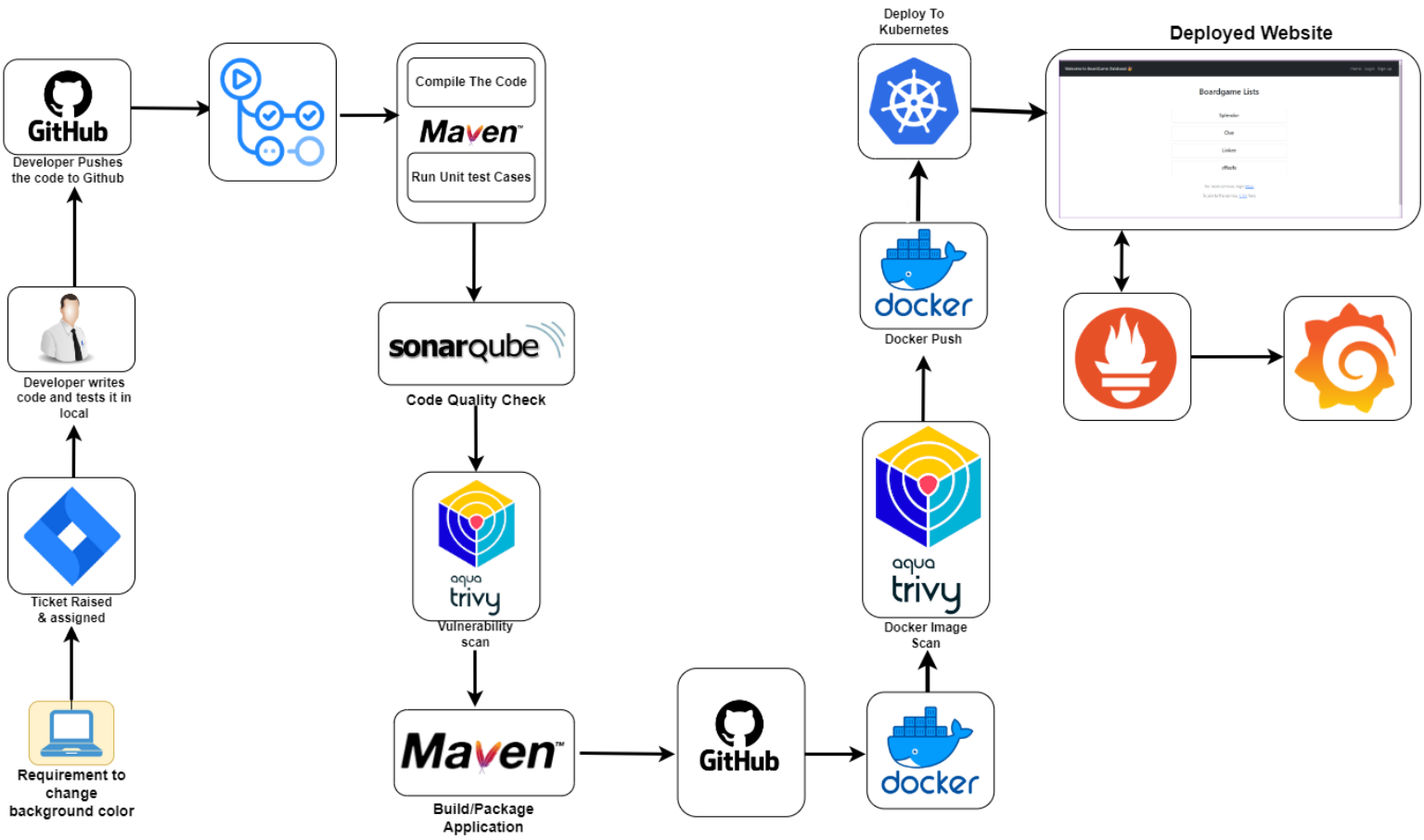
DevOps Shack

The Ultimate Corporate Pipeline With GitHub Actions



PHASE-1 | Setup Repo

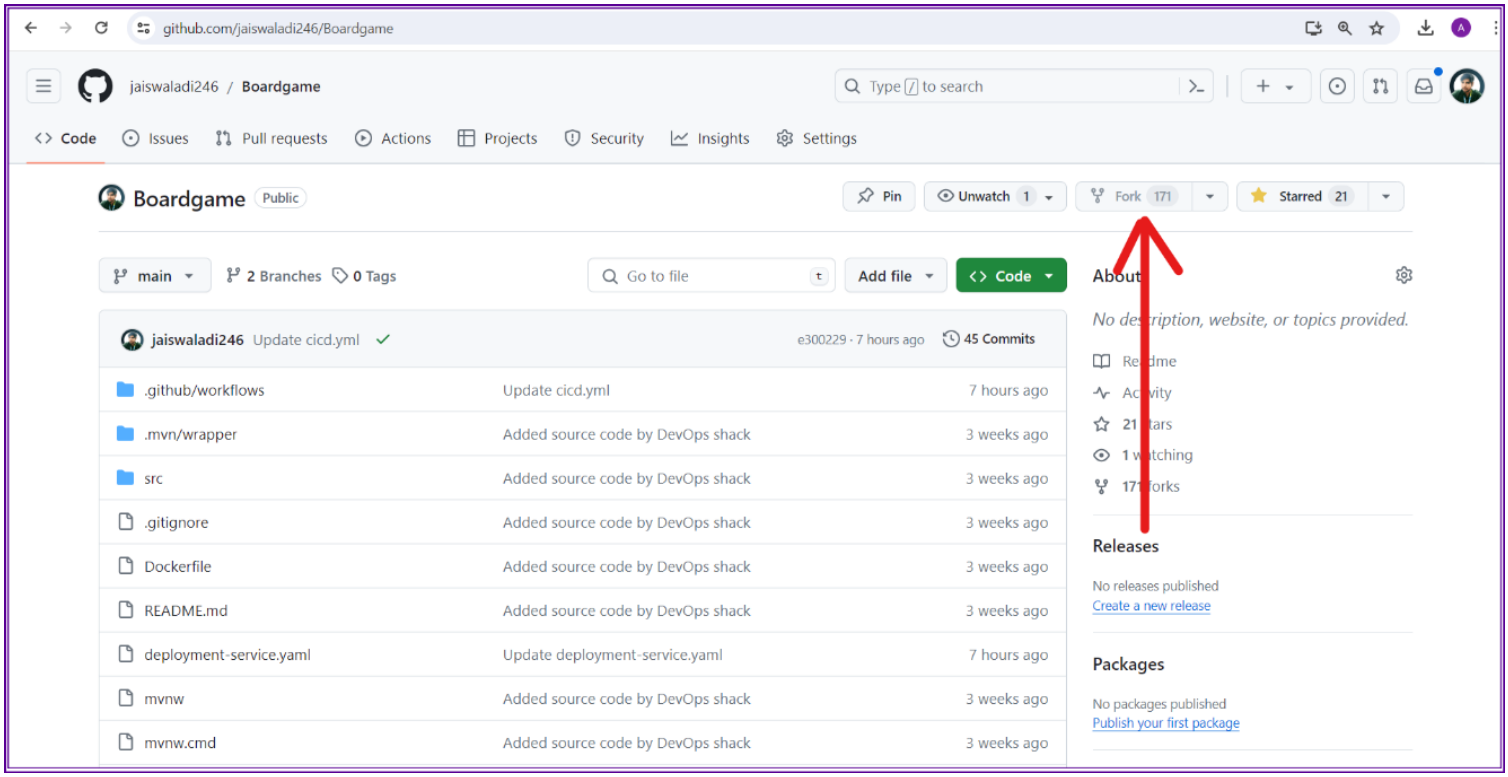
Fork the Repo

1. **Navigate to the Repository**: Go to the repository you want to fork. This can be done through the platform's search feature or by directly accessing the repository's URL.

2. **Locate the Fork Button**: Look for the "Fork" button on the repository's page. This button is usually located in the top-right corner of the page. Click on it.

3. **Choose the Destination**: When you click on the "Fork" button, you'll be prompted to choose where you want to fork the repository. This is typically your personal account or an organization you belong to. Select the appropriate destination.

4. **Wait for the Fork to Complete**: The platform will start the forking process, creating a copy of the repository under your account. Depending on the size of the repository, this process may take a few moments.



PHASE-2 | Infra Setup

Setting Up Kubernetes Cluster on AWS EC2 Instances

1. Creating VMs:

- Log in to the AWS Management Console.
- Navigate to the EC2 dashboard.
- Click on "Launch Instance".
- Choose an Amazon Machine Image (AMI), select the appropriate instance type (t2.medium), configure instance details, add storage (20GB), and configure security groups to allow SSH access.
- Repeat the above steps to create the second VM.

2. Connecting to VMs via SSH(using Mobaexterm or any other Terminal):

- Use an SSH client like mobaxterm (for Windows) or Terminal (for macOS/Linux) to connect to the VMs using their public IP addresses and SSH key pair.

3. Updating Packages:

```
sudo apt update && sudo apt upgrade -y
```

4. Create and Execute Script on Both Master & Worker VM:

Script (`setup.sh`):

```
sudo apt install docker.io -y
sudo chmod 666 /var/run/docker.sock

sudo apt-get install -y apt-transport-https ca-certificates curl gnupg
sudo mkdir -p -m 755 /etc/apt/keyrings

curl -fsSL https://pkgs.k8s.io/core:/stable:/v1.28/deb/Release.key | sudo
gpg --dearmor -o /etc/apt/keyrings/kubernetes-apt-keyring.gpg
echo 'deb [signed-by=/etc/apt/keyrings/kubernetes-apt-keyring.gpg]
https://pkgs.k8s.io/core:/stable:/v1.28/deb/ /' | sudo tee
/etc/apt/sources.list.d/kubernetes.list

sudo apt update

sudo apt install -y kubeadm=1.28.1-1.1 kubelet=1.28.1-1.1 kubectl=1.28.1-
1.1
```

Execution:

```
sudo chmod +x setup.sh
sudo ./setup.sh
```

5. On Master Node:

Script (`init_master.sh`):

```
sudo kubeadm init --pod-network-cidr=10.244.0.0/16

mkdir -p $HOME/.kube
sudo cp -i /etc/kubernetes/admin.conf $HOME/.kube/config
sudo chown $(id -u):$(id -g) $HOME/.kube/config

kubectl apply -f https://docs.projectcalico.org/manifests/calico.yaml

kubectl apply -f https://raw.githubusercontent.com/kubernetes/ingress-
nginx/controller-v0.49.0/deploy/static/provider/baremetal/deploy.yaml
```

Execution:

```
sudo chmod +x init_master.sh
sudo ./init_master.sh
```

6. On Worker Node:

- Copy the `kubeadm join` command provided in the output of `kubeadm init` from the master node.
- Execute the command on the worker node as the root user.

7. Verification:

- On the master node, run:

```
kubectl get nodes
kubectl get pods --all-namespaces
```

- Ensure all nodes are in the `Ready` state and pods are running.

Create Service Account, Role & Assign that role, And create a secret for Service Account and genrate a Token

Creating Service Account

```
apiVersion: v1
kind: ServiceAccount
metadata:
  name: jenkins
  namespace: webapps
```

Create Role

```
apiVersion: rbac.authorization.k8s.io/v1
kind: Role
metadata:
  name: app-role
  namespace: webapps
rules:
  - apiGroups:
        - ""
        - apps
        - autoscaling
        - batch
        - extensions
        - policy
        - rbac.authorization.k8s.io
    resources:
      - pods
      - componentstatuses
      - configmaps
      - daemonsets
      - deployments
      - events
      - endpoints
      - horizontalpodautoscalers
      - ingress
      - jobs
      - limitranges
      - namespaces
      - nodes
      - pods
      - persistentvolumes
      - persistentvolumeclaims
      - resourcequotas
      - replicasets
      - replicationcontrollers
      - serviceaccounts
      - services
    verbs: ["get", "list", "watch", "create", "update", "patch", "delete"]
```

Bind the role to service account

```
apiVersion: rbac.authorization.k8s.io/v1
kind: RoleBinding
metadata:
  name: app-rolebinding
  namespace: webapps
roleRef:
  apiGroup: rbac.authorization.k8s.io
  kind: Role
  name: app-role
subjects:
- namespace: webapps
  kind: ServiceAccount
  name: jenkins
```

Generate token using service account in the namespace

Create Token

SetUp SonarQube

```
sudo apt-get update
sudo apt-get install -y ca-certificates curl
sudo install -m 0755 -d /etc/apt/keyrings


sudo curl -fsSL https://download.docker.com/linux/ubuntu/gpg -o
/etc/apt/keyrings/docker.asc

sudo chmod a+r /etc/apt/keyrings/docker.asc

echo "deb [arch=$(dpkg --print-architecture) signed-
by=/etc/apt/keyrings/docker.asc] https://download.docker.com/linux/ubuntu \
$(. /etc/os-release && echo "$VERSION_CODENAME") stable" | \
sudo tee /etc/apt/sources.list.d/docker.list > /dev/null

sudo apt-get update

sudo apt-get install -y docker-ce docker-ce-cli containerd.io docker-
buildx-plugin docker-compose-plugin
```

Save this script in a file, for example, `install_docker.sh`, and make it executable using:

```
chmod +x install_docker.sh
```

Then, you can run the script using:

```
./install_docker.sh
```

Create Sonarqube Docker container

To run SonarQube in a Docker container with the provided command, you can follow these steps:

1. Open your terminal or command prompt.
2. Run the following command:

```
docker run -d --name sonar -p 9000:9000 sonarqube:lts-community
```

This command will download the `sonarqube:lts-community` Docker image from Docker Hub if it's not already available locally. Then, it will create a container named "sonar" from this image, running it in detached mode (`-d` flag) and mapping port 9000 on the host machine to port 9000 in the container (`-p 9000:9000` flag).

3. Access SonarQube by opening a web browser and navigating to `http://VmIP:9000`.

This will start the SonarQube server, and you should be able to access it using the provided URL. If you're running Docker on a remote server or a different port, replace `localhost` with the appropriate hostname or IP address and adjust the port accordingly.

Setting Up GitHub Actions Self-hosted Runner on VM

1. Provisioning VM:

- Log in to your cloud provider (e.g., AWS, Azure, GCP).
- Navigate to the dashboard or console for managing virtual machines.
- Click on "Launch Instance" or similar to create a new virtual machine.
- Choose an appropriate instance type (t2.large), configure instance details (8GB RAM, 20GB storage), networking, and security settings.
- Complete the setup and wait for the VM to be provisioned.

2. Accessing VM:

- Once the VM is provisioned, obtain its public IP address or DNS name.
- Use SSH (for Linux) or RDP (for Windows) to connect to the VM.

3. Setting Up Self-hosted Runner:

- Open a terminal or command prompt on the VM.

4. Registering Runner:

- Go to your GitHub repository where you want to set up the self-hosted runner.
- Navigate to the "Settings" tab.

5. Accessing Runner Configuration:

- On the left sidebar, click on "Actions".
- Click on "Runners".

6. Adding New Runner:

- Click on "New self-hosted runner".

7. Selecting Machine Type:

- Choose the appropriate machine type (Linux, macOS, Windows) based on your VM's operating system.

8. Executing Commands:

- Follow the instructions provided by GitHub to download and configure the runner. These typically involve running a set of commands.

9. Starting the Runner:

- After configuring the runner, start it by running the command provided.

PHASE-3 | CICD

Java CI Pipeline with GitHub Actions

This document outlines the steps to create a continuous integration (CI) pipeline using GitHub Actions for a Java project built with Maven. The pipeline includes steps for building the project, running security scans, performing code quality analysis with SonarQube, building and scanning Docker images, and deploying to Kubernetes. Secrets are used to securely store sensitive information such as authentication tokens and configuration files.

Pipeline Overview:

1. **Java Build and Package:**
    - Sets up JDK 17 using Temurin distribution.
    - Builds the Java project using Maven.
    - Uploads the generated JAR artifact as a GitHub Action artifact.
2. **Security Scans:**
    - Performs file system scan using Trivy.
    - Runs SonarQube scan for code quality analysis.
3. **Docker Build and Scan:**
    - Sets up QEMU and Docker Buildx.
    - Builds Docker image for the Java application.
    - Scans Docker image using Trivy.
    - Logs in to Docker Hub using provided credentials.
    - Pushes the Docker image to Docker Hub.
4. **Kubernetes Deployment:**
    - Uses Kubectl Action to interact with Kubernetes cluster.
    - Applies deployment and service configuration from `deployment-service.yaml` file to deploy the application to Kubernetes namespace `webapps`.

Pipeline Configuration:

```
name: CICD By DevOps Shack

on:
  push:
    branches: [ "main" ]

jobs:
  build:
    runs-on: self-hosted

    steps:
    - uses: actions/checkout@v3
    - name: Set up JDK 17
      uses: actions/setup-java@v3
      with:
        java-version: '17'
        distribution: 'temurin'
        cache: maven
    - name: Build with Maven
      run: mvn package

    - uses: actions/upload-artifact@v4
      with:
        name: my-artifact
        path: target/*.jar

    - name: Trivy FS Scan
      run: |
        trivy fs --format table -o trivy-fs-report.html .

    - name: SonarQube Scan
      uses: sonarsource/sonarqube-scan-action@master
      env:
        SONAR_TOKEN: ${{ secrets.SONAR_TOKEN }}
        SONAR_HOST_URL: ${{ secrets.SONAR_HOST_URL }}

    - name: Install jq
      run: sudo apt-get update && sudo apt-get install -y jq

    - name: SonarQube Quality Gate check
      id: sonarqube-quality-gate-check
      uses: sonarsource/sonarqube-quality-gate-action@master
      timeout-minutes: 5
      env:
        SONAR_TOKEN: ${{ secrets.SONAR_TOKEN }}
        SONAR_HOST_URL: ${{ secrets.SONAR_HOST_URL }}

    - name: Set up QEMU
      uses: docker/setup-qemu-action@v3

    - name: Set up Docker Buildx
      uses: docker/setup-buildx-action@v3

    - name: Build Docker Image
      run: |
        docker build -t adijaiswal/boardgame:latest .
```

```
    - name: Trivy Image Scan
      run: |
        trivy image --format table -o trivy-image-report.html
adijaiswal/board:latest

    - name: Login to Docker Hub
      uses: docker/login-action@v3
      with:
        username: ${{ secrets.DOCKERHUB_USERNAME }}
        password: ${{ secrets.DOCKERHUB_TOKEN }}

    - name: Push Docker Image
      run: |
        docker push adijaiswal/boardgame:latest

    - name: Kubectl Action
      uses: tale/kubectl-action@v1
      with:
        base64-kube-config: ${{ secrets.KUBE_CONFIG }}

    - run: |
        kubectl apply -f deployment-service.yaml -n webapps

        kubectl get svc -n webapps
```

Secrets Configuration: Ensure that the following secrets are configured in your GitHub repository:

- `SONAR_TOKEN`: Token for authenticating SonarQube scan.
- `SONAR_HOST_URL`: URL of your SonarQube instance.
- `DOCKERHUB_USERNAME`: Username for Docker Hub authentication.
- `DOCKERHUB_TOKEN`: Token for Docker Hub authentication.
- `KUBE_CONFIG`: Base64 encoded Kubernetes configuration file (`kubeconfig`) for accessing the Kubernetes cluster.

PHASE-4 | Monitoring

Downloading Prometheus Components and Grafana

Below are the steps to download Prometheus components (Node Exporter, Blackbox Exporter, and Prometheus itself) from the official Prometheus website and Grafana from the Grafana website:

1. Downloading Node Exporter:

- Go to the Prometheus download page: Prometheus Download Page.
- Scroll down to the "Node Exporter" section.
- Choose the appropriate version for your operating system.
- Click on the download link to download the Node Exporter binary.

2. Downloading Blackbox Exporter:

- Go to the Prometheus download page: Prometheus Download Page.
- Scroll down to the "Blackbox Exporter" section.
- Choose the appropriate version for your operating system.
- Click on the download link to download the Blackbox Exporter binary.

3. Downloading Prometheus:

- Go to the Prometheus download page: Prometheus Download Page.
- Scroll down to the "Prometheus" section.
- Choose the appropriate version for your operating system.
- Click on the download link to download the Prometheus binary.

4. Downloading Grafana:

- Go to the Grafana download page: Grafana Download Page.
- Choose the appropriate version for your operating system.
- Click on the download link to download the Grafana binary.

Documentation:

You can find additional information and documentation for each component from the following links:

- Node Exporter Documentation
- Blackbox Exporter Documentation
- Prometheus Documentation
- Grafana Documentation

For Proper command Please refer the video from Time stamp 01:06:00 https://youtu.be/FTrTFOLbdm4