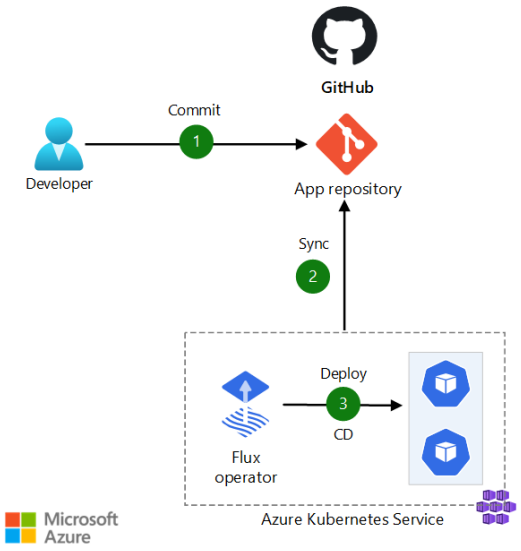
GitHub & DevOps – using AKS

PROBLEM STATEMENT :

In today's rapidly changing business landscape, traditional application deployment falls short in meeting the growing demands for scalability and cross-platform compatibility. To address these challenges, a DevOps solution combining GitHub Actions and Azure Kubernetes Services (AKS) is crucial. This solution automates container management, ensuring efficient, secure, and consistent application deployment across diverse environments.

SOLUTION ARCHITECTURE :



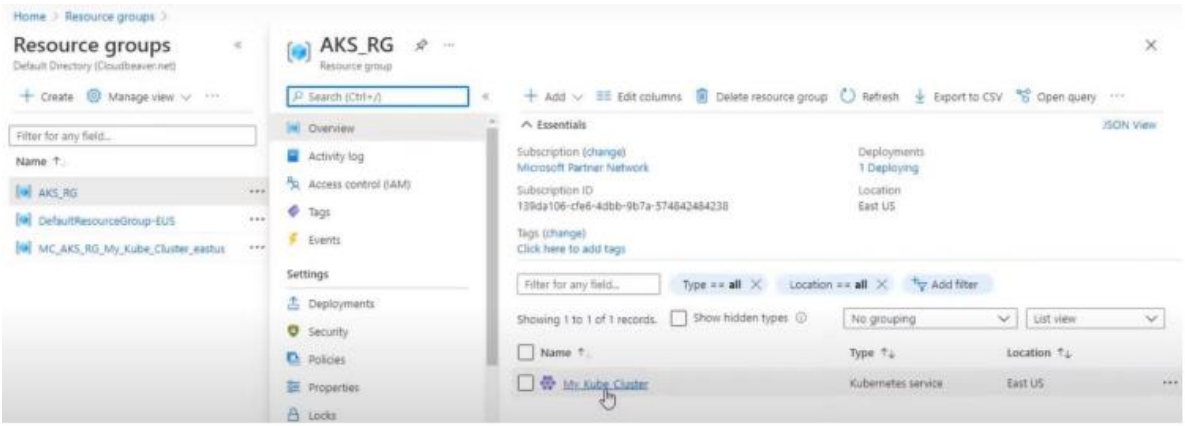
Prerequisites:

- Access to an Azure subscription
- Access to a GitHub account
- Basic knowledge of executing commands by using the Azure CLI
- Basic knowledge of Kubernetes and its concepts
- Basic knowledge of AKS and its concepts
- Basic knowledge of Git and GitHub

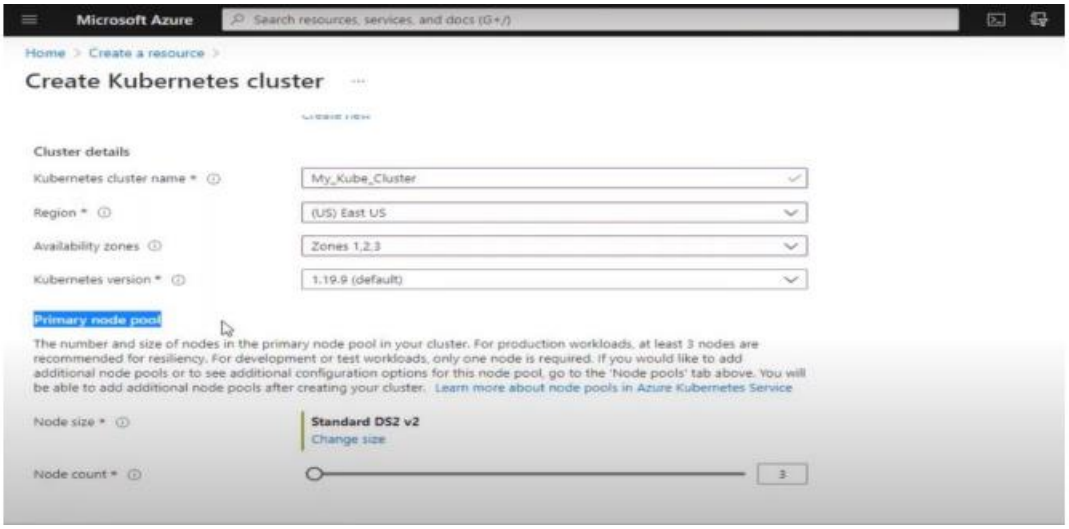
Step 1: Creating a Kubernetes cluster in azure portal.

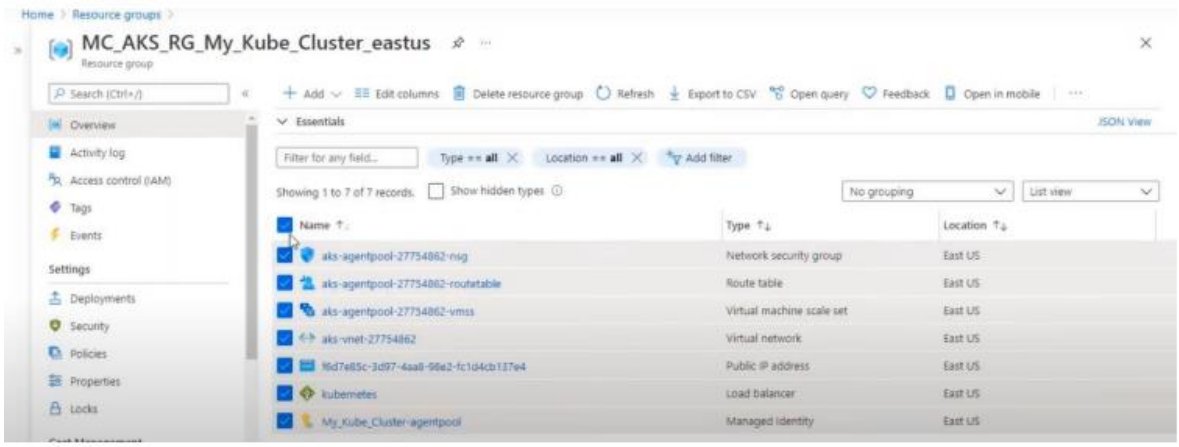
Before creating a Kubernetes cluster you need to create a resource group in

which your cluster will reside



When setting up your cluster, the critical step is selecting the right node size and determining the number of nodes required. The node count represents the VMs within your cluster, with a maximum limit of 1000 nodes. Remember that you can adjust the node count post-deployment, but the instance type remains fixed. Keep in mind that if you opt for Linux as the OS, hosting Windows applications won't be possible, and vice versa.





You can also use CLI :

Add windows server 2019 node pool:

Ex:

az aks nodepool add \ */used to add a node pool named npwin

--resource-group myResourceGroup \

--cluster-name myAKSCluster \

--os-type Windows \

--name npwin \

--node-count 1

Add a windows server node pool 2022:

For newer versions we need to specify os sku type.

Ex:

az aks nodepool add \

--resource-group myResourceGroup \

--cluster-name myAKSCluster \

--os-type Windows \

--os-sku Windows2022 \

--name npwin \

--node-count 1

connect to the cluster:

● To connect to the cluster we use the kubectl it can installed locally using the

command az aks install-cli.az aks get-credentials --resource-group

myResourceGroup --name myAKSCluster is the command used to configure

kubectl.

To check the status of each node execute the following command:

kubectl get nodes -o wide

Step 2 :

In Azure CLI clone the github repository

```
Bash

git clone https://github.com/{your-username}/mslearn-aks-deployment-pipeline-github-actions
```

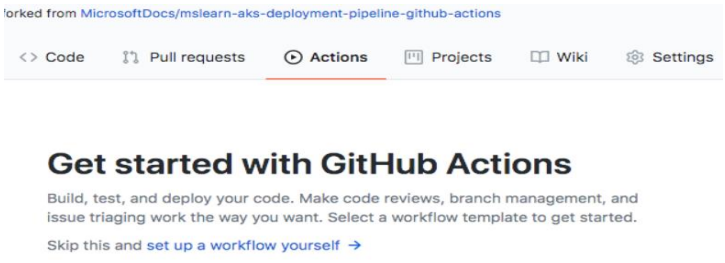
The command creates a new directory called mslearn-aks-deployment-pipeline-github-actions.

```
Bash

cd mslearn-aks-deployment-pipeline-github-actions
```

```
Bash

bash init.sh
```

Step 3:

Build the Application WorkFlow



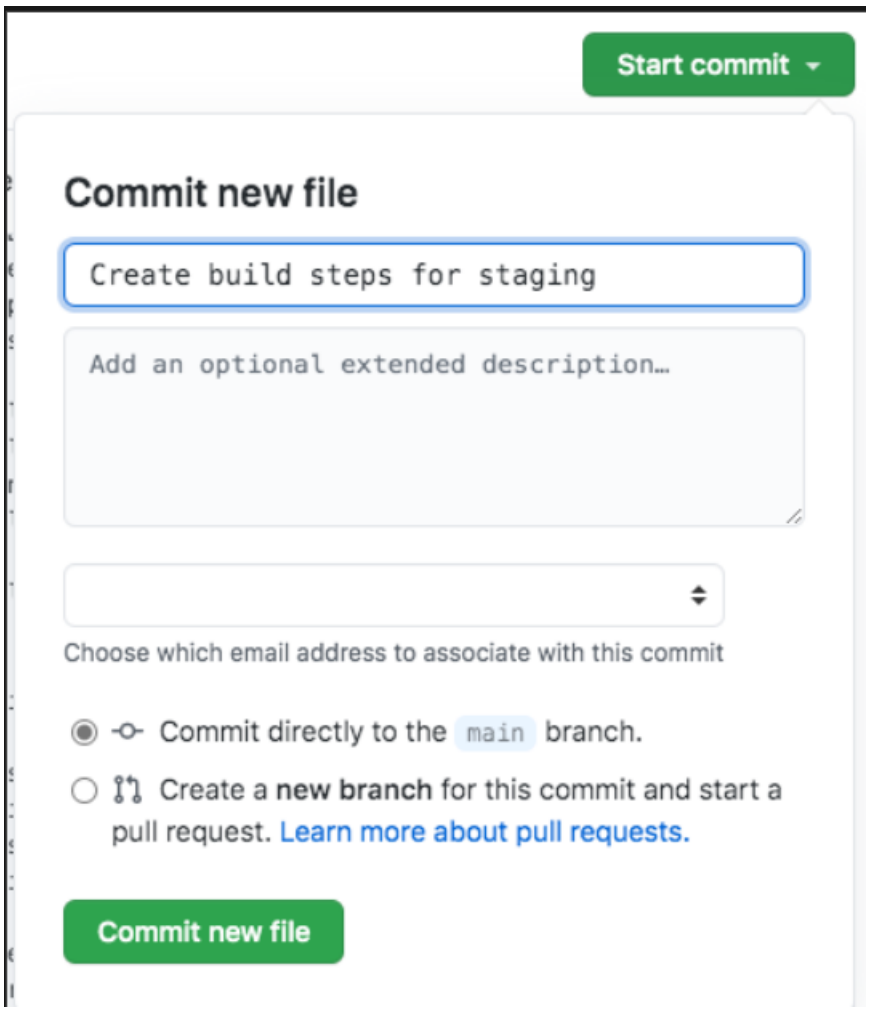
Step 4:

Create a YAML file for pushing and deploying

name: Build and push the latest build to staging

```
on:
  push:
    branches: [ main ]

jobs:
  build_push_image:
    runs-on: ubuntu-20.04

    steps:
      - uses: actions/checkout@v2

      - name: Set up Buildx
        uses: docker/setup-buildx-action@v1

      - name: Docker Login
        uses: docker/login-action@v1
        with:
          registry: ${{ secrets.ACR_NAME }}
          username: ${{ secrets.ACR_LOGIN }}
          password: ${{ secrets.ACR_PASSWORD }}

      - name: Build and push staging images
        uses: docker/build-push-action@v2
        with:
          context: .
          push: true
          tags: ${{secrets.ACR_NAME}}/contoso-website:latest
```

Commit the Changes:



Step 5:

Connect the AKS CLI

¬ az aks get-credentials –resource-group (name) –name (cluster name)

Step 6 :

apiVersion: apps/v1

kind: Deployment

metadata:

name: sam

labels:

app: sam

spec:

replicas: 1

template:

metadata:

name: sam

labels:

app: sam

spec:

nodeSelector:

"kubernetes.io/os": windows

containers:

- name: sam

image: E:/dotnet/framework/sam:asp netapp

resources:

limits:

cpu: 1

memory: 800M

ports:

- containerPort: 80

selector:

matchLabels:

app: sam

---

apiVersion: v1

kind: Service

metadata:

name: sam

spec:

type: LoadBalancer

ports:

- protocol: TCP

port: 80

selector:

app: sample

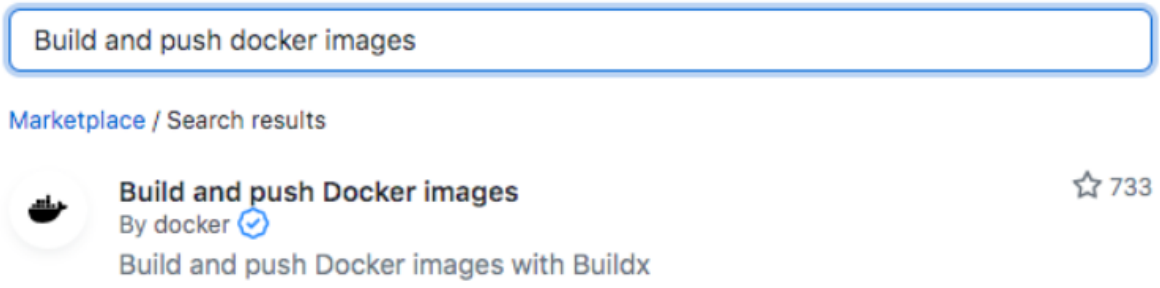
Deploy the application using kubectl apply:

kubectl apply -f sam.yaml

Your application is deployed.

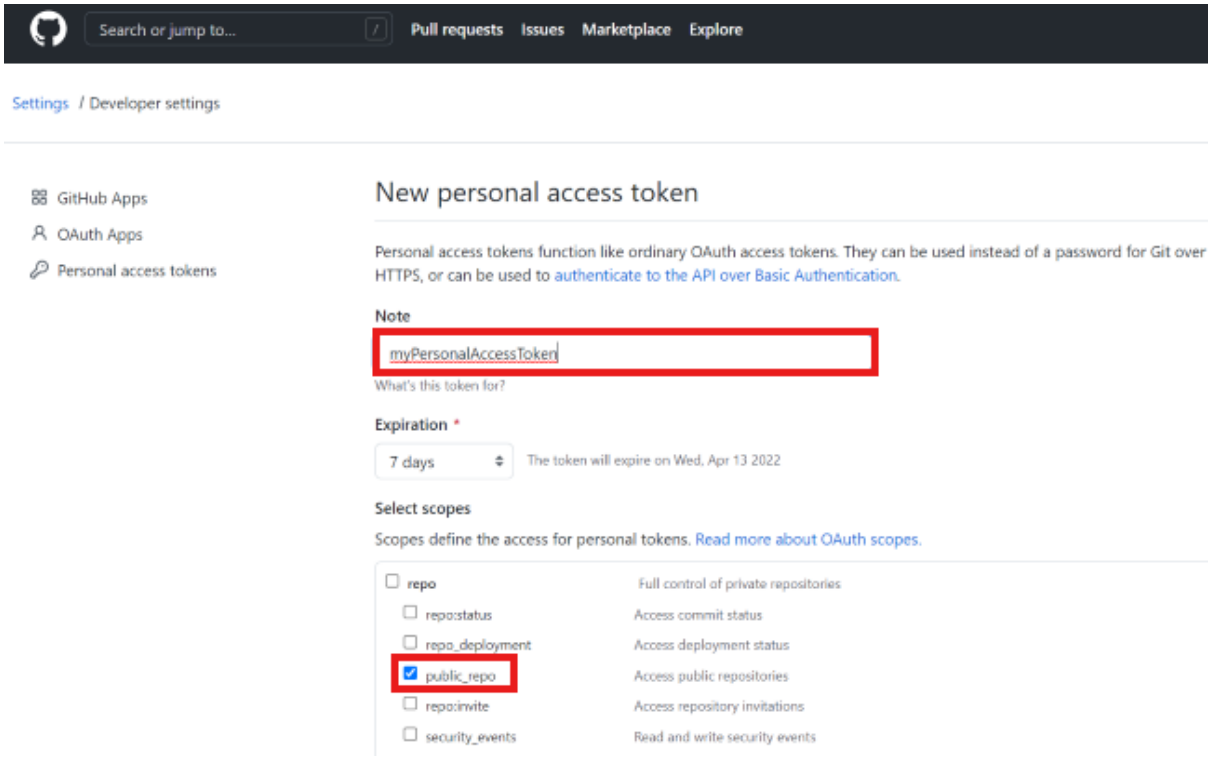
Docker Configuration:

search for **Docker Login**. Select the first result published by **Docker**.



Create a personal access token (PAT)

1. Go to the fork of the sample repository in the GitHub website. On the top right hand corner, select your profile photo, then select **Settings**.
2. Select **Developer settings** at the bottom of the left menu.
3. Select **Personal access tokens**.
4. Select **Generate new token**.
5. Provide a name for your PAT, such as *myPersonalAccessToken*
6. Select the checkbox next to **public_repo**.

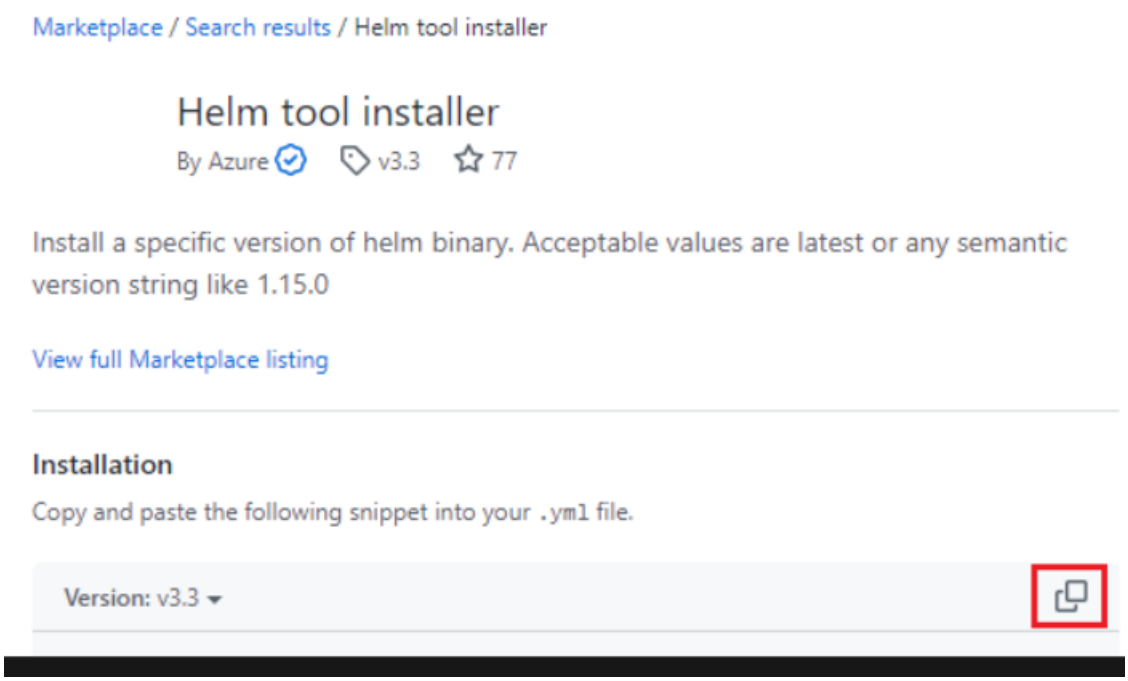


Install Helm

In this exercise, you use Helm version v3.3.1. Azure has a built action that downloads and installs Helm.

1. Below the runs-on key, add a new steps key. Then, search for **Helm tool installer**. Select the first result published by **Azure**.

```
deploy:
  runs-on: ubuntu-20.04
  needs: build_push_image

  steps:
   - uses: actions/checkout@v2

   - name: Helm tool installer
     uses: Azure/setup-helm@v1
     with:
       # Version of helm
       version: # default is latest
```



1. To commit the changes, select the **Start commit** button. Enter a description for the commit, and then select **Commit new file**.
2. In Cloud Shell, run git pull to fetch the latest changes. Then, run the following command to tag and push the changes:

BashCopy

git tag -a v2.0.1 -m 'Creating first production deployment' && git push --tags

3. When prompted, provide your GitHub username, and the PAT created previously as the password.
4. Open the **Actions** tab and see the running process.

CHALLENGES FACED:

1. **Initial Configuration Complexity:** Setting up AKS to meet project requirements initially posed a challenge. Detailed documentation from Microsoft and reference materials from various GitHub repositories were crucial resources.
2. **Multi-Cloud Deployment Complexity:** Deploying applications across multiple cloud infrastructures increases the complexity of managing Kubernetes clusters. Coordinating networking and storage across different environments can be challenging.

3. **Storage Management:** Handling storage can be a significant challenge, especially without relying on a cloud service. Kubernetes requires efficient storage solutions, and configuring this can be complex.
4. **Security Concerns:** Kubernetes is an open-source tool, which means security may not be as robust as desired. Ensuring the security of containerized applications and the cluster itself can be a challenge.
5. **Tooling and Interface Transition:** Transitioning from one environment to another, such as moving from CLI to PowerShell, can be challenging. Different environments offer varying features and require adaptation, adding complexity to DevOps processes

BUSINESS BENEFITS

Kubernetes offers robust load balancing capabilities for efficient traffic distribution.

It facilitates declarative configuration and automation, reducing the risk of human errors in managing complex deployments.

Implementing CI/CD with GitHub Actions and AKS brought several significant business benefits. It streamlined and automated the development pipeline, reducing manual image builds and deployments, which saved valuable time. This increased efficiency translated into cost savings, as the company no longer needed to allocate resources for time-consuming manual tasks. Furthermore, the solution improved the overall agility of the development process, enabling quicker feature releases and enhancing the company's competitiveness in the market.