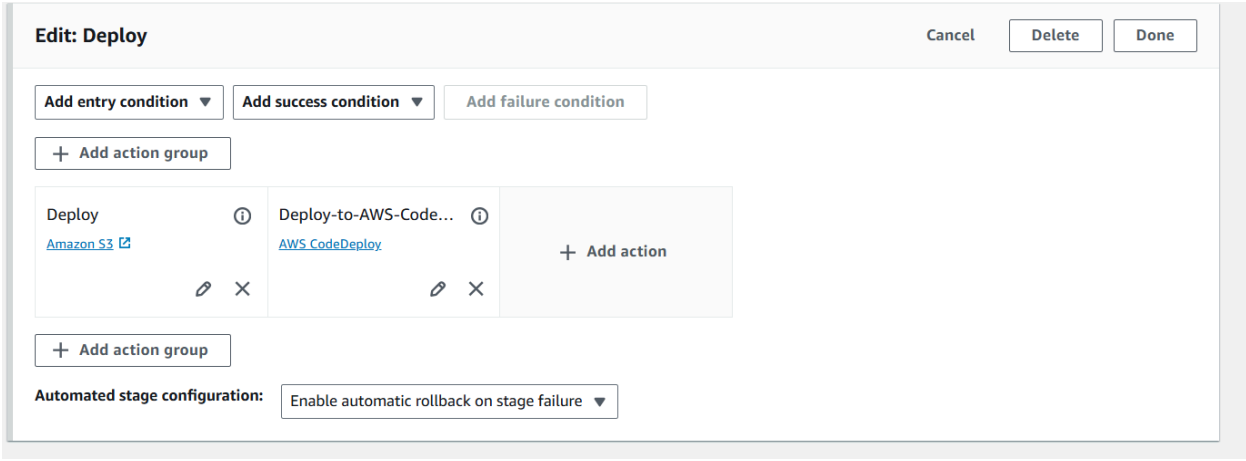
Code Blame 7 lines (7 loc) · 175 Bytes

```
1  #!/bin/bash
2  echo "Starting Before Install"
3  sudo yum update -y
4  sudo yum install -y httpd
5  sudo systemctl start httpd
6  sudo systemctl enable httpd
7  echo "Before Install completed"
```

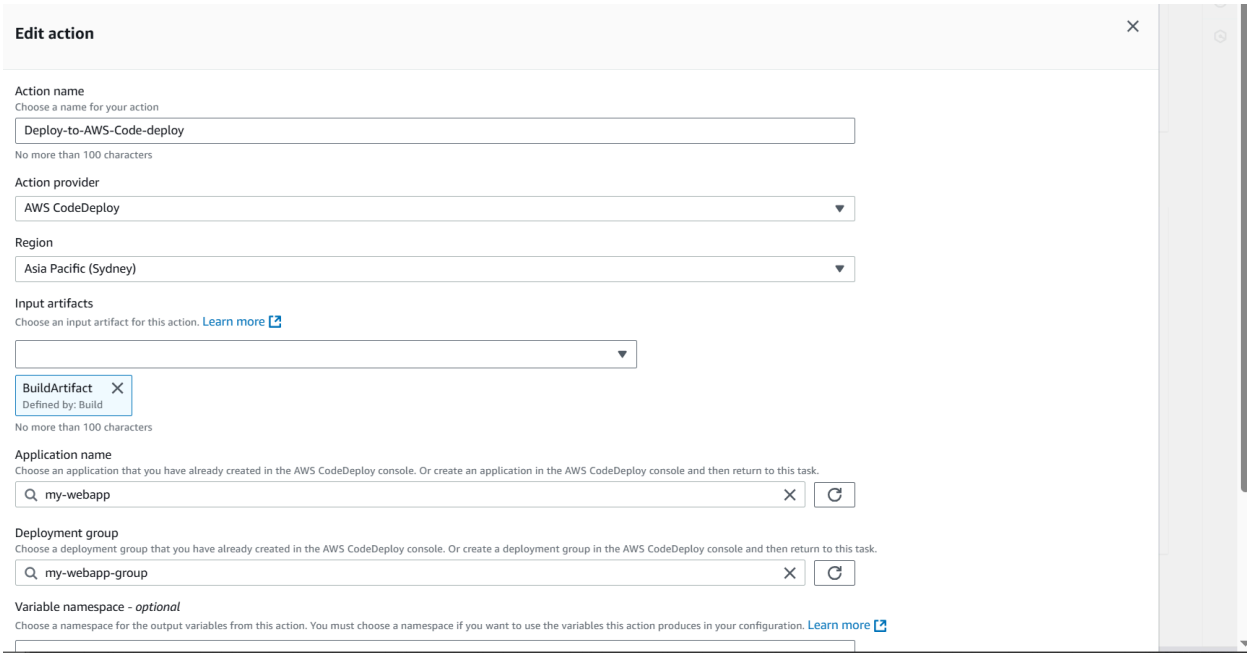
3. **Add Deployment Stage to CodePipeline**:
   - Go back to your CodePipeline.



- Add a new stage for deployment.

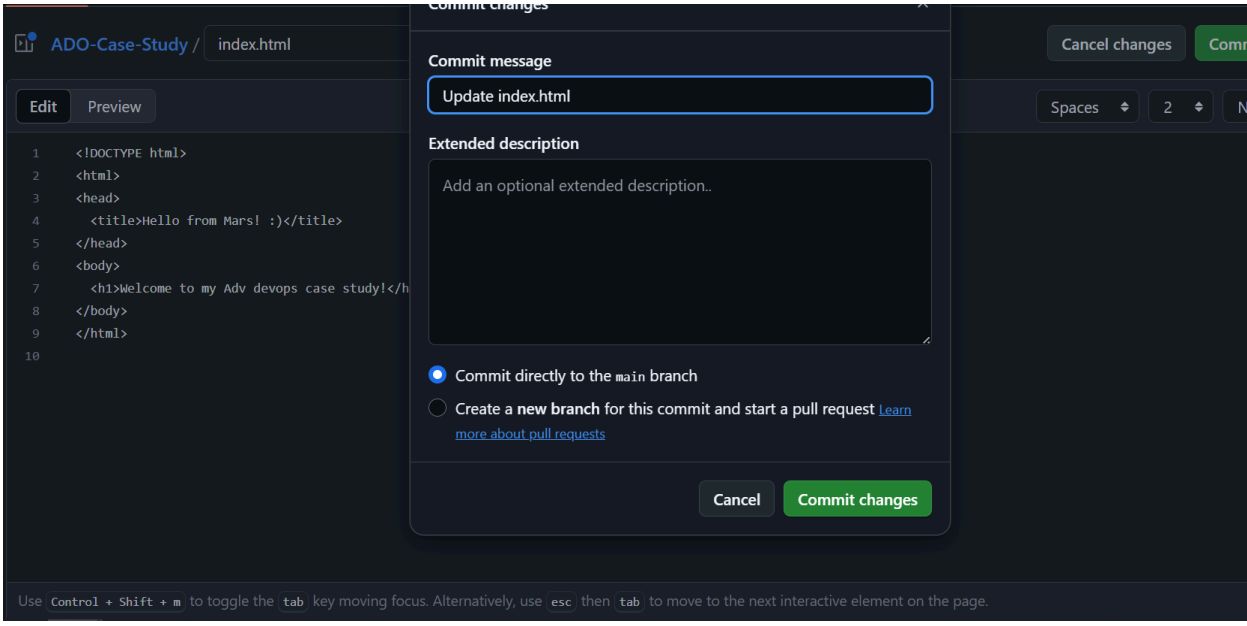


- Select **AWS CodeDeploy** and choose the application and deployment group you created earlier.

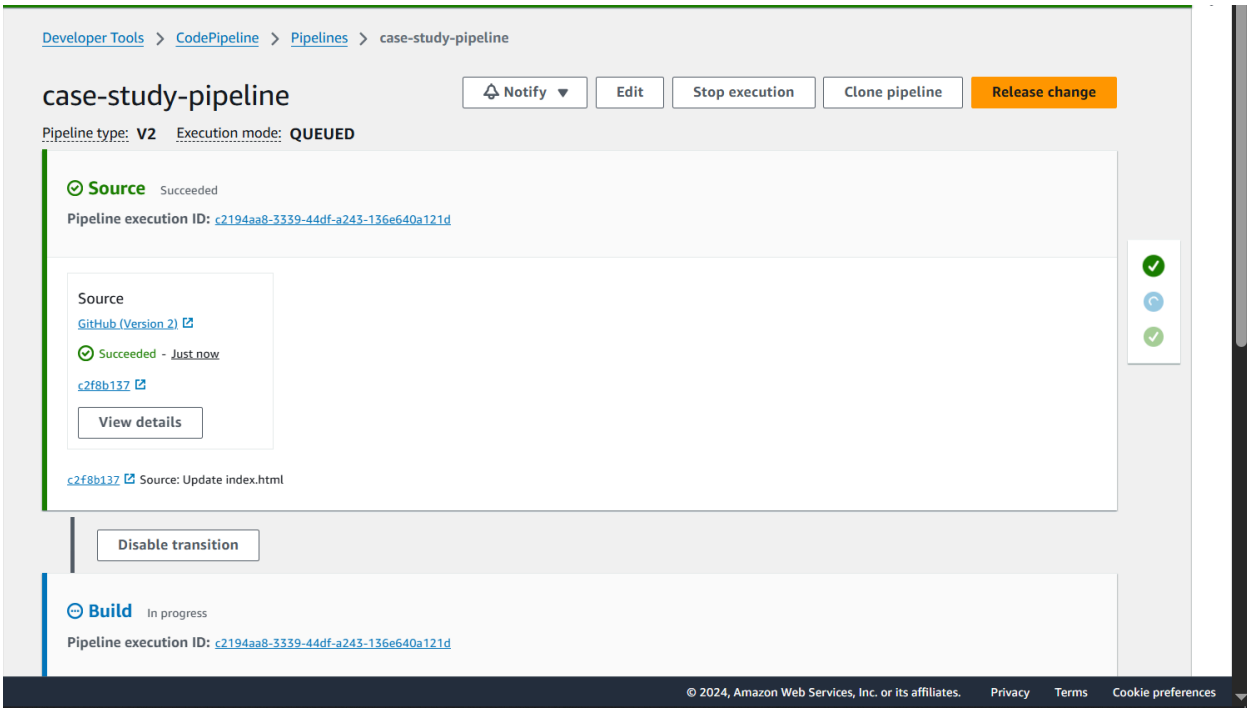


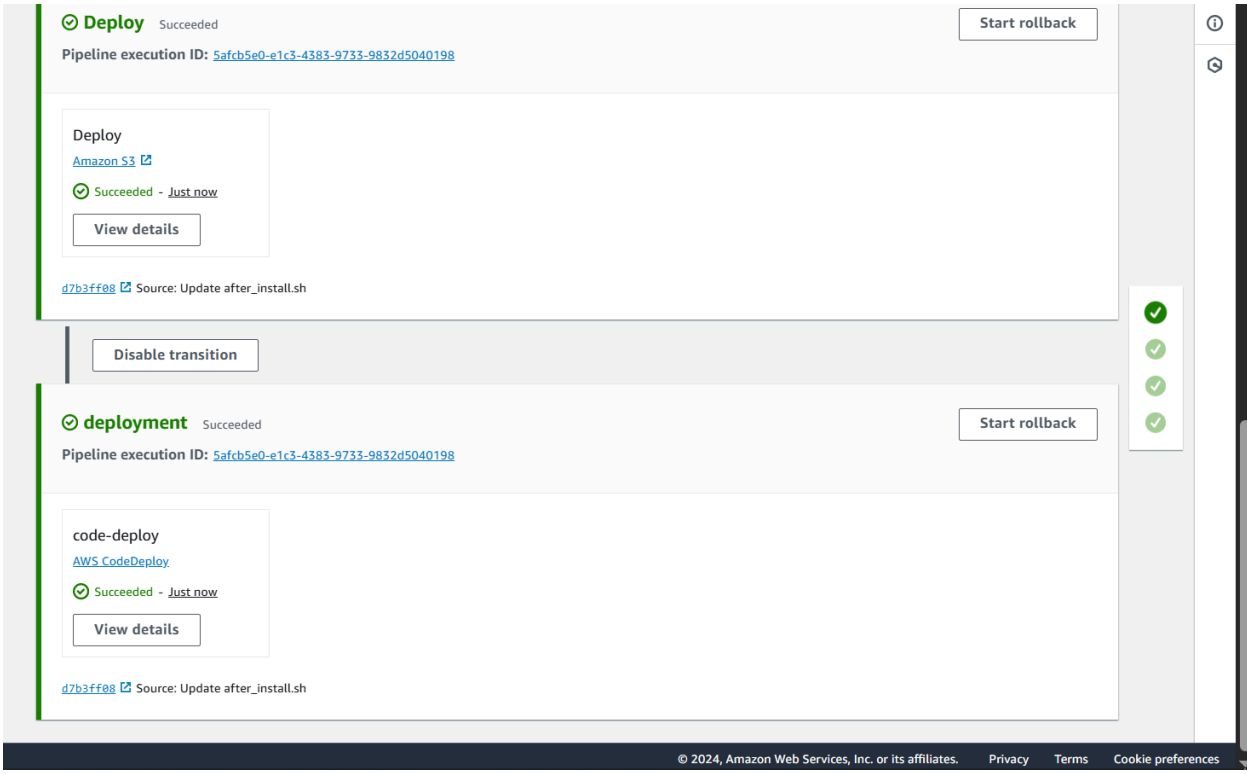
4. **Test Deployment**:

- Make a change to `index.html` in your source repository and push it.

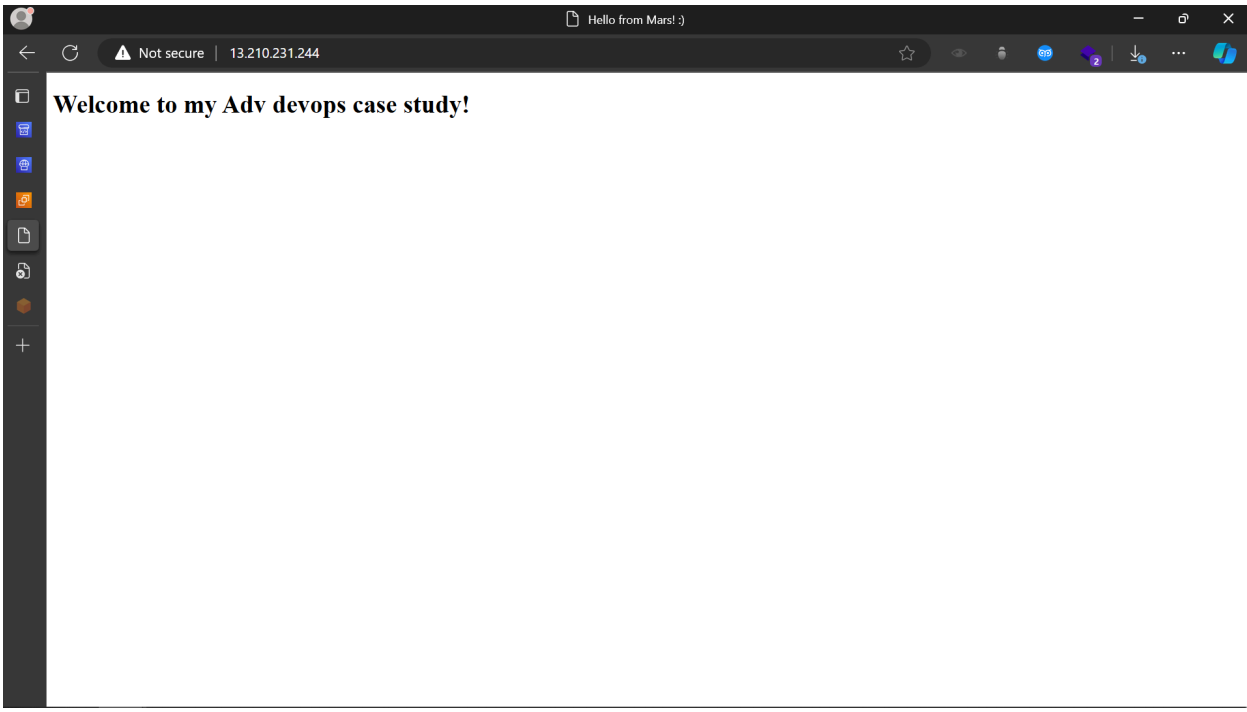


- This should trigger the pipeline, rebuild the app, push it to S3, and deploy it to the EC2 instance.





- You can access your EC2 instance via its public IP to view the updated web app.



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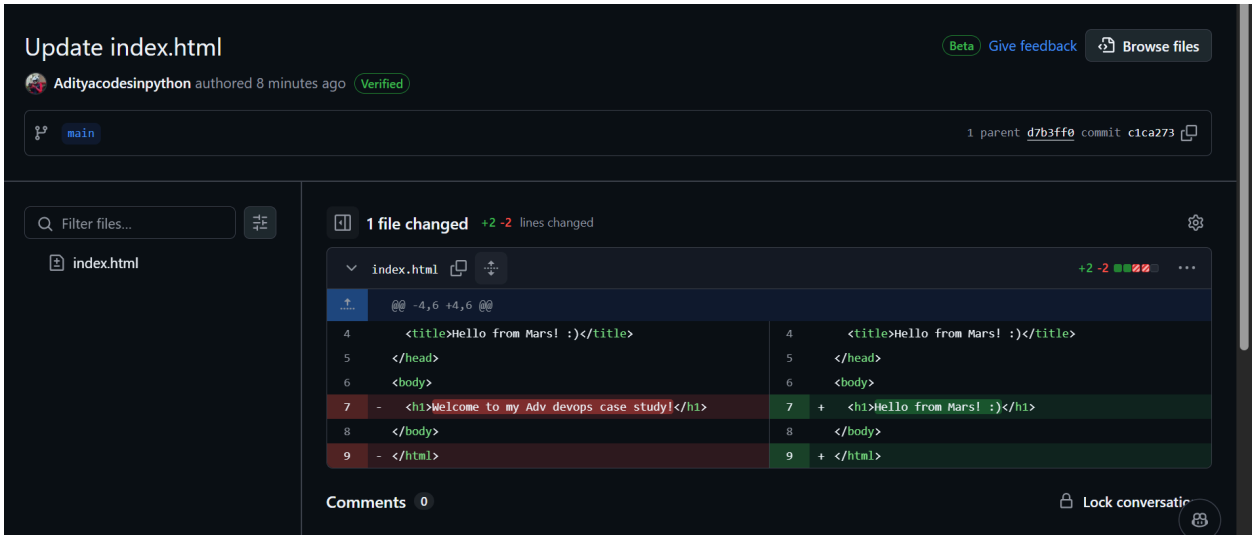
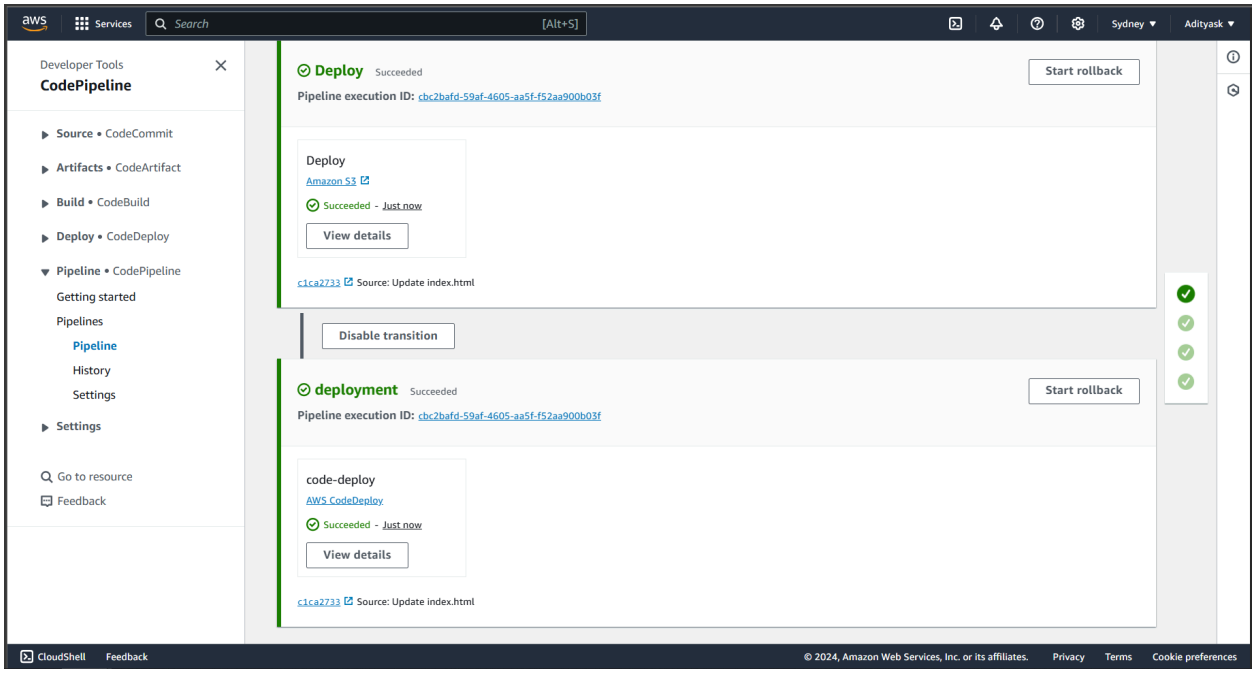
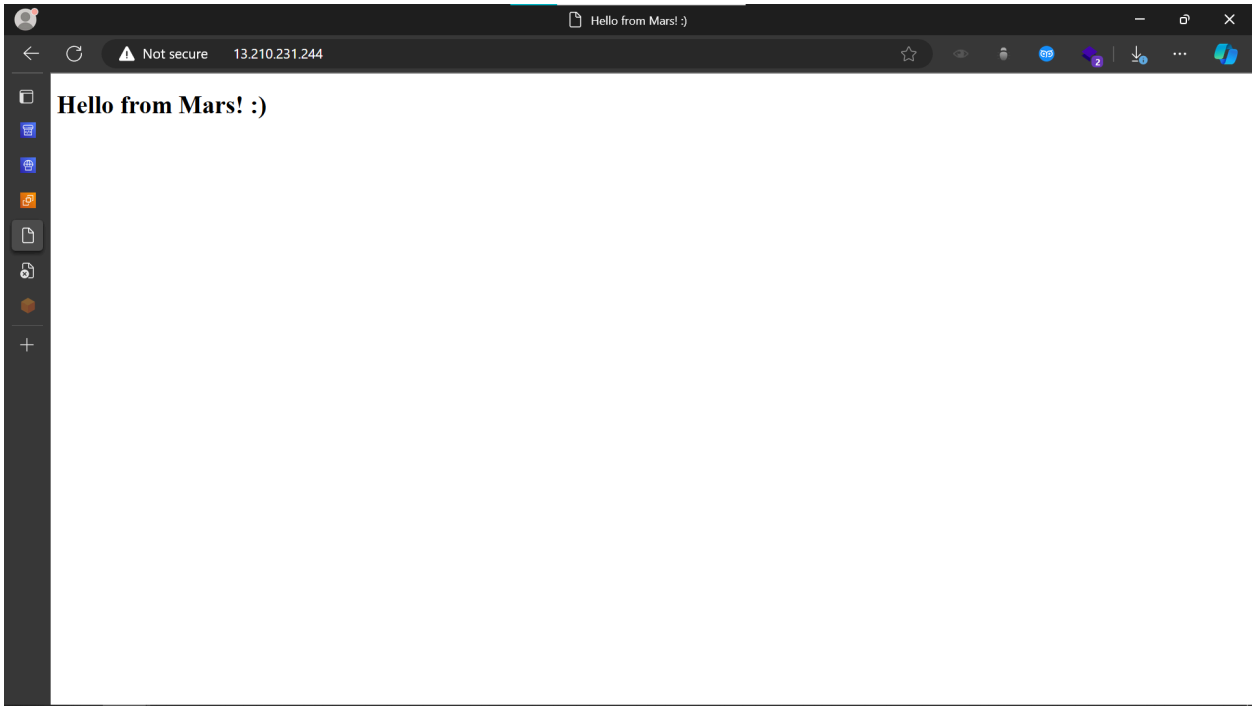
7. Verify Automation

- Now that your pipeline is set up, any changes to your repository (e.g., modifying the `index.html` file) should automatically trigger the build, deploy it to S3, and push updates to your EC2 instance.







CHALLENGES FACED:

1. **Permission Issues**: One of the main hurdles was setting the correct permissions in IAM roles and the S3 bucket policy. Errors like `403 Forbidden` when accessing S3 were resolved by adjusting the S3 bucket policy.
2. **Missing AppSpec File**: The CodeDeploy process failed initially because the `appspec.yml` file was not placed correctly in the root directory of the build artifacts.
3. **CodeDeploy Agent Issues**: The EC2 instance had issues with the CodeDeploy agent, such as failing to start or showing `Permission Denied` errors. These were resolved by restarting the agent and ensuring the instance had appropriate permissions to access S3.

Despite these challenges, the overall deployment was successful, demonstrating the effectiveness of AWS's automation tools in managing continuous deployment workflows.

CONCLUSION:

This experiment successfully demonstrated the process of building and deploying a simple web application using AWS CodePipeline, CodeBuild, CodeDeploy, and EC2. The pipeline automates the workflow from the moment the code is pushed to a repository until the application is deployed on an EC2 instance.