AWS ECS – API GATEWAY TASK

The architecture entails creating a VPC with two public subnets and two private subnets. These are attached to private and public route tables, respectively, along with NAT and internet gateways. RDS DB is deployed privately within the private subnet. ECS is deployed within the private subnet for security reasons. AWS ALB is then deployed, followed by a REST API Gateway with API key authentication and request limits set. Client requests are authenticated securely through API Gateway before being forwarded to ALB, ECS, and then to the DB. That's the flow.

To deploy the infrastructure, we've created Terraform scripts, along with our custom root modules. We call these root modules within child modules. Additionally, we're creating various components such as ECR, ECS, ALB, RDS, VPC, and REST API Gateway using Terraform for security purposes. To enhance security, we've set up two public and private subnets, along with Internet and NAT gateways. All configurations have been completed accordingly.

We've also created S3 buckets and implemented backend configuration to store the state file.

You can also check the resources on the AWS console.

TERRAFORM

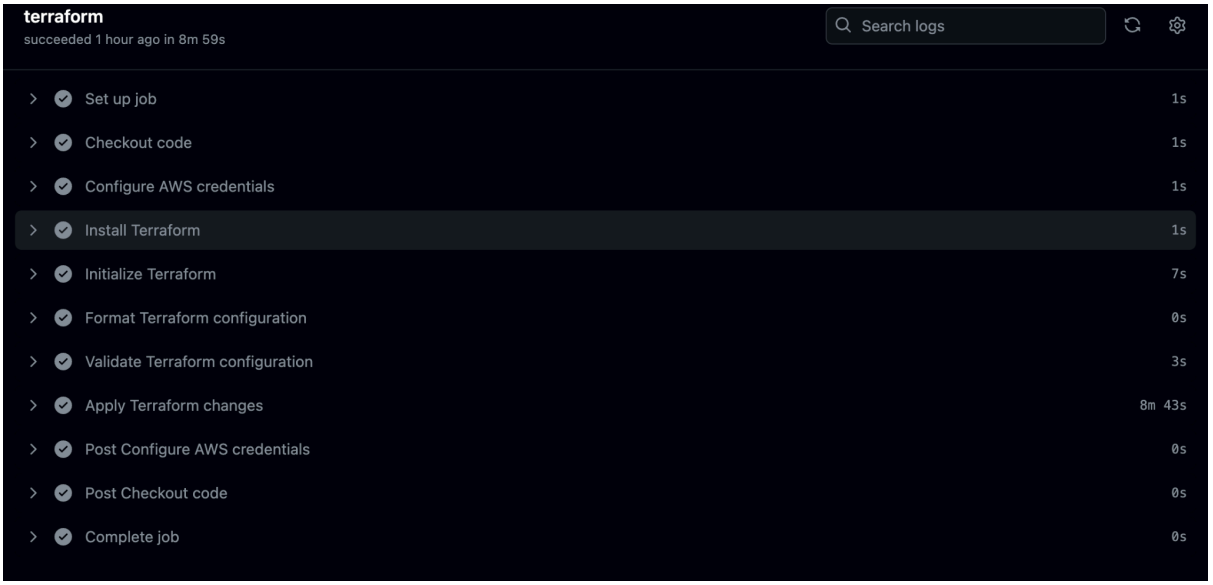
In our GitHub Action pipeline, we've set up a process to deploy Terraform resources on AWS. Within this pipeline, we install Terraform, initialize it, format the Terraform code, validate it, and finally apply the Terraform configuration. To maintain security, we securely store the access key and secret key in GitHub secrets, which are then utilized during the Terraform apply command. Below are the steps of our pipeline.

GITHUB ACTION CODE

```
name: Deploy Terraform

on:
  push:
    branches:
    - master

jobs:
  terraform:
    runs-on: ubuntu-latest

    steps:
    - name: Checkout code
      uses: actions/checkout@v2
```

```
    - name: Configure AWS credentials
      uses: aws-actions/configure-aws-credentials@v1
      with:
        aws-access-key-id: ${{ secrets.AWS_ACCESS_KEY_ID }}
                                  aws-secret-access-key:    ${{
secrets.AWS_SECRET_ACCESS_KEY }}
        aws-region: ap-south-1

    - name: Install Terraform
      run: |
                                                              wget
https://releases.hashicorp.com/terraform/1.0.2/terraform_1.0.2
_linux_amd64.zip
        unzip terraform_1.0.2_linux_amd64.zip
        sudo mv terraform /usr/local/bin/


    - name: Initialize Terraform
      run: |
        terraform init

    - name: Format Terraform configuration
      run: |
        terraform fmt

    - name: Validate Terraform configuration
      run: |
        terraform validate

    - name: Apply Terraform changes
      run: |
         terraform apply -auto-approve -var aws_access_key=${{
secrets.AWS_ACCESS_KEY_ID    }}    -var    aws_secret_key=${{
secrets.AWS_SECRET_ACCESS_KEY }}
```

PIPELINE EXECUTION



After deploying the resources, we've also deployed a small Node.js application that connects to the database and inserts some sample data. We've dockerized this application and deployed it on ECS.

DOCKERFILE

```
# Use an official Node.js runtime as a parent image
FROM node:14

# Set the working directory in the container
WORKDIR /usr/src/app

# Copy package.json and package-lock.json to the working directory
COPY package*.json ./

# Install dependencies
RUN npm install

# Copy the rest of the application files
COPY . .

# Expose the port that the app runs on
EXPOSE 5000

# Define the command to run your application
CMD [ "node", "server.js" ]
```

On the GitHub Action side, to deploy the backend application, we've used the following steps: building the Docker image, pushing it to ECR, updating the task definition with the new image tag, and deploying the task definition. Below are the steps and code of the pipeline.

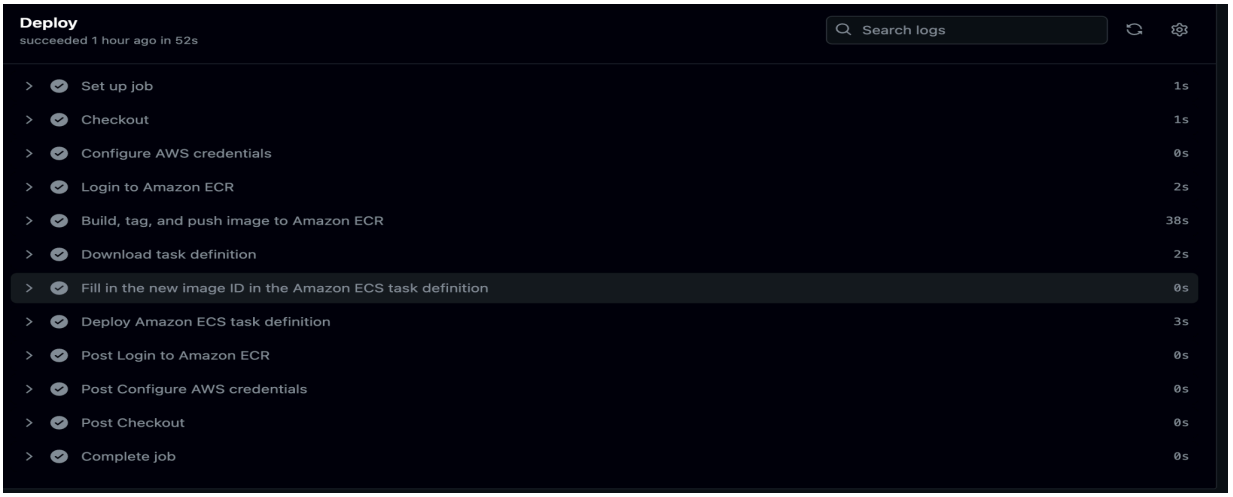
GITHUB-ACTION-BACKEND-PIPELINE-CODE

```
name: Deploy to Amazon ECS

on:
  push:
    branches: ["master"]

env:
   AWS_REGION: ap-south-1 # set this to your preferred AWS
region, e.g. us-west-1
   ECR_REPOSITORY: demo-node-application-test # set this to
your Amazon ECR repository name
  ECS_SERVICE: demo-node-application-test # set this to your
Amazon ECS service name
  ECS_CLUSTER: demo-ecs-cluster-test # set this to your Amazon
ECS cluster name
   ECS_TASK_DEFINITION: demo-node-application-test # set this
to the path to your Amazon ECS task definition
  # file, e.g. .aws/task-definition.json
  CONTAINER_NAME: demo-node-application-test # set this to the
name of the container in the
  # containerDefinitions section of your task definition

permissions:
  contents: read

jobs:
  deploy:
    name: Deploy
    runs-on: ubuntu-latest
    environment: production

    steps:
```

```
    - name: Checkout
      uses: actions/checkout@v4

    - name: Configure AWS credentials
      uses: aws-actions/configure-aws-credentials@v1
      with:
        aws-access-key-id: ${{ secrets.AWS_ACCESS_KEY_ID }}
                                    aws-secret-access-key:    ${{
secrets.AWS_SECRET_ACCESS_KEY }}
        aws-region: ap-south-1

    - name: Login to Amazon ECR
      id: login-ecr
      uses: aws-actions/amazon-ecr-login@v1

    - name: Build, tag, and push image to Amazon ECR
      id: build-image
      env:
        ECR_REGISTRY: ${{ steps.login-ecr.outputs.registry }}
        IMAGE_TAG: ${{ github.sha }}
      run: |
        # Build a docker container and
        # push it to ECR so that it can
        # be deployed to ECS.
                                        docker     build     -t
$ECR_REGISTRY/$ECR_REPOSITORY:$IMAGE_TAG .
        docker push $ECR_REGISTRY/$ECR_REPOSITORY:$IMAGE_TAG
          echo "image=$ECR_REGISTRY/$ECR_REPOSITORY:$IMAGE_TAG"
>> $GITHUB_OUTPUT

    - name: Download task definition
      run: |
           aws ecs describe-task-definition --task-definition
demo-node-application-test \
        --query taskDefinition > task-definition.json

     - name: Fill in the new image ID in the Amazon ECS task
definition
      id: task-def
      uses: aws-actions/amazon-ecs-render-task-definition@v1
      with:
        task-definition: task-definition.json
        container-name: ${{ env.CONTAINER_NAME }}
        image: ${{ steps.build-image.outputs.image }}
```

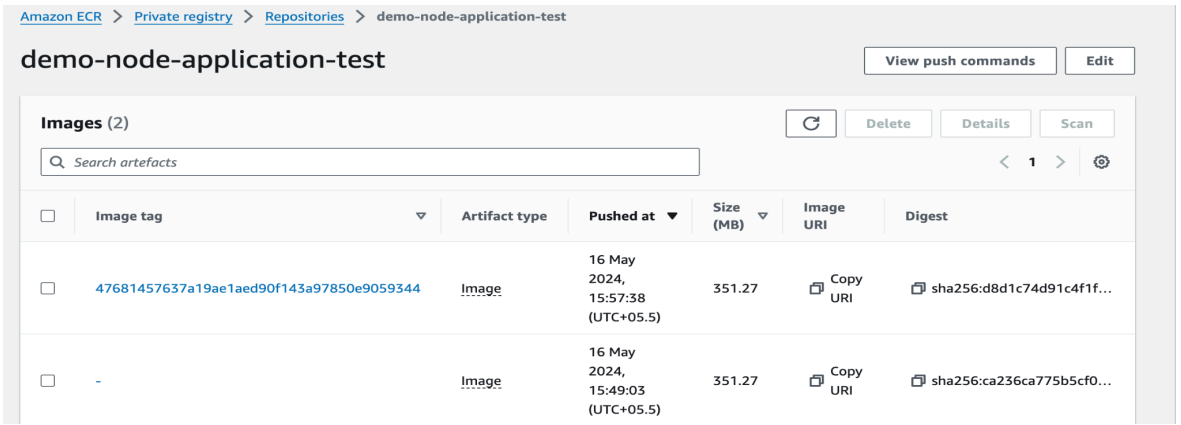
```
    - name: Deploy Amazon ECS task definition
      uses: aws-actions/amazon-ecs-deploy-task-definition@v1
      with:
                                        task-definition:     ${{
steps.task-def.outputs.task-definition }}
        service: ${{ env.ECS_SERVICE }}
        cluster: ${{ env.ECS_CLUSTER }}
        wait-for-service-stability: false
```

STEPS

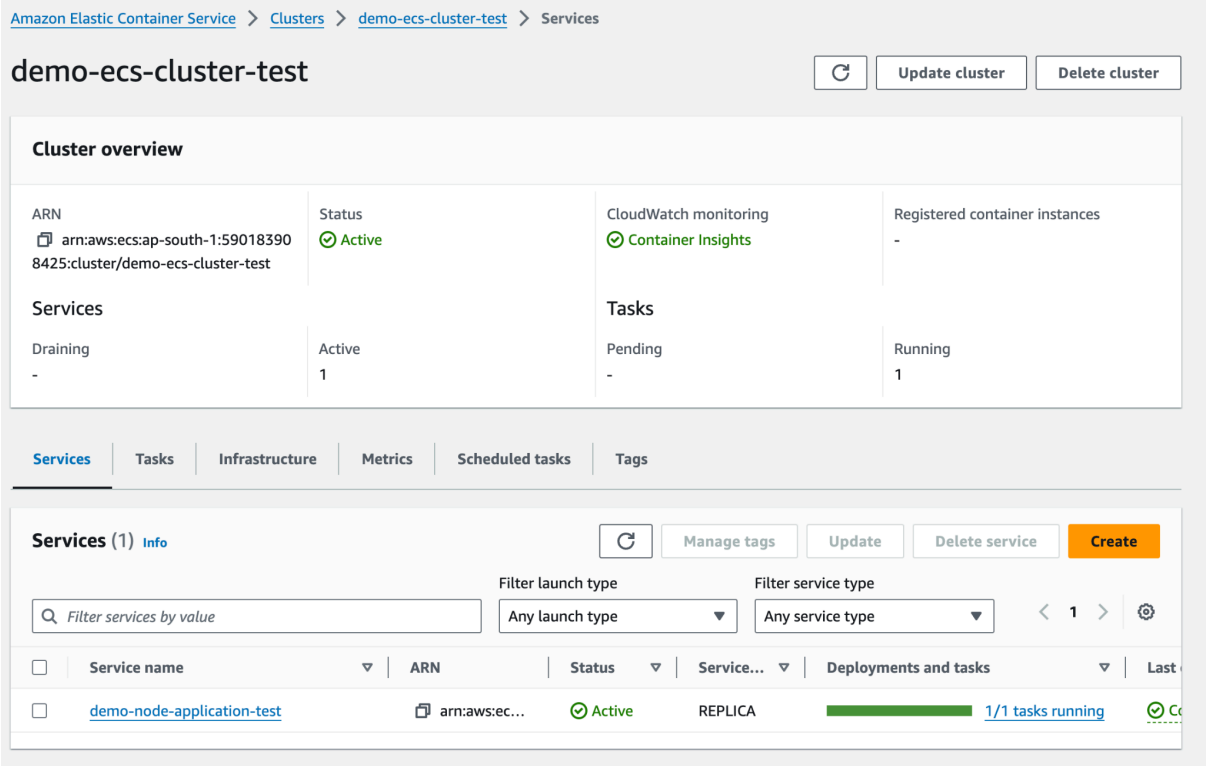


You can verify the deployment of the application by logging into the AWS console and checking the ECS service running tasks.

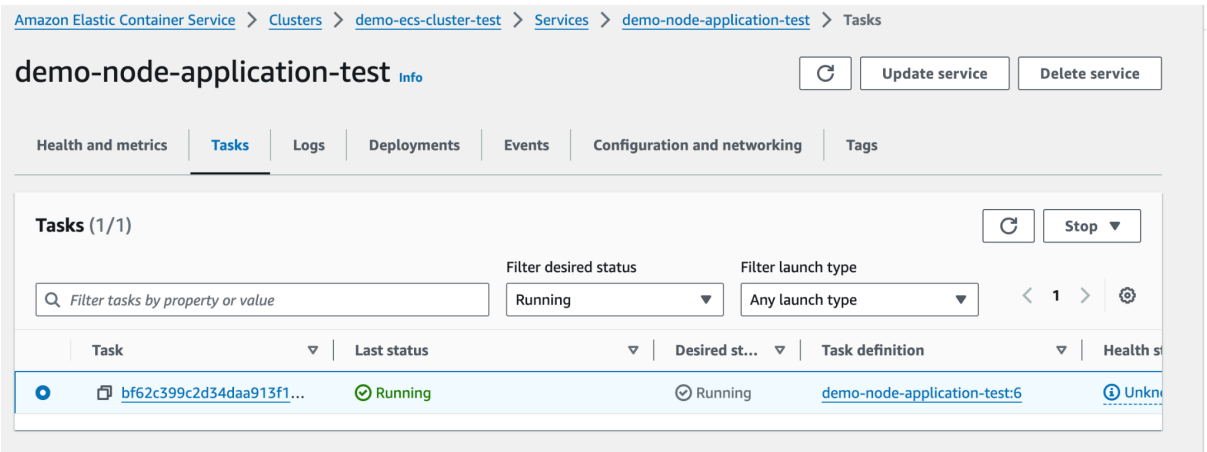
ECR



ECS CLUSTER AND SERVICE



ECS TASK



And finally, you can verify the API output by accessing it through API Gateway with API key authentication