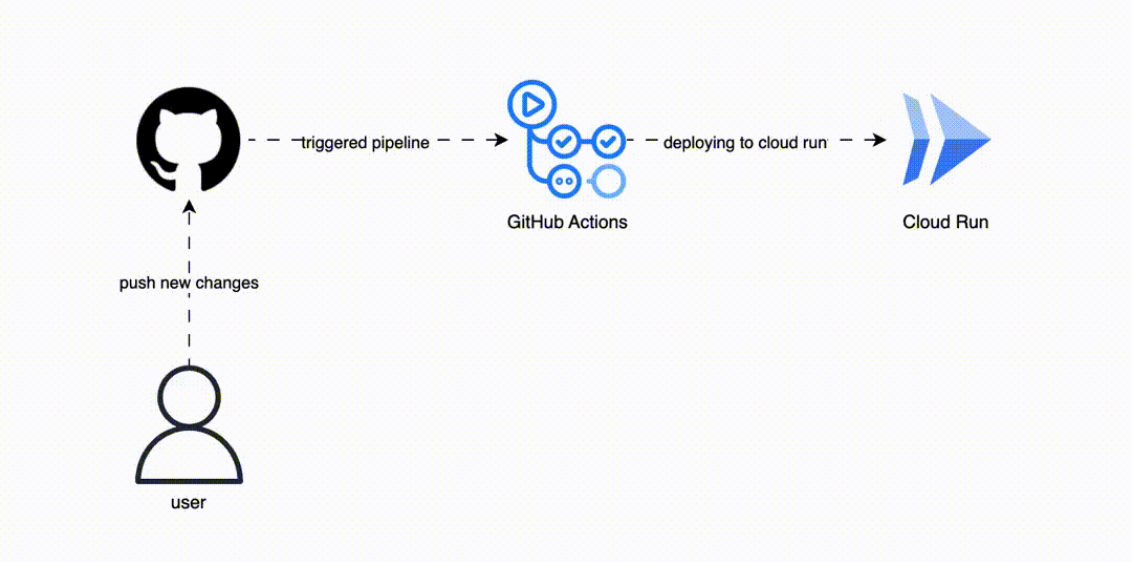


Picture 1. Global Pipeline Workflow

Create a new service account in Google Cloud IAM

The first thing we must do is create Service Account in Google Cloud IAM, Service Account functions as a restriction on access to resources we use later. We can use this command:

```
gcloud projects list # to get project ID
export PROJECT_ID="your-project-id" # Set your project id in here
```

after that, we run this command to create the Service Account:

```
gcloud iam service-accounts create "cloud-run-sa" --project="${PROJECT_ID}"
--description="Cloud Run Service Account" --display-name="Cloud Run Service
Account"
```

We set roles as Artifact Registry Admin and Cloud Run Admin because we need access to those resources, we can run this command:

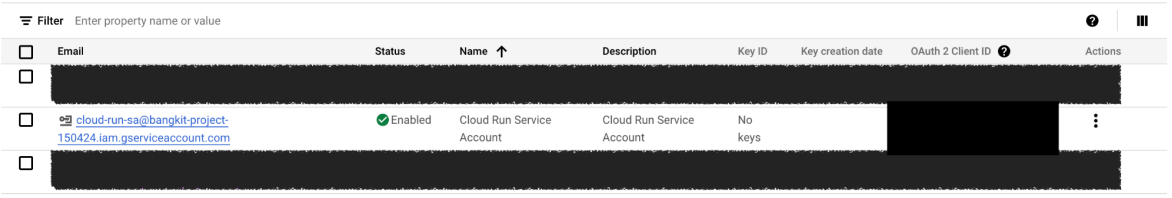
```
gcloud projects add-iam-policy-binding "${PROJECT_ID}"
--member="serviceAccount:cloud-run-sa@${PROJECT_ID}.iam.gserviceaccount.com
" --role="roles/artifactregistry.repoAdmin" --role="roles/run.admin"
--role="roles/iam.serviceAccountUser"
```

```
rofim58@cloudshell:~ (bangkit-project-150424)$ export PROJECT_ID="bangkit-project-150424"
rofim58@cloudshell:~ (bangkit-project-150424)$ gcloud iam service-accounts create \
    "cloud-run-sa" \
    --project="${PROJECT_ID}" \
    --description="Cloud Run Service Account" \
    --display-name="Cloud Run Service Account"
Created service account [cloud-run-sa].
```

Picture 2. Run the command to create the service account

```
rofim58@cloudshell:~ (bangkit-project-150424)$ gcloud projects add-iam-policy-binding "${PROJECT_ID}" \
    --member="serviceAccount:cloud-run-sa@${PROJECT_ID}.iam.gserviceaccount.com" \
    --role="roles/artifactregistry.repoAdmin" \
    --role="roles/run.admin"
Updated IAM policy for project [bangkit-project-150424].
bindings:
- members:
  - serviceAccount:service-223643940089@gcp-gae-service.iam.gserviceaccount.com
  role: roles/appengine.serviceAgent
- members:
  - serviceAccount:service-223643940089@gcp-sa-artifactregistry.iam.gserviceaccount.com
  role: roles/artifactregistry.serviceAgent
- members:
  - serviceAccount:223643940089@cloudbuild.gserviceaccount.com
  role: roles/cloudbuild.builds.builder
- members:
  - serviceAccount:service-223643940089@gcp-sa-cloudbuild.iam.gserviceaccount.com
  role: roles/cloudbuild.serviceAgent
- members:
  - serviceAccount:service-223643940089@compute-system.iam.gserviceaccount.com
  role: roles/compute.serviceAgent
- members:
  - serviceAccount:service-223643940089@container-engine-robot.iam.gserviceaccount.com
  role: roles/container.serviceAgent
- members:
  - serviceAccount:service-223643940089@containerregistry.iam.gserviceaccount.com
  role: roles/containerregistry.ServiceAgent
- members:
  - serviceAccount:223643940089-compute@developer.gserviceaccount.com
  - serviceAccount:223643940089@cloudservices.gserviceaccount.com
  - serviceAccount:bangkit-project-150424@appspot.gserviceaccount.com
  role: roles/editor
- members:
  - serviceAccount:service-223643940089@gcp-sa-firestore.iam.gserviceaccount.com
  role: roles/firestore.serviceAgent
- members:
  - serviceAccount:service-223643940089@gcp-sa-networkconnectivity.iam.gserviceaccount.com
  role: roles/networkconnectivity.serviceAgent
- members:
  - user:rofim58@gmail.com
  role: roles/owner
- members:
  - serviceAccount:service-223643940089@gcp-sa-pubsub.iam.gserviceaccount.com
  role: roles/pubsub.serviceAgent
- members:
  - serviceAccount:cloud-run-sa@bangkit-project-150424.iam.gserviceaccount.com
```

Picture 3. Run the command to assign a role to the service account



Picture 4. Result service account

Create a new Workload Identity Pool

A workload identity pool is an entity that lets you manage external identities.

First, we must export the repo owner and repo name

```
export REPO_OWNER="your-github-username"
export REPO_NAME="your-repo-name"
```

We create a Workload Identity Pool we named “github” using this command:

```
gcloud iam workload-identity-pools create "github" \
  --project="${PROJECT_ID}" \
  --location="global" \
  --display-name="GitHub Actions Pool"
```

We can check WIP was successfully created or not using this command:

```
gcloud iam workload-identity-pools describe "github" \
  --project="${PROJECT_ID}" \
  --location="global" \
  --format="value(name)"
```

We create OpenID Connect for an identity provider, This command sets up an OIDC identity provider that allows Google Cloud to trust tokens issued by GitHub Actions. By mapping specific attributes from the GitHub OIDC token, it enables fine-grained access control based on these attributes in your Google Cloud environment:

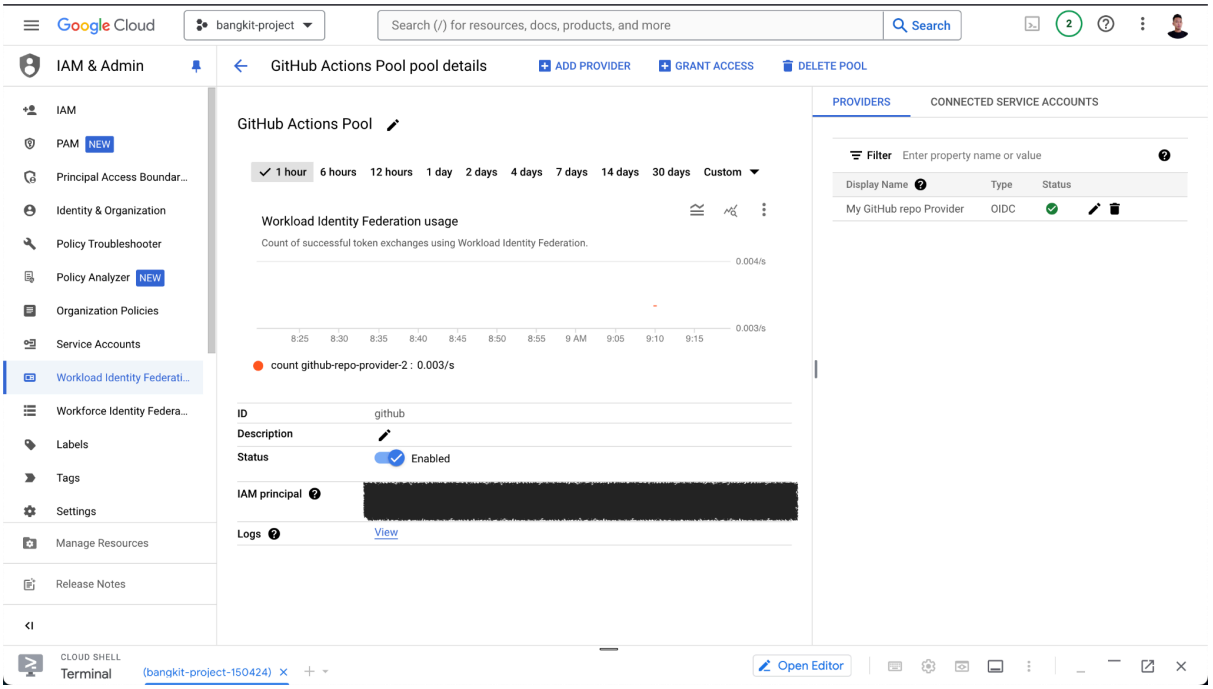
```
gcloud iam workload-identity-pools providers create-oidc
"github-repo-provider" \
  --project="${PROJECT_ID}" \
  --location="global" \
  --workload-identity-pool="github" \
  --display-name="My GitHub repo Provider" \
--attribute-mapping="google.subject=assertion.sub,attribute.actor=assertion
.actor,attribute.repository=assertion.repository,attribute.repository_owner
=assertion.repository_owner,attribute.repository_id=assertion.repository_id
" \
  --issuer-uri="https://token.actions.githubusercontent.com"
```

This sequence of commands allows a specific GitHub repository to assume the cloud-run-sa service account's identity, enabling it to interact with Google Cloud

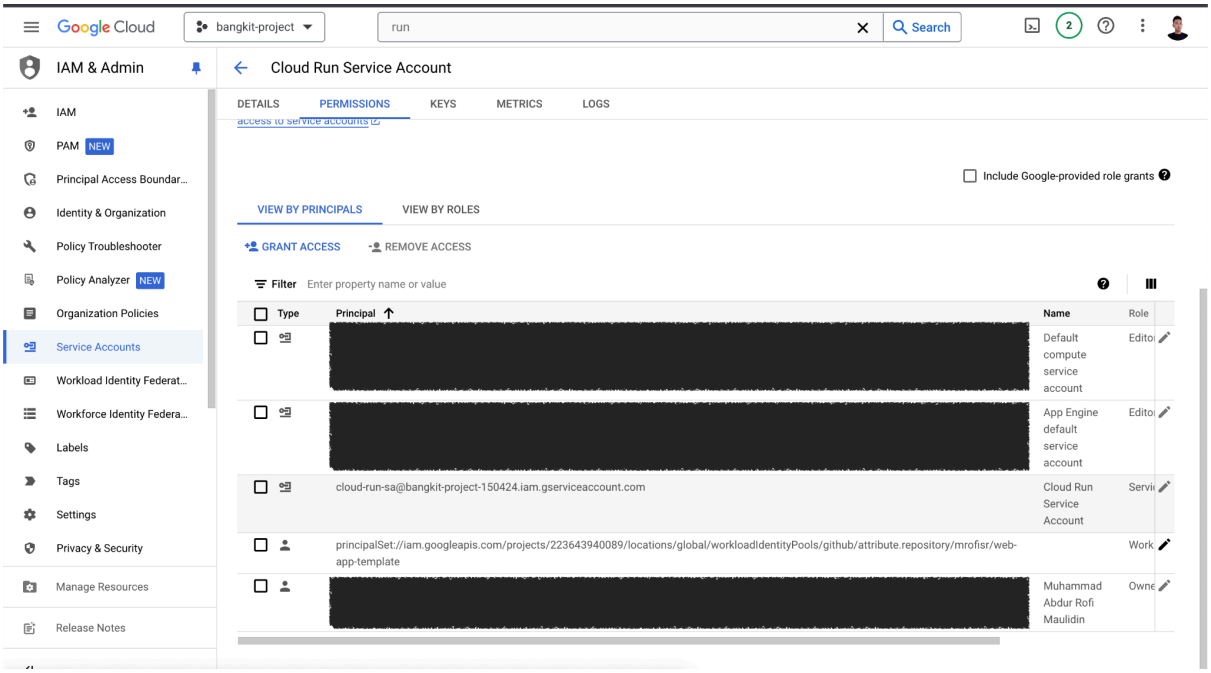
resources as this service account. This setup is useful for securely granting permissions to GitHub Actions workflows to interact with Google Cloud.

```
export SA_EMAIL="cloud-run-sa@${PROJECT_ID}.iam.gserviceaccount.com"
export WORKLOAD_POOL=`gcloud iam workload-identity-pools describe "github"
\
  --project="${PROJECT_ID}" \
  --location="global" \
  --format="value(name)"`

gcloud iam service-accounts add-iam-policy-binding ${SA_EMAIL}
--project="${PROJECT_ID}" --role="roles/iam.workloadIdentityUser"
--member="principalSet://iam.googleapis.com/${WORKLOAD_POOL}/attribute.repo
sitory/${REPO_OWNER}/${REPO_NAME}"
```



Picture 4. Result in Workload Identity Pool and Provider

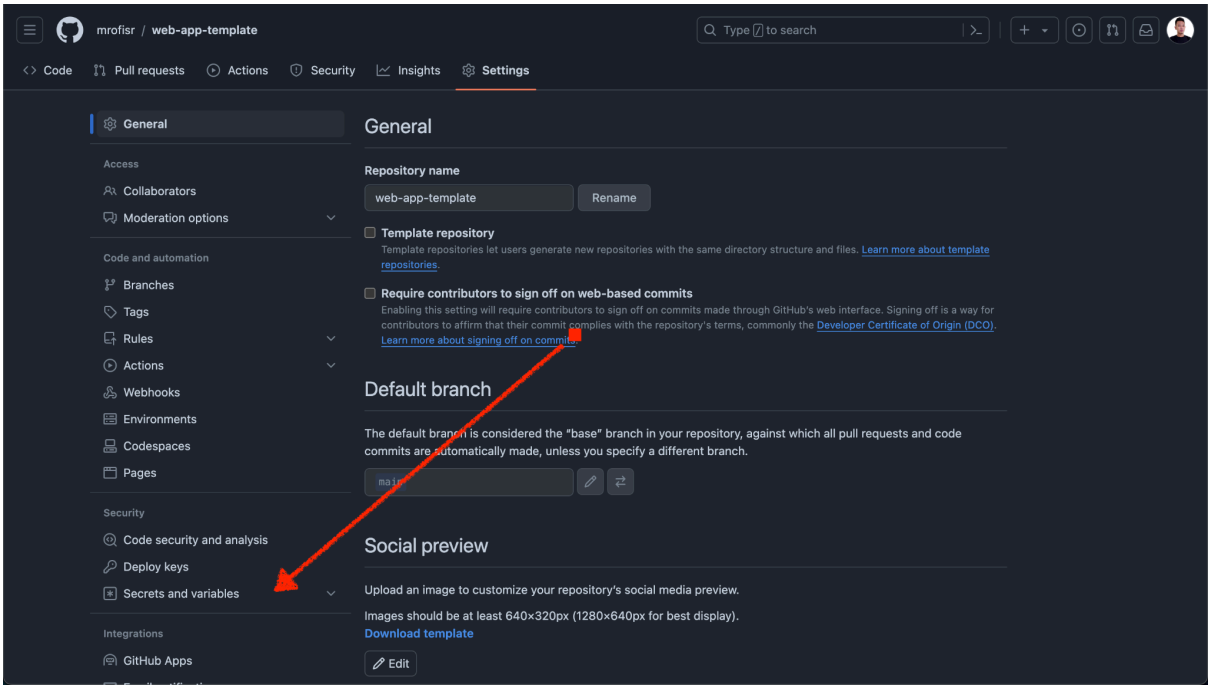


Picture 5. Result in service account assign member and roles

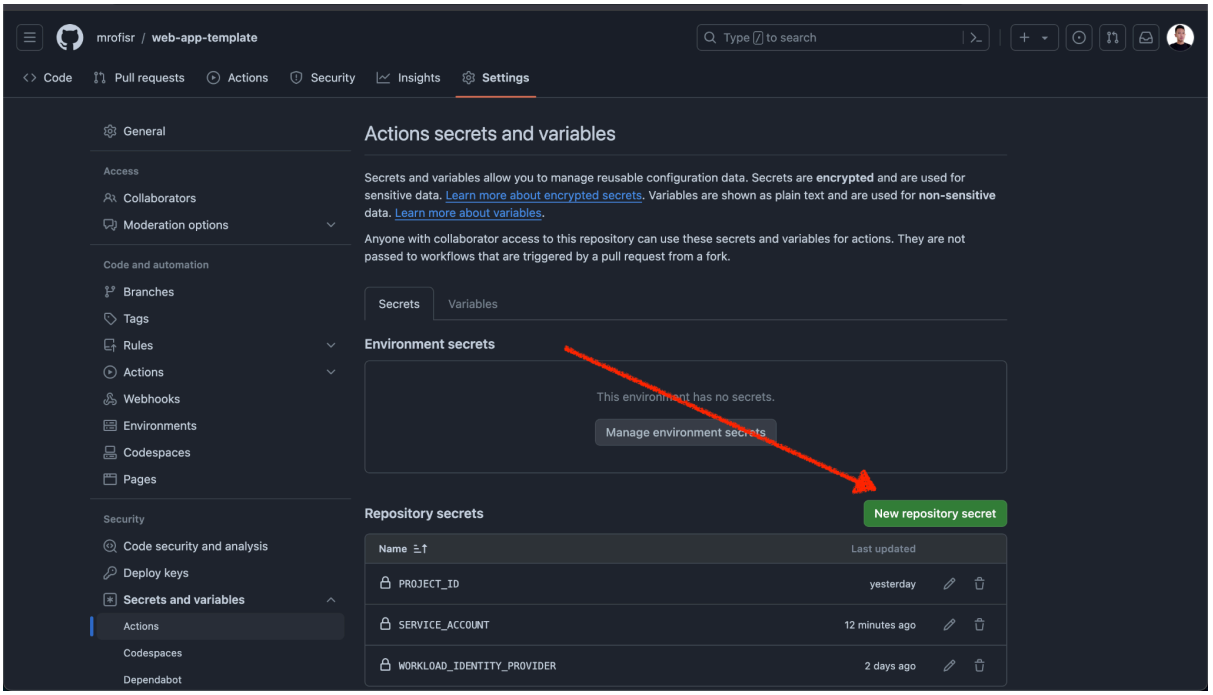
Setup GitHub Actions Secret

To setup GitHub Actions Secret we need 3 items:

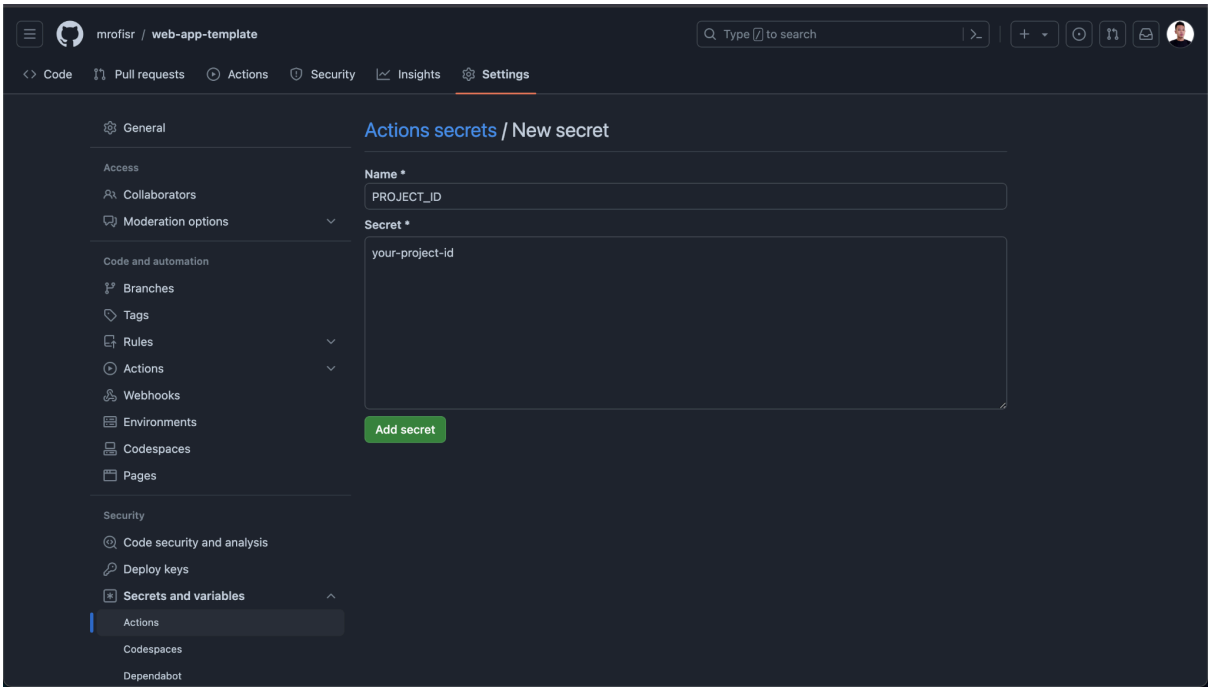
- PROJECT_ID, use this command to get the project ID `gcloud projects list`
- SERVICE_ACCOUNT, value is the email of the service account `cloud-run-sa@${PROJECT_ID}.iam.gserviceaccount.com`
- WORKLOAD_IDENTITY_PROVIDER, use this command to get WIP `gcloud iam workload-identity-pools providers describe "github-repo-provider" --project="${PROJECT_ID}" --location="global" --workload-identity-pool="github" --format="value(name)”`



Picture 6. Create GitHub Actions secret



Picture 7. Add new GitHub Actions secret



Picture 8. Set key value GitHub Actions secret

Setup Pipeline

First, we must create a directory `.github/workflows` and create new file inside the directory named `deployment.yaml` and fill it with this:

```
name: CI and CD Pipeline to Cloud Run

on:
  push:
    branches:
      - main
      - dev
  pull_request:
    branches:
      - main
      - dev
    types:
      - closed

jobs:
  build-and-deploy:
    permissions:
      contents: 'read'
      id-token: 'write'
    runs-on: ubuntu-latest
    steps:
      # Step to checkout the code from the repository
      - name: Checkout code
        id: checkout
```

```
        uses: actions/checkout@v4

      # Step to set environment variables
      - name: Set environment variables
        id: set-env
        run: |
          echo "IMAGE_VERSION=${{ github.ref_name }}" >> $GITHUB_ENV

      # Step to authenticate with Google Cloud
      - name: Gcloud Auth
        id: gcloud-auth
        uses: google-github-actions/auth@v2
        with:
          token_format: 'access_token'
          project_id: ${{ secrets.PROJECT_ID }}
          service_account: ${{ secrets.SERVICE_ACCOUNT }}
          workload_identity_provider: ${{
secrets.WORKLOAD_IDENTITY_PROVIDER }}

      # Step to authenticate with the Google Container Registry
      - name: Auth Container Registry
        id: container-registry-auth
        uses: docker/login-action@v3
        with:
          registry: us-central1-docker.pkg.dev
          username: oauth2accesstoken
          password: ${{ steps.gcloud-auth.outputs.access_token }}

      # Step to build and push the Docker image for the backend
      - name: Build and push Docker image Backend
        id: build-push-back
        uses: docker/build-push-action@v6
        with:
          context: .
          file: ./Dockerfile.back
          push: true
          tags: us-central1-docker.pkg.dev/${{ secrets.PROJECT_ID
}}/cloud-run/cloud-run-back:${{ env.IMAGE_VERSION }}

      # Step to deploy the backend Docker image to Cloud Run
      - name: Deploy to Cloud Run Backend
        id: deploy-cloud-run-back
        uses: google-github-actions/deploy-cloudrun@v2
        with:
          service: cloud-run-backend-${{ env.IMAGE_VERSION }}
          image: us-central1-docker.pkg.dev/${{ secrets.PROJECT_ID
}}/cloud-run/cloud-run-back:${{ env.IMAGE_VERSION }}
          region: us-central1
          project_id: ${{ secrets.PROJECT_ID }}
          flags: --port 4000 --allow-unauthenticated

      # Step to update the NGINX configuration with the new backend URL
```

```
      - name: Change backend stream NGINX config
        run: |
          DOMAIN=$(echo ${{ steps.deploy-cloud-run-back.outputs.url }} |
cut -d'/' -f3)
          sed -i 's|backend:4000|'${DOMAIN}'|g' ./nginx.conf
          sed -i 's|http://backend|https://'${DOMAIN}'|g' ./nginx.conf
          cat ./nginx.conf

      # Step to build and push the Docker image for the frontend
      - name: Build and push Docker image Frontend
        id: build-push-front
        uses: docker/build-push-action@v6
        with:
          context: .
          file: ./Dockerfile.front
          push: true
          tags: us-central1-docker.pkg.dev/${{ secrets.PROJECT_ID
}}/cloud-run/cloud-run-front:${{ env.IMAGE_VERSION }}

      # Step to deploy the frontend Docker image to Cloud Run
      - name: Deploy to Cloud Run Frontend
        id: deploy-cloud-run-front
        uses: google-github-actions/deploy-cloudrun@v2
        with:
          service: cloud-run-frontend-${{ env.IMAGE_VERSION }}
          image: us-central1-docker.pkg.dev/${{ secrets.PROJECT_ID
}}/cloud-run/cloud-run-front:${{ env.IMAGE_VERSION }}
          region: us-central1
          project_id: ${{ secrets.PROJECT_ID }}
          flags: --port 80 --allow-unauthenticated

      # Step to test if both the backend and frontend are running correctly
      - name: Test Cloud Run
        run: |
          curl "${{ steps.deploy-cloud-run-back.outputs.url }}" -I -s |
grep "HTTP/2 200"
          curl "${{ steps.deploy-cloud-run-front.outputs.url }}" -I -s |
grep "HTTP/2 200"
```

Test Pipeline

youtu.be/1BGgfenYUhE