DevOps Python Web App Deployment (Azure + GitHub Actions)

📌 Overview

This document provides a detailed guide on deploying a **Flask Web App** on **Azure App Service** using **GitHub Actions CI/CD**. The setup ensures **automation, security, and scalability**, following best DevOps practices.

✅ Github Repository Link

https://github.com/sadik-pimpalkar1/devops-pythonwebapp/tree/main

✅ Features

- 🔹 Flask Web App with dynamic UI.
- 🔹 Hosted on **Azure App Service**.
- 🔹 Automated deployment using **GitHub Actions CI/CD**.
- 🔹 Secure authentication with **OIDC (OpenID Connect)**.
- 🔹 Ensures **high availability and scalability**.

Task 1: Cloud Infrastructure & Deployment

📌 1. Prerequisites

Ensure you have:
✅ **Azure Account** (Sign up)
✅ **GitHub Account** (Sign up)
✅ **Azure CLI Installed** (Install Guide)

📌 2. Setting Up Azure Web App

🔹 Step 1: Create Azure App Service

1. **Go to Azure Portal → App Services → Create a new App Service**.
2. Configure the following settings:
   - **Name:** `devops-pythonwebapp`
   - **Runtime:** Python 3.12
   - **OS:** Linux
   - **Region:** East US (or nearest)
3. **Click "Review + Create" → Deploy**.

📌 3. Uploading Code to GitHub

Clone the GitHub Repository:
sh
CopyEdit
```
git clone https://github.com/YOUR_GITHUB_USERNAME/devops-pythonwebapp.git
cd devops-pythonwebapp
```

Create Flask Web App (`app.py`):

```
from flask import Flask, render_template_string
from datetime import datetime

app = Flask(__name__)

HTML_TEMPLATE = """
<html>
<head><title>DevOps on Azure</title></head>
<body>
    <h1>🚀 DevOps on Azure with GitHub Actions</h1>
    <p>Deployment Successful ✅</p>
    <p>Current Server Time: <strong>{{ time }}</strong></p>
</body>
</html>
"""
@app.route("/")
def home():
    return render_template_string(HTML_TEMPLATE, time=datetime.now().strftime("%Y-%m-%d
%H:%M:%S"))

if __name__ == "__main__":
    app.run(host="0.0.0.0", port=5000)
```

Create `requirements.txt`:

```
Flask
Gunicorn
```

Push to GitHub:

```
git add .
git commit -m "Initial commit for devops-pythonwebapp"
git push origin main
```

Task 2: CI/CD Pipeline Implementation

📌 4. Setting Up GitHub Actions for CI/CD

🔹 Step 1: Configure GitHub Actions in Azure

1. **Go to Azure Portal** → **App Services** → **Deployment Center**.
2. **Select GitHub Actions** → Click **Change Provider**.
3. **Sign in to GitHub** and select your repository (`devops-pythonwebapp`).
4. **Select Branch**: `main`
5. **Click Save**.

📌 5. GitHub Actions Workflow (`.github/workflows/deploy.yml`)

This workflow automates **building and deploying** the Flask web app.

```
name: Build and Deploy Python App to Azure Web App - devops-pythonwebapp

on:
  push:
    branches:
      - main
  workflow_dispatch:

permissions:
  id-token: write  # ✅ Required for OIDC authentication
  contents: read   # ✅ Required for checking out code

jobs:
  build:
    runs-on: ubuntu-latest
    steps:
      - name: Checkout Code
        uses: actions/checkout@v4
```

```yaml
    - name: Set up Python
      uses: actions/setup-python@v5
      with:
        python-version: '3.12'

    - name: Install Dependencies
      run: |
        python -m venv venv
        source venv/bin/activate
        pip install -r requirements.txt

    - name: Zip Artifact for Deployment
      run: zip release.zip ./* -r

    - name: Upload Artifact for Deployment Jobs
      uses: actions/upload-artifact@v4
      with:
        name: python-app
        path: |
          release.zip
          !venv/

deploy:
  runs-on: ubuntu-latest
  needs: build
  environment:
    name: 'Production'
    url: ${{ steps.deploy-to-webapp.outputs.webapp-url }}

  steps:
    - name: Download Artifact from Build Job
      uses: actions/download-artifact@v4
      with:
        name: python-app

    - name: Unzip Artifact for Deployment
      run: unzip release.zip

    - name: Azure Login (OIDC)
      uses: azure/login@v2
      with:
        client-id: ${{ secrets.AZURE_CLIENT_ID }}
        tenant-id: ${{ secrets.AZURE_TENANT_ID }}
        subscription-id: ${{ secrets.AZURE_SUBSCRIPTION_ID }}
        allow-no-subscriptions: true

    - name: Deploy to Azure Web App
      uses: azure/webapps-deploy@v3
      id: deploy-to-webapp
      with:
        app-name: "devops-pythonwebapp"
        slot-name: "Production"
```

📌 6. Explanation of CI/CD Pipeline Stages

🔹 Build Stage

1. **Checkout Code**: Pulls the latest code from GitHub.
2. **Set Up Python**: Installs Python 3.12.
3. **Install Dependencies**: Installs necessary libraries.
4. **Package Application**: Creates a `.zip` file for deployment.

🔹 Deploy Stage

1. **Download Artifact**: Fetches the `.zip` file from the build stage.
2. **Azure Login (OIDC)**: Authenticates using OpenID Connect.
3. **Deploy to Azure Web App**: Uploads and runs the Flask application.

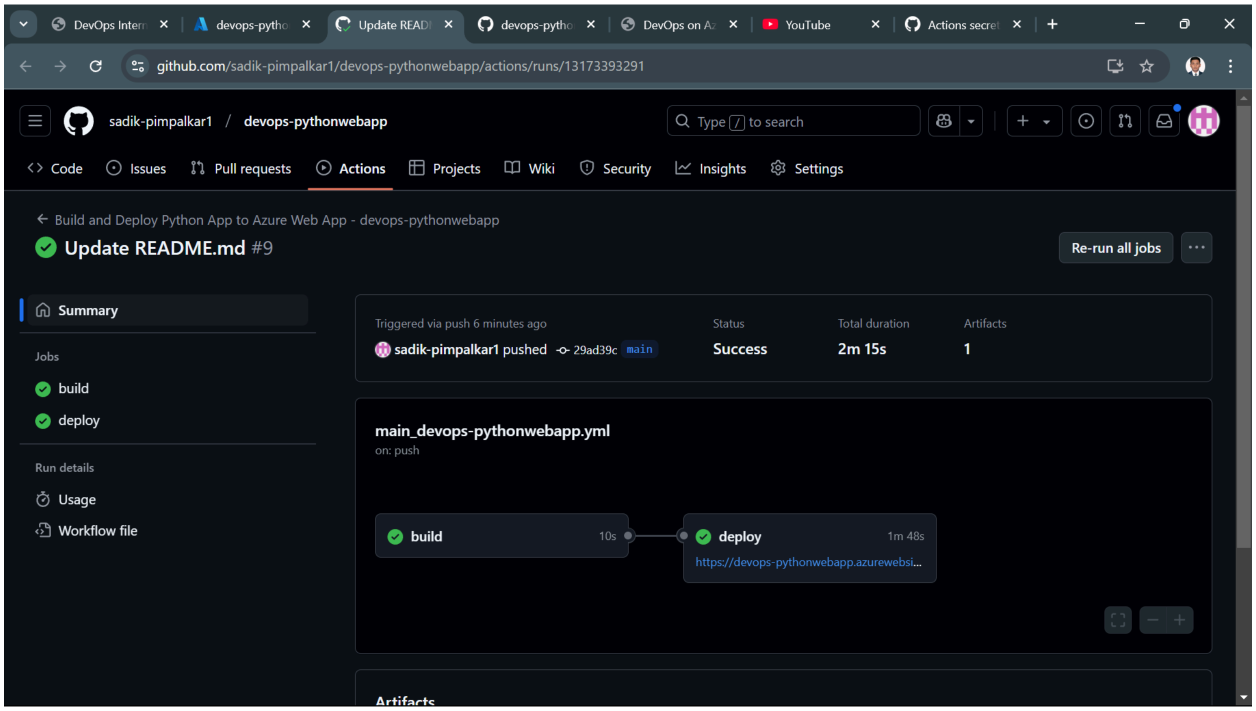
📌 7. Managing Secrets & Environment Variables

Adding Secrets in GitHub

1. **Go to GitHub Repository** → **Settings** → **Secrets and Variables** → **Actions**.
2. Add the following:
   - **AZURE_CLIENT_ID**
   - **AZURE_TENANT_ID**
   - **AZURE_SUBSCRIPTION_ID**
3. **Save and Apply Changes**.

📌 8. Screenshots & Results

✅ GitHub Actions Successful Pipeline Run



github.com/sadik-pimpalkar1/devops-pythonwebapp/actions/runs/13173393291

sadik-pimpalkar1 / devops-pythonwebapp

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← Build and Deploy Python App to Azure Web App - devops-pythonwebapp

✓ Update README.md #9

Re-run all jobs

Summary

Jobs
- ✓ build
- ✓ deploy

Run details
- Usage
- Workflow file

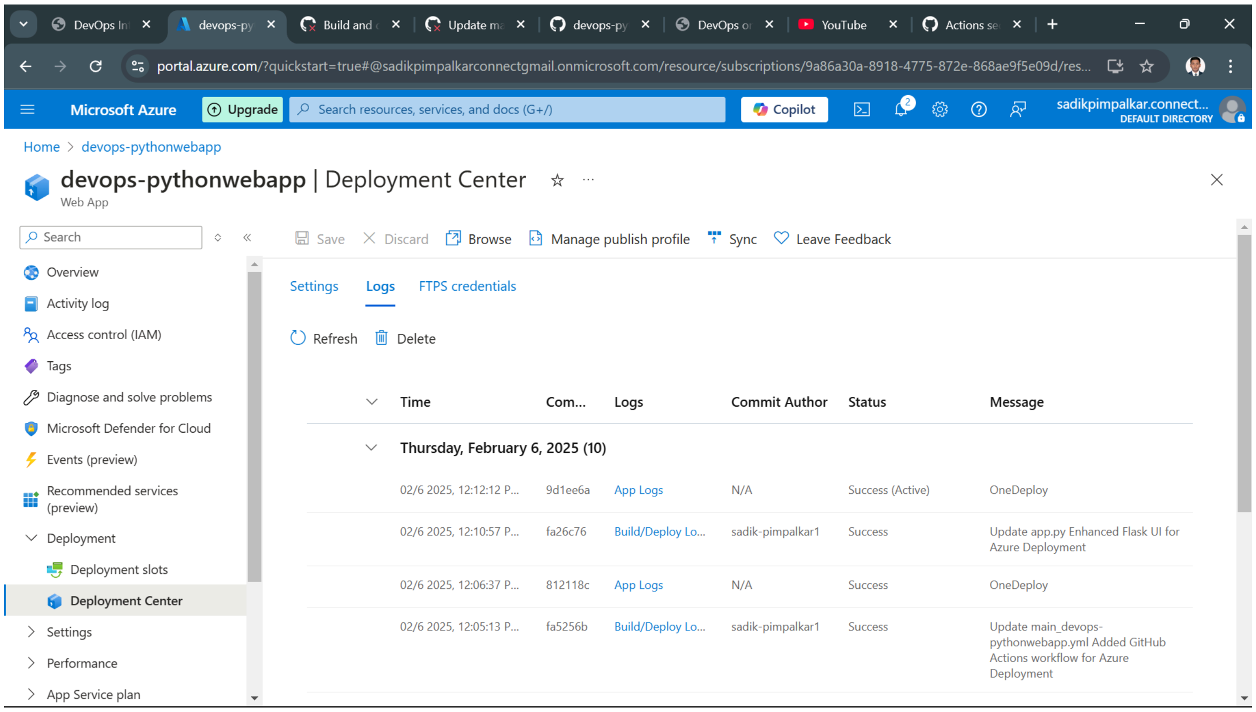
Triggered via push 6 minutes ago	Status	Total duration	Artifacts
sadik-pimpalkar1 pushed -o- 29ad39c main	Success	2m 15s	1

main_devops-pythonwebapp.yml
on: push

✓ build 10s → ✓ deploy 1m 48s
https://devops-pythonwebapp.azurewebsi...

Artifacts

✅ Azure Portal Showing Deployed Web App



portal.azure.com/?quickstart=true#@sadikpimpalkarconnectgmail.onmicrosoft.com/resource/subscriptions/9a86a30a-8918-4775-872e-868ae9f5e09d/res...

Microsoft Azure

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Web App

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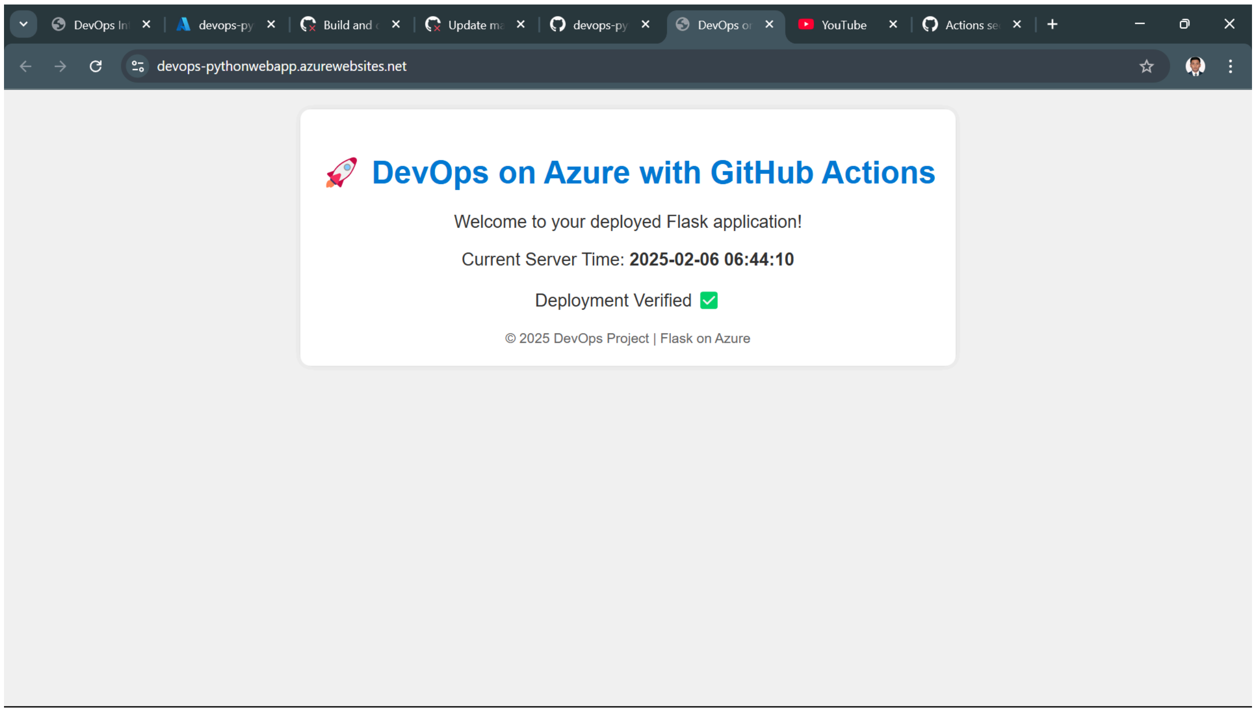
Thursday, February 6, 2025 (10)

Time	Com...	Logs	Commit Author	Status	Message
02/6 2025, 12:12:12 P...	9d1ee6a	App Logs	N/A	Success (Active)	OneDeploy
02/6 2025, 12:10:57 P...	fa26c76	Build/Deploy Lo...	sadik-pimpalkar1	Success	Update app.py Enhanced Flask UI for Azure Deployment
02/6 2025, 12:06:37 P...	812118c	App Logs	N/A	Success	OneDeploy
02/6 2025, 12:05:13 P...	fa5256b	Build/Deploy Lo...	sadik-pimpalkar1	Success	Update main_devops-pythonwebapp.yml Added GitHub Actions workflow for Azure Deployment

✅ **Live Web App Running in Browser**



🚀 DevOps on Azure with GitHub Actions

Welcome to your deployed Flask application!

Current Server Time: **2025-02-06 06:44:10**

Deployment Verified ✅

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🎯 Conclusion

- ✅ **Fully automated deployment** using **GitHub Actions & Azure App Service**.
- ✅ **Secure authentication** via **OIDC (OpenID Connect)**.
- ✅ **Scalable and production-ready Flask Web App**.

🚀 **Try it out:** https://devops-pythonwebapp.azurewebsites.net