Project Documentation: Infrastructure as Code and Containerized Application Deployment

Assignment by: smallcase

Overview

This project demonstrates the use of Infrastructure as Code (IaC) using Terraform to provision a secure, region-agnostic EC2 instance on AWS. The instance hosts a lightweight containerized application using Docker. The application is exposed through Nginx and utilizes an encrypted EBS volume with KMS support.

Key Components

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1. EC2 Instance with Terraform:
   - Deployed in a user-defined AWS region.
   - Dynamic AMI selection for region agnosticism.
   - Configured with a public IP, security groups, and user data scripts.

2. Encrypted EBS Volume:
   - KMS key created and used to encrypt a 20 GB EBS volume.
   - Volume is formatted and mounted on the instance.

3. Dockerized Application:
   - FastAPI application built with Python.
   - Returns a random string from a predefined list on hitting the `/api/v1` endpoint.
   - Exposed on port 8081 inside the Docker container.

4. Proxy via Nginx:
   - Configured to listen on port 80.
   - Forwards requests to port 8081 where the application is running.

Application Code

- Dockerfile

```
FROM python:3.9-slim
WORKDIR /app
COPY . .
RUN pip install -r requirements.txt
EXPOSE 8081
CMD ["python", "main.py"]
```

- main.py

```
from fastapi import FastAPI
from random import choice
import uvicorn

app = FastAPI()
OPTIONS = ["Investments", "Smallcase", "Stocks", "buy-the-dip", "TickerTape"]

@app.get("/api/v1")
async def get_random_string():
    return {"random_string": choice(OPTIONS)}

if __name__== "__main__":
    uvicorn.run(app, host="0.0.0.0", port=8081)
```

- requirements.txt

```
fastapi
uvicorn
```

Docker Image: https://hub.docker.com/repository/docker/prajwalthaware/prajwalone/general

Terraform Highlights

- Creates VPC, Subnet, Route Tables, IGW.
- Provisions EC2 with Docker and Nginx.
- Pulls the Docker image and deploys the app.
- Formats and mounts the KMS encrypted EBS volume.
- Outputs EC2 instance ID, public IP, EBS volume ID, and KMS key.

Outputs

- Instance Public IP: Automatically fetched post-deployment.
- Instance ID, EBS Volume ID, KMS Key ID: Available via Terraform output.

Conclusion

This project exemplifies full-cycle deployment using Terraform and Docker. The infrastructure is secure, automated, and the application is modular and scalable. It can be extended further for production readiness with CI/CD and monitoring.