# AZURE CLOUD SOLUTION DOCUMENTATION FOR XAI-SERVICE

## Electrical and Computer Engineering
## Summer 2023

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## Table of Contents

# 1. Prerequisite Installations

Note: LINUX Subsystem.

It is better to have WSL in windows than using Ubuntu. Please avoid ARM based processor for this application.

## 1.1. WSL Installation:

STEP 1. After enabling the WSL feature, go to the Microsoft Store (you can search for it in the Start menu).

STEP 2. Search for the Linux distribution you want to install (e.g., Ubuntu, Debian, Fedora, SUSE Linux Enterprise Server, etc.).

STEP 3. Click on the distribution you prefer, and then click the "Install" button. This will download and install the Linux distribution on your system.

## 1.2. Anaconda Installation

STEP 1. Open a new terminal.

STEP 2. Download Anaconda for Linux from their official page.

STEP 3. Execute: chmod +x Anaconda3-2023.03-1-Linux-x86_64.sh

STEP 4. Execute: ./Anaconda3-2023.03-1-Linux-x86_64.sh

STEP 5. Accept Terms and Conditions

STEP 6. Enter the installation directory as “home/<user>/anaconda”

STEP 7. Execute: nano ~/.bashrc

STEP 8. Add the path: export PATH="/path/to/anaconda3/bin:$PATH"

STEP 9. Ctrl+X-> y -> Enter.

STEP 10. source ~/.bashrc

STEP 11. Open a new terminal.

STEP 12. Execute: su -> give the user credentials.

STEP 13. Execute conda init bash.

STEP 14. Check the conda installation by executing “conda --version”.

STEP 15. Clone the repository and cd to the working directory.

STEP 16. Create new environment: conda create -n xai39 python=3.9

STEP 17. Execute: conda activate xai39

STEP 18. Try running the application locally before dockerising the application.

## 1.3. Docker Installation

STEP 1. Open a new terminal in sudo access (“su”).

STEP 2. Execute the following commands consequently,

a. apt update
b. apt install apt-transport-https ca-certificates curl software-properties-common
c. curl -fsSL https://download.docker.com/linux/ubuntu/gpg | sudo gpg --dearmor -o /usr/share/keyrings/docker-archive-keyring.gpg
d. echo "deb [arch=amd64 signed-by=/usr/share/keyrings/docker-archive-keyring.gpg] https://download.docker.com/linux/ubuntu $(lsb_release -cs) stable" | sudo tee /etc/apt/sources.list.d/docker.list > /dev/null
e. apt update
f. apt install docker-ce docker-ce-cli containerd.io
g. systemctl status docker
h. usermod -aG docker $USER

STEP 3. docker –version

STEP 4. docker login

STEP 5. Verify the login executed successfully.

## 1.4. Azure CLI Installation

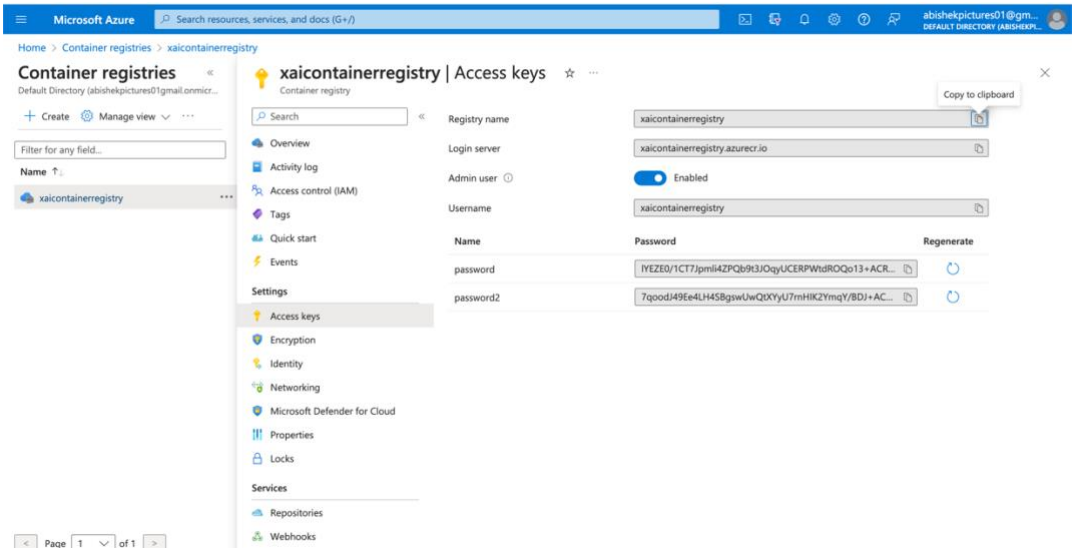
STEP 1. Visit https://learn.microsoft.com/en-us/cli/azure/install-azure-cli-windows?tabs=azure-cli#install-or-update.

STEP 2. Download and install Azure CLI.

## 1.5. Container Registry Creation

STEP 1. Create a container registry “xaicontainerregistry”.

STEP 2. Enable admin user and use the password for the environment variables.



# 4. CI-CD Deployment using AWS-Terraform

## 4.1. Prerequisites:

### 4.1.1. azure-buildspec.yml:

The following file in the repository, stores the flow of series of commands to execute to deploy our application.

### 4.1.2. S3 bucket:

Create an S3 bucket to store the terraform state. We need the state to be saved, because on every ci-cd deployment conflict will arise as the state is not saved.

### 4.1.3. CodeBuild Configuration:

Here we set the location of our buildspec, the values for environment variables and the runtime for performing the build.

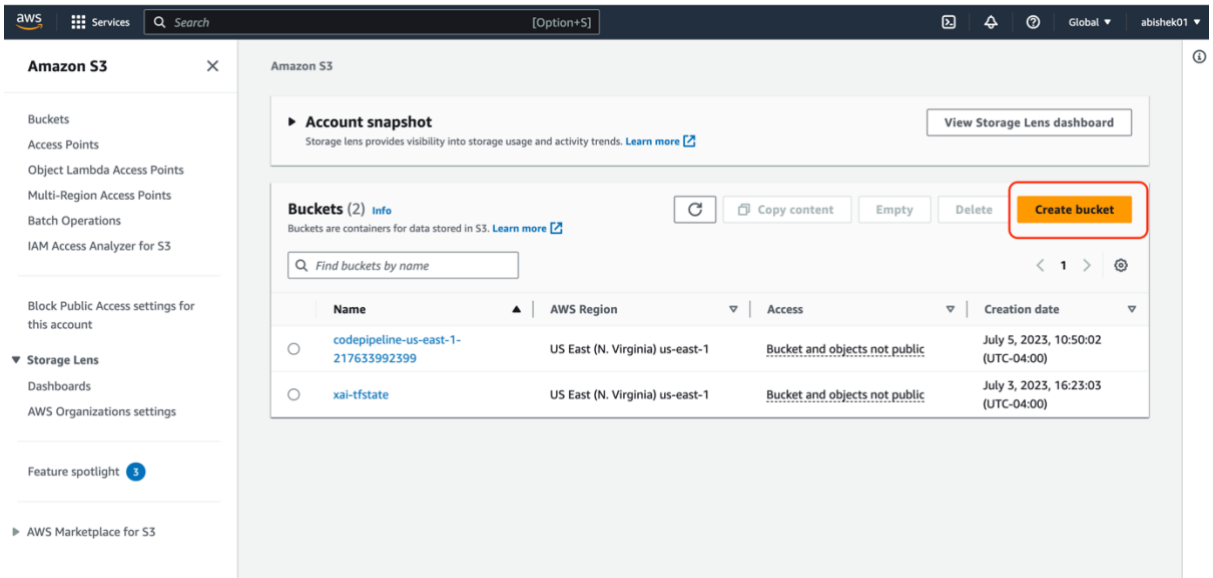
### 4.1.4. Connection Strings:

We need to save the azure and mongodb connection strings in AWS Systems Manager to access in out buildspec securely.

## 4.2. S3 Configuration:

STEP 1. In AWS, go to S3.

STEP 2. Create a bucket with name “xai-tfstate”, because out “provider.tf” has configured under this name.




STEP 3. Follow the below screenshots to and click create.

# Create bucket Info

Buckets are containers for data stored in S3. Learn more

## General configuration

Bucket name

xai-tfstate

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

AWS Region

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

Copy settings from existing bucket - *optional*

Only the bucket settings in the following configuration are copied.

Choose 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.

- (●) 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.

## 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

## Tags (0) - *optional*

You can use bucket tags to track storage costs and organize buckets. Learn more

No tags associated with this bucket.

Add tag

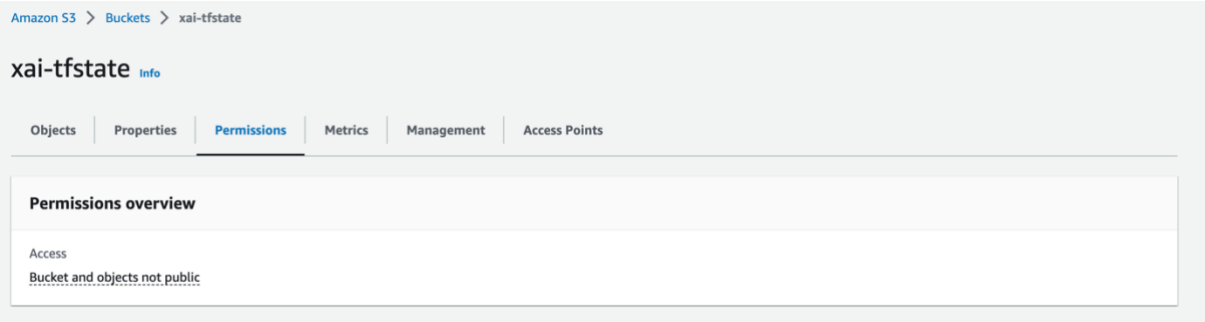
## Default encryption Info

Server-side encryption is automatically applied to new objects stored in this bucket.

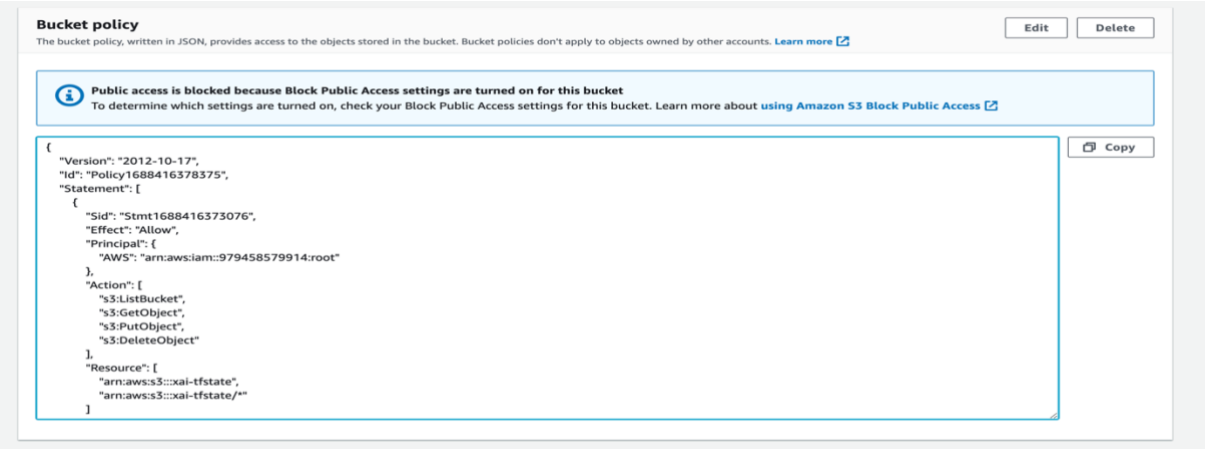
Encryption type Info

- (●) Server-side encryption with Amazon S3 managed keys (SSE-S3)
- ( ) Server-side encryption with AWS Key Management Service keys (SSE-KMS)
- ( ) Dual-layer server-side encryption with AWS Key Management Service keys (DSSE-KMS)

STEP 4. Click the bucket created and go to permissions tab.




STEP 5. Under bucket policy add the following json policy.



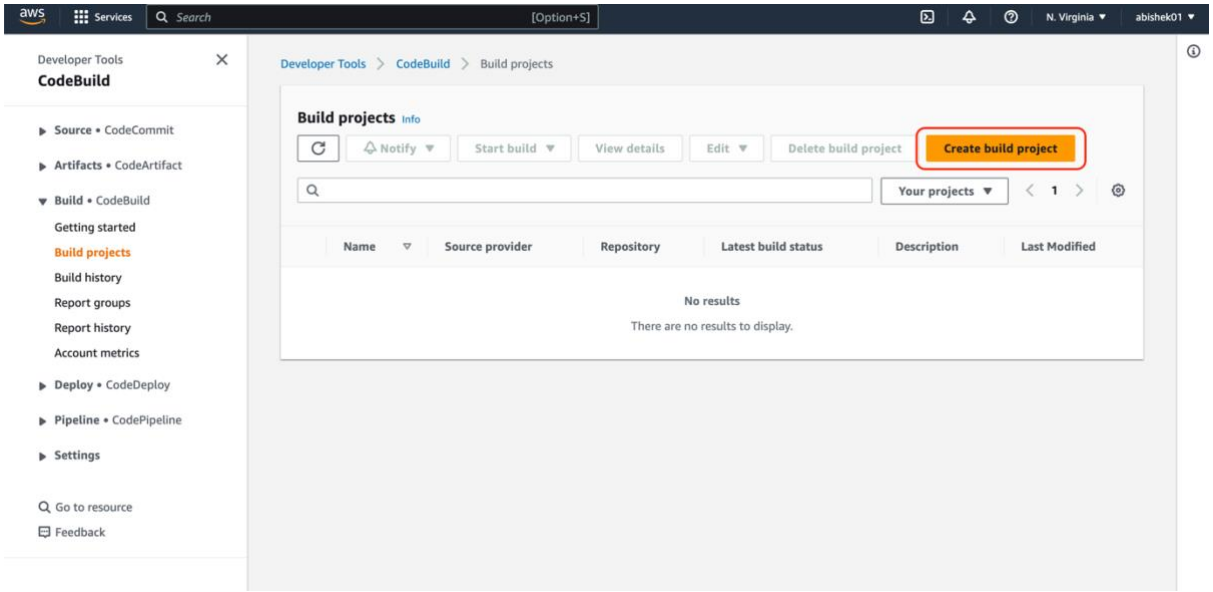

```
        {
"Version": "2012-10-17",
"Id": "Policy1688416378375",
"Statement": [
    {
        "Sid": "Stmt1688416373076",
        "Effect": "Allow",
        "Principal": {
            "AWS": "arn:aws:iam::<account-id>:root"
        },
        "Action": [
            "s3:ListBucket",
            "s3:GetObject",
            "s3:PutObject",
            "s3:DeleteObject"
        ],
        "Resource": [
            "arn:aws:s3:::xai-tfstate",
            "arn:aws:s3:::xai-tfstate/*"
```

```
        ]
      }
    ]
}
```

## 4.3. CodeBuild Configuration:

STEP 1. In AWS console, go to CodeBuild.

STEP 2. Click create build project.




STEP 3. Give the project name as “xai-build”.

STEP 4. Follow the steps shown in below images.

# Create build project

## Project configuration

Project name

xai-build

A project name must be 2 to 255 characters. It can include the letters A-Z and a-z, the numbers 0-9, and the special characters - and _.

Description - *optional*

Build badge - *optional*

☐ Enable build badge

Enable concurrent build limit - *optional*

Limit the number of allowed concurrent builds for this project.

☐ Restrict number of concurrent builds this project can start

▶ **Additional configuration**

tags

## Source

Add source

### Source 1 - Primary

Source provider

GitHub

Repository

◉ Public repository

○ Repository in my GitHub account

Repository URL

https://github.com/ZeruiW/XAI-Service

https://github.com/<user-name>/<repository-name>

Connection status

You are connected to GitHub using OAuth.

Disconnect from GitHub

Source version - *optional* Info

Enter a pull request, branch, commit ID, tag, or reference and a commit ID.

▶ **Additional configuration**

Git clone depth, Git submodules

## Environment

Environment image

- (●) **Managed image** — Use an image managed by AWS CodeBuild
- ( ) **Custom image** — Specify a Docker image

Operating system

Amazon Linux 2

The programming language runtimes are now included in the standard image of Ubuntu 18.04, which is recommended for new CodeBuild projects created in the console. See Docker Images Provided by CodeBuild for details.

Runtime(s)

Standard

Image

aws/codebuild/amazonlinux2-x86_64-standard:5.0

Image version

Always use the latest image for this runtime version

Image

aws/codebuild/amazonlinux2-x86_64-standard:5.0

Image version

Always use the latest image for this runtime version

Environment type

Linux GPU

Privileged

[x] Enable this flag if you want to build Docker images or want your builds to get elevated privileges

Service role

- (●) **New service role** — Create a service role in your account
- ( ) **Existing service role** — Choose an existing service role from your account

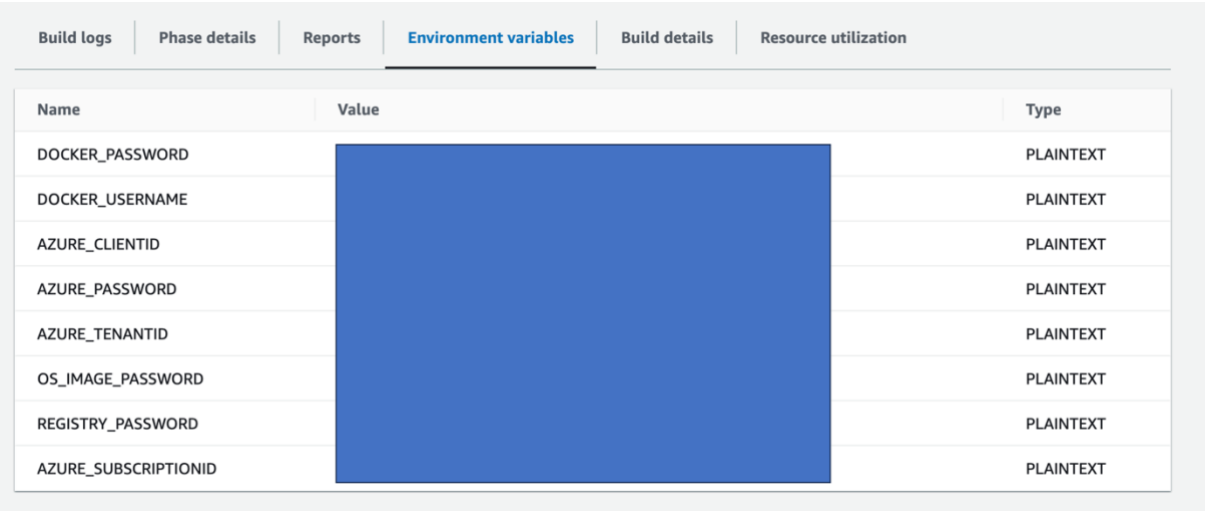
Role name

codebuild-xai-build-service-role

Type your service role name

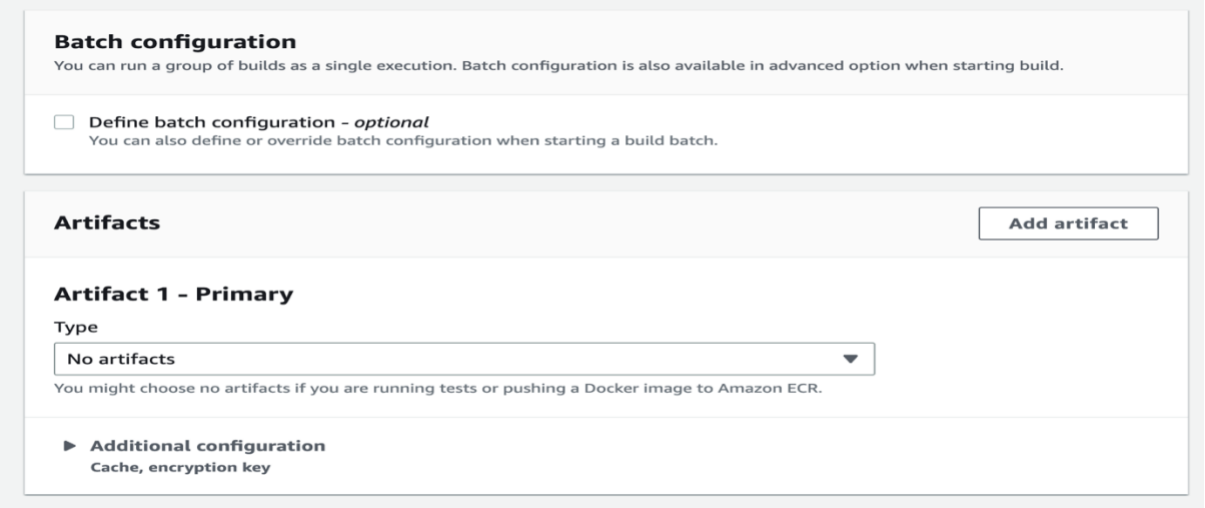
▶ **Additional configuration**

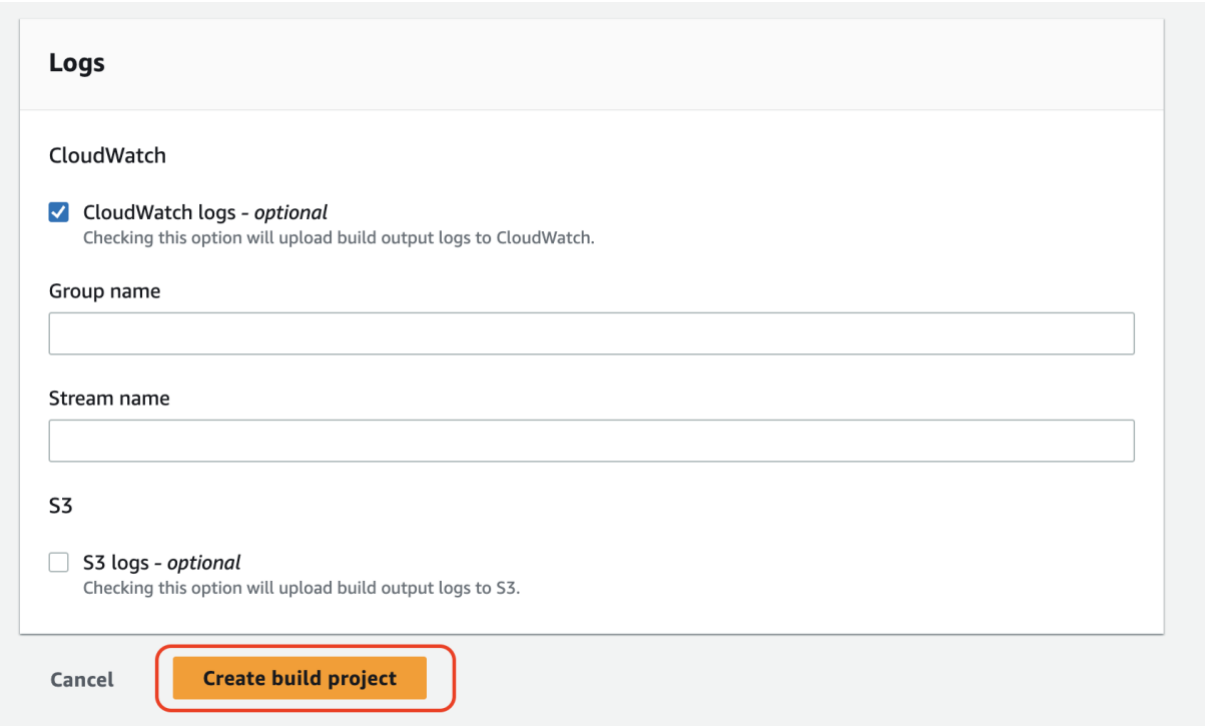
Timeout, certificate, VPC, compute type, environment variables, file systems




- OS_IMAGE_PASSWORD is user defined VM password.
- REGISTRY_PASSWORD is copied from the access keys from azure container registry.

STEP 5. Use buildspec file and give the path “backend/azure-buildspec.yml”



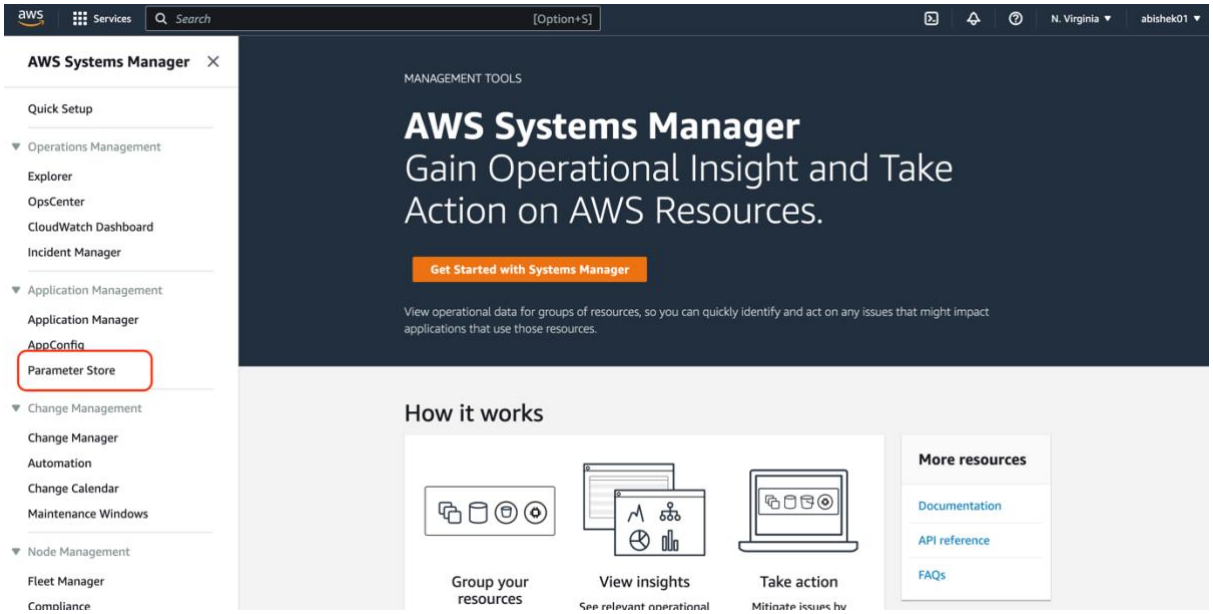



STEP 6. Click create.

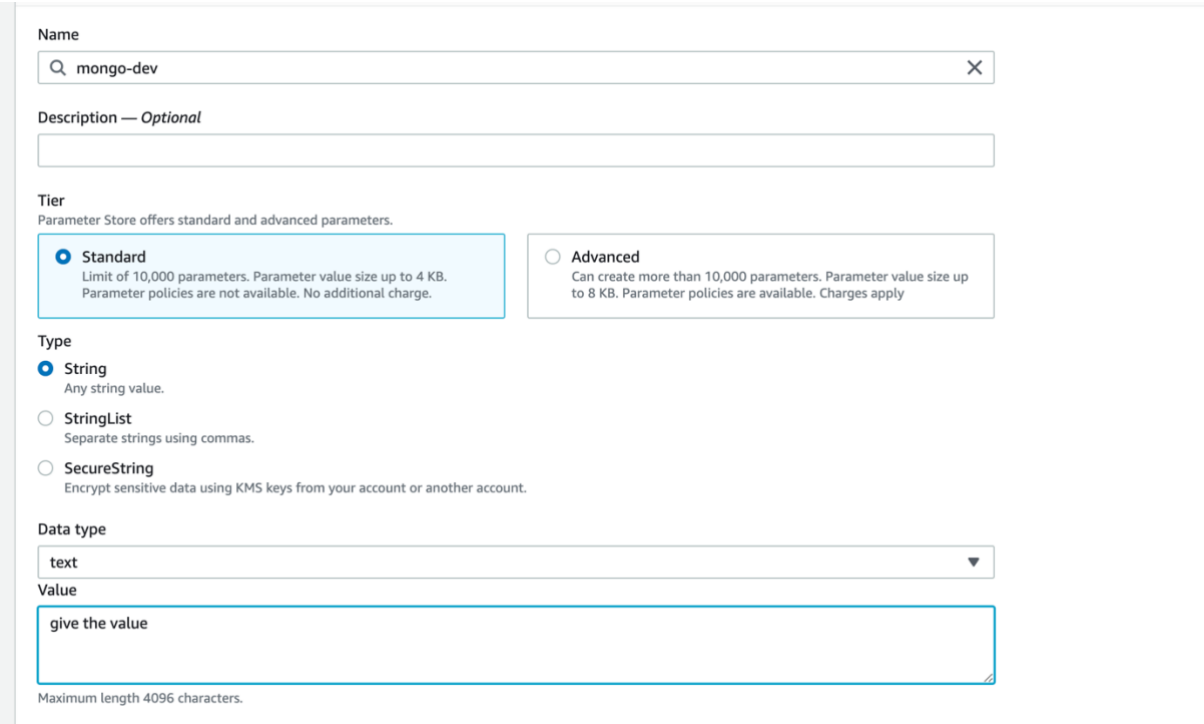
## 4.3. Connection String Configuration:

STEP 1. In AWS Console, go to “Systems Manager”.

STEP 2. Go to parameter Store.



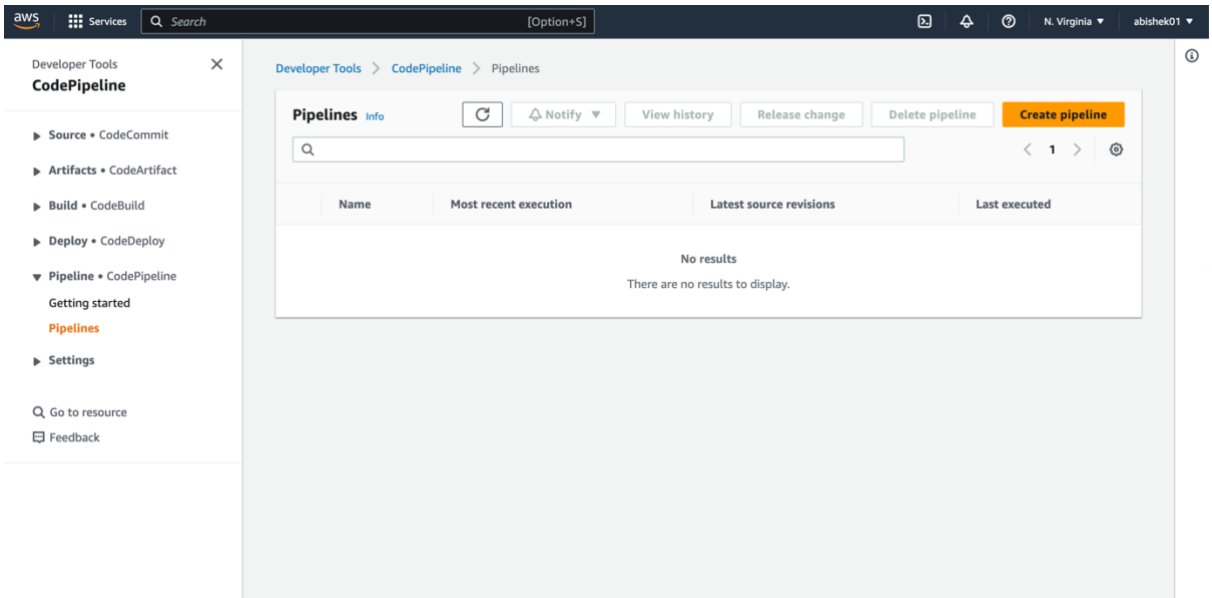

STEP 3. Use the name of the file as “azure-con-str” and “mongo-dev” as we have configured the name in buildspec.



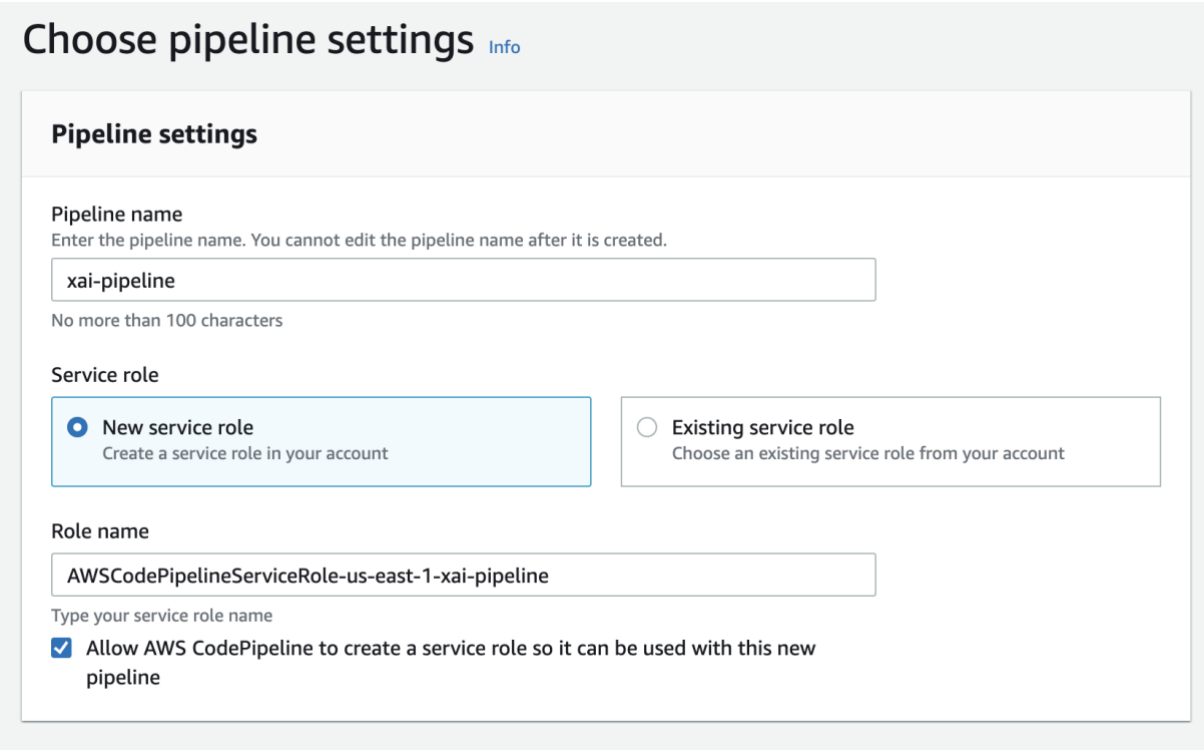

## 4.4. CodePipeline Configuration:

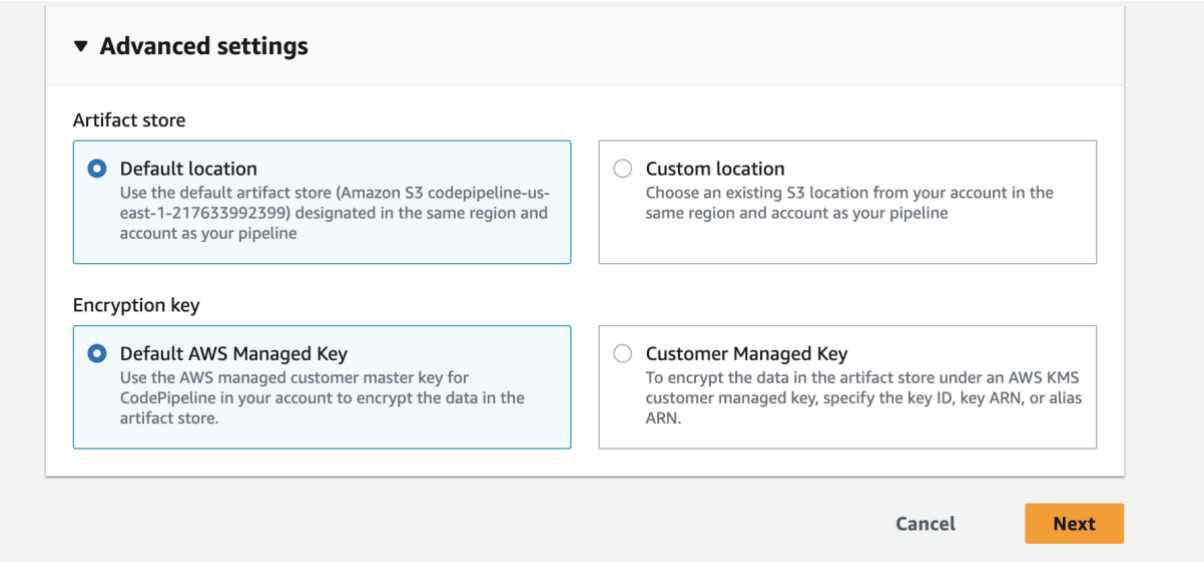
STEP 1. In AWS Console, go to CodePipeline.

STEP 2. Click Create Pipeline.

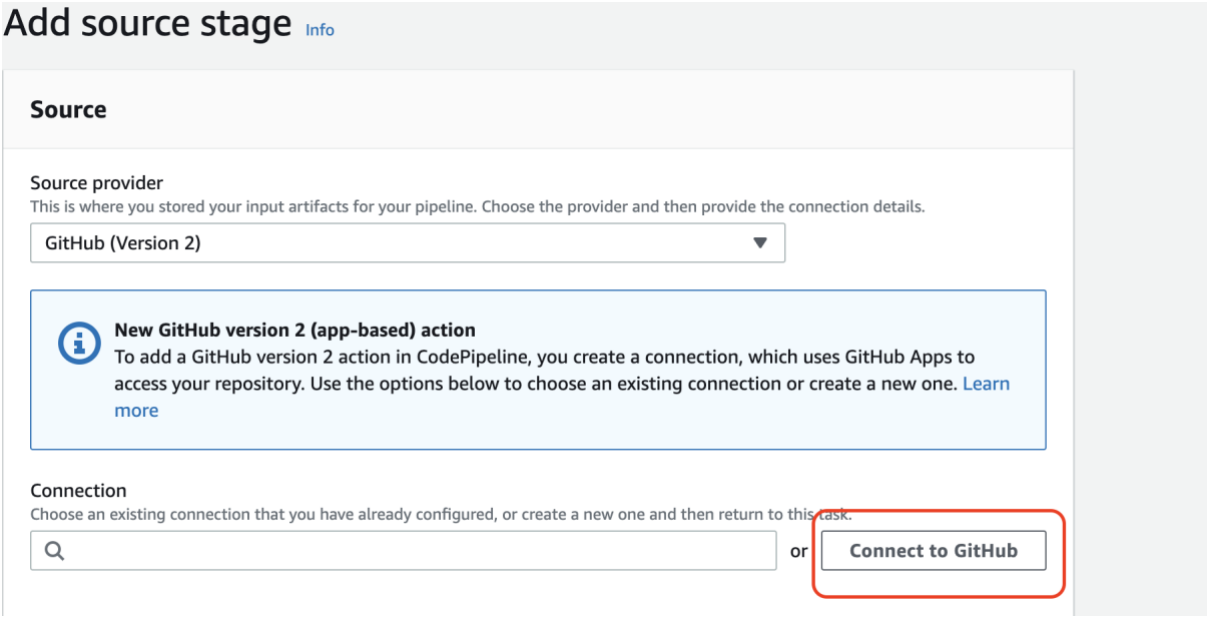



STEP 3. Give the pipeline name as “xai-pipeline”, rest as default and click next.



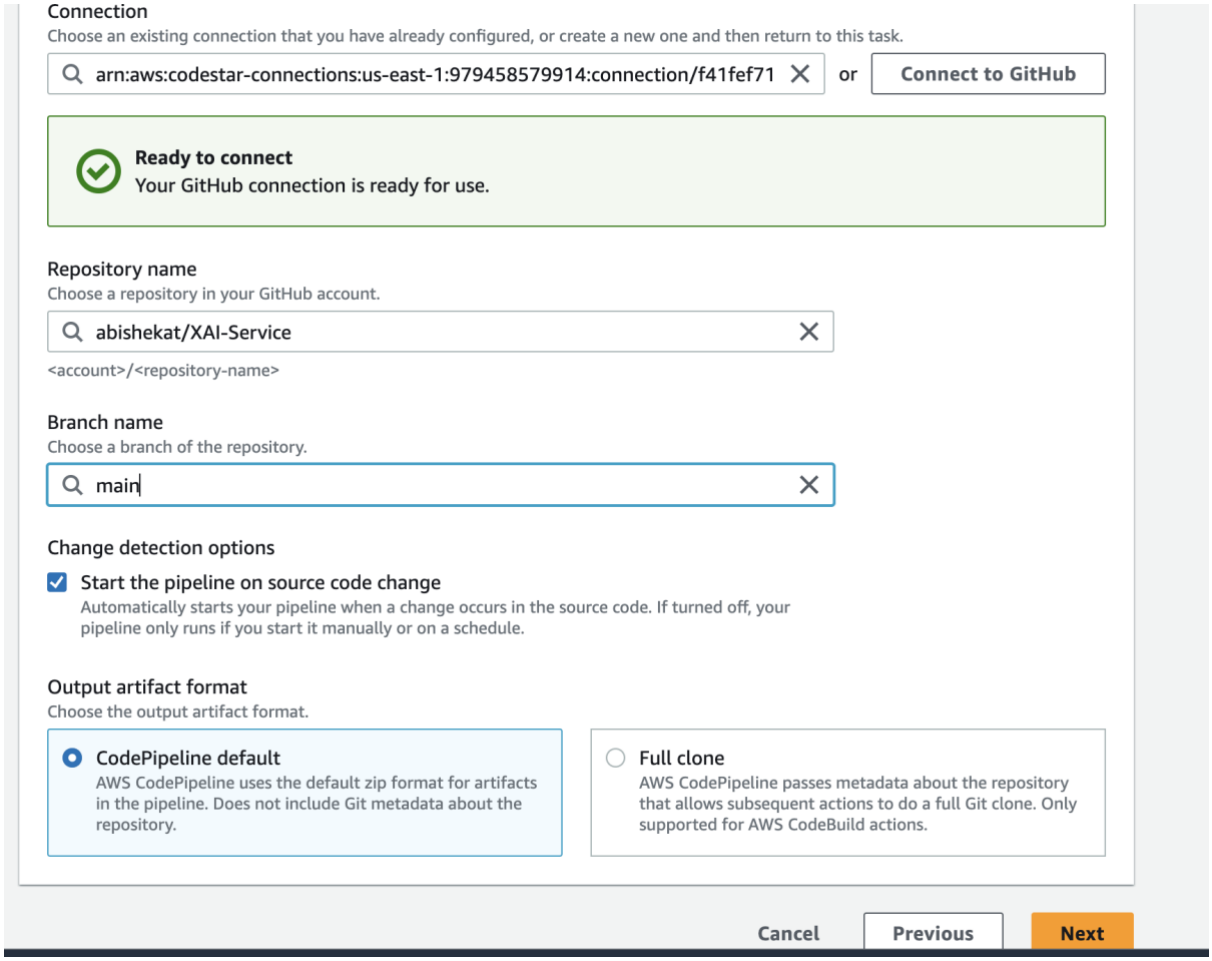




STEP 4. Source provider as GitHub (Version 2).

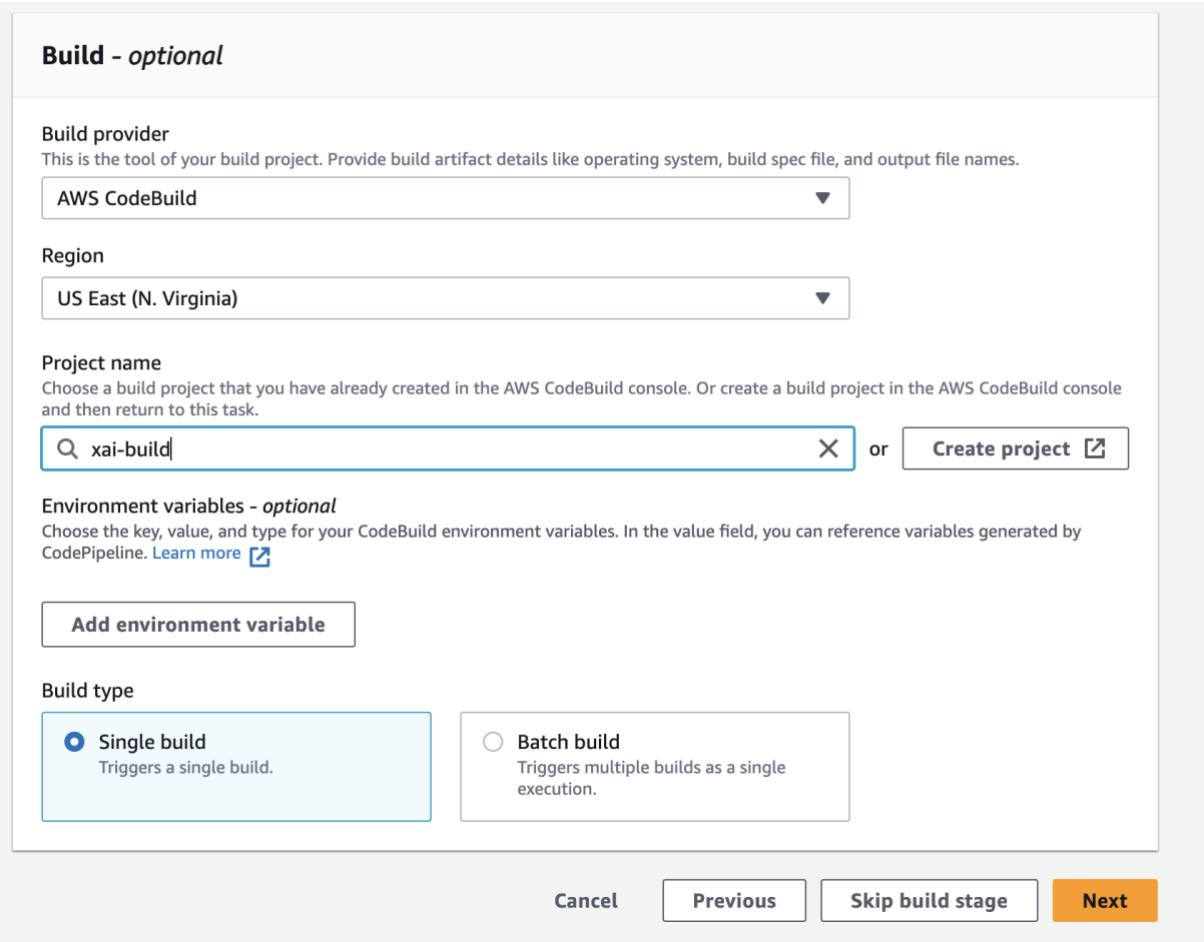



STEP 5. Connect to Github, give your github username when a window popup.

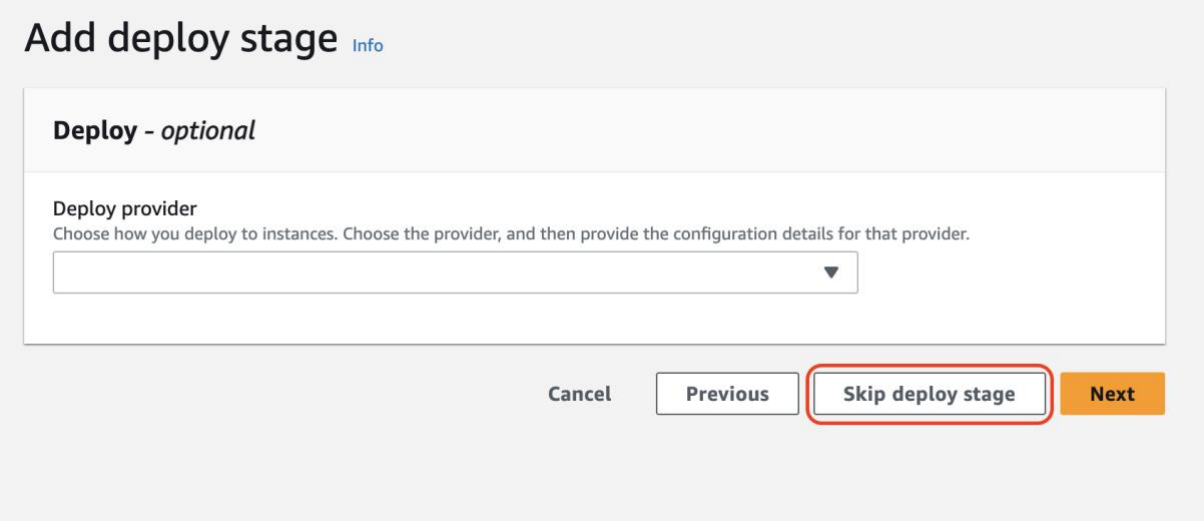
STEP 6. Follow the image for rest of the fields and click next.



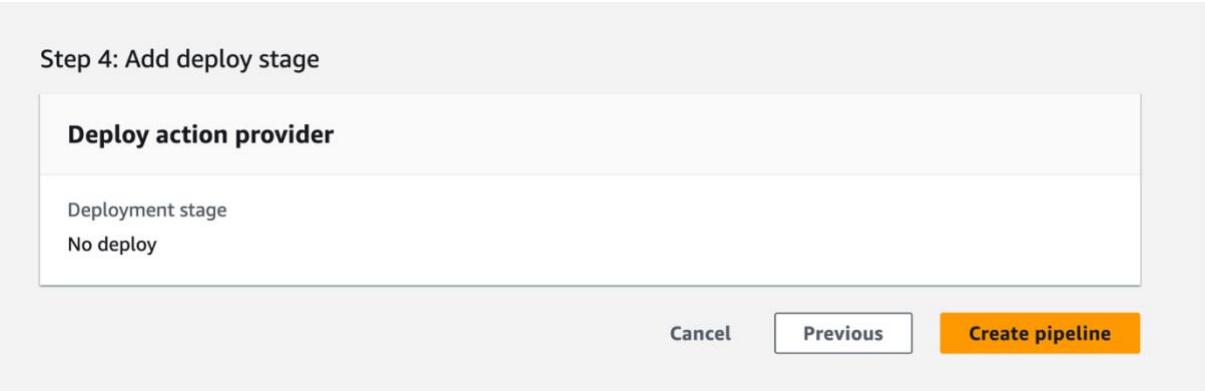

STEP 7. Build provider as AWS CodeBuild and give the project name as “xai-build” created in section 4.2. Click on Next.




STEP 8. Skip the deploy stage.




STEP 9. Click create pipeline.




## 4.5. *Resource clean-up:

Once you have successfully deployed using terraform and want to remove the resources created. Follow the below steps.

STEP 1. Go to the local setup of your xai-service.

STEP 2. Open terminal and “cd backend/terraform”.

STEP 3. Use the command “terraform init”. It copies the terraform state file from s3.

STEP 4. Use the command “terraform destroy” and type yes on prompt.

STEP 5. All the resources created by CodeBuild will be destroyed.