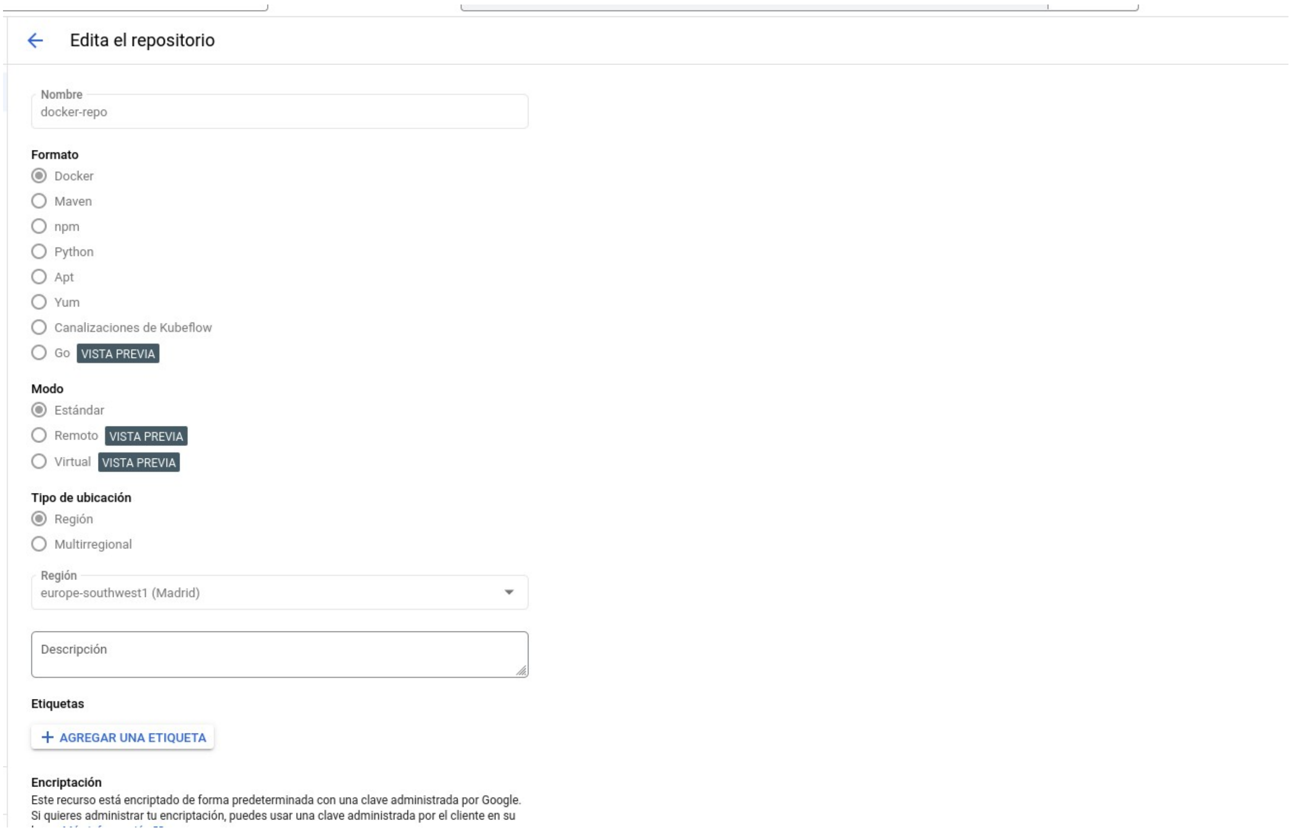
1. Register the Container generated by the DockerFile with Cloud Build / Artifacts.

First of all we are going to create the docker repository on google artifact registry. So we enable the service, and then create a new repo, format: Docker, model: standard.



Edita el repositorio

Nombre: docker-repo

Formato
● Docker
○ Maven
○ npm
○ Python
○ Apt
○ Yum
○ Canalizaciones de Kubeflow
○ Go VISTA PREVIA

Modo
● Estándar
○ Remoto VISTA PREVIA
○ Virtual VISTA PREVIA

Tipo de ubicación
● Región
○ Multirregional

Región: europe-southwest1 (Madrid)

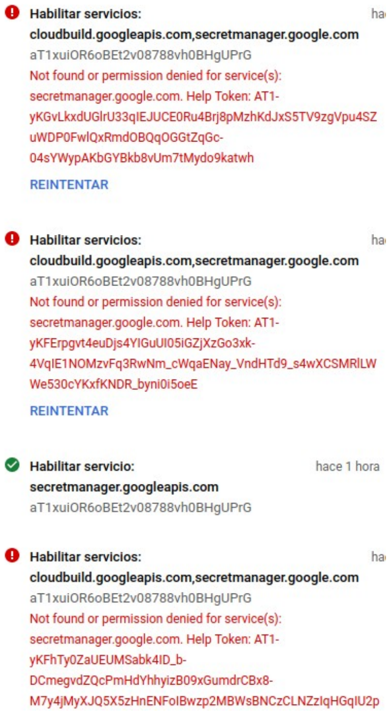
Descripción

Etiquetas

Encriptación
Este recurso está encriptado de forma predeterminada con una clave administrada por Google. Si quieres administrar tu encriptación, puedes usar una clave administrada por el cliente en su

The first approach consist on using Cloud Build to connect to a GitHUb repo which contains all the files needed to build the image with the vue app.

But this plan fails as we do not have sufficient permisions to configure the GitHub repo with the Cloud Build service.



Habilitar servicios: ha
cloudbuild.googleapis.com,secretmanager.google.com
aT1xuiOR6oBEt2v08788vh0BHgUPrG
Not found or permission denied for service(s):
secretmanager.google.com. Help Token: AT1-
yKGvLkxdUGlrU33qIEJUCE0Ru4Brj8pMzhKdJxS5TV9zgVpu4SZ
uWDP0FwlQxRmdOBQqOGGtZqGc-
04sYWypAKbGYBkb8vUm7tMydo9katwh

Habilitar servicios: ha
cloudbuild.googleapis.com,secretmanager.google.com
aT1xuiOR6oBEt2v08788vh0BHgUPrG
Not found or permission denied for service(s):
secretmanager.google.com. Help Token: AT1-
yKFErpgvt4euDjs4YIGuUI05iGZjXzGo3xk-
4VqIE1NOMzvFq3RwNm_cWqaENay_VndHTd9_s4wXCSMRlLW
We530cYKxfKNDR_byni0i5oeE

Habilitar servicio: hace 1 hora
secretmanager.googleapis.com
aT1xuiOR6oBEt2v08788vh0BHgUPrG

Habilitar servicios: ha
cloudbuild.googleapis.com,secretmanager.google.com
aT1xuiOR6oBEt2v08788vh0BHgUPrG
Not found or permission denied for service(s):
secretmanager.google.com. Help Token: AT1-
yKFhTy0ZaUEUMSabk4ID_b-
DCmegvdZQcPmHdYhhyizB09xGumdrCBx8-
M7y4jMyXJQ5X5zHnENFoIBwzp2MBWsBNCzCLNZzIqHGqIU2p

So a second approach has been applied. This one consists on cloning the github repo in our local machine, build the image from the Dockerfile provided and push the image to the already docker repository created in Google Artifatcs.

Firstly we have to login and enable permisions to push images from our local repo to the Google repository.

Configure gcloud with registry:

```
gcloud auth configure-docker \
    europe-southwest1-docker.pkg.dev
```

Then login to the gcloud:

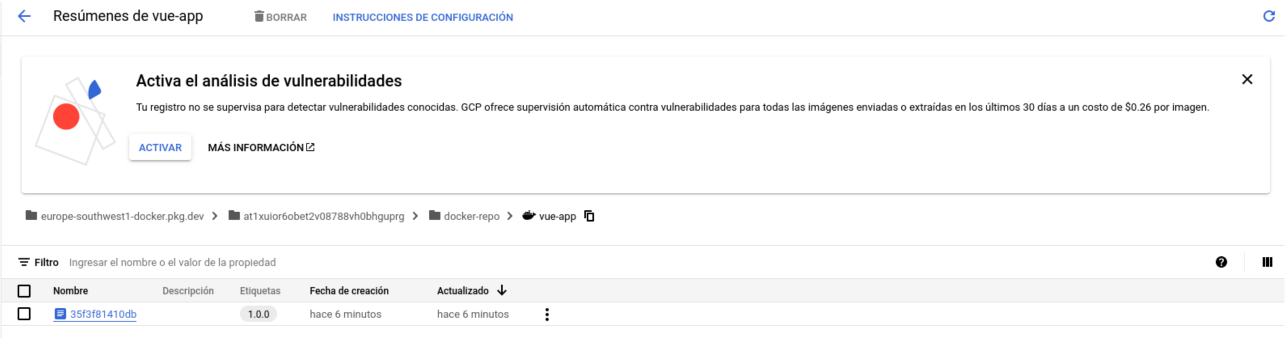
```
gcloud auth login
```

Finally we build locally our image with the following command:

```
docker build -t
europe-southwest1-docker.pkg.dev/at1xuior6obet2v08788vh0bhguprg/docker-repo/vue-app:1.0.0 .
```

And push the generated image to our google artifact registry:

docker push europe-southwest1-docker.pkg.dev/at1xuior6obet2v08788vh0bhguprg/docker-repo/vue-app:1.0.0



Resúmenes de vue-app

Activa el análisis de vulnerabilidades

Tu registro no se supervisa para detectar vulnerabilidades conocidas. GCP ofrece supervisión automática contra vulnerabilidades para todas las imágenes enviadas o extraídas en los últimos 30 días a un costo de $0.26 por imagen.

europe-southwest1-docker.pkg.dev > at1xuior6obet2v08788vh0bhguprg > docker-repo > vue-app

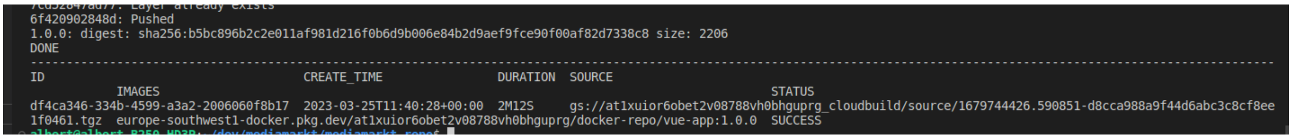
Filtro Ingresar el nombre o el valor de la propiedad

□	Nombre	Descripción	Etiquetas	Fecha de creación	Actualizado ↓
□	35f3f81410db		1.0.0	hace 6 minutos	hace 6 minutos

Another option is to configure our project in the gcloud cli client and use Cloud Build service to build the image and push it to the artifactory. This way we do not have to use docker locally, instead we use Cloud Build.

gcloud config set project at1xuior6obet2v08788vh0bhguprg

gcloud builds submit --region=global --tag europe-southwest1-docker.pkg.dev/at1xuior6obet2v08788vh0bhguprg/docker-repo/vue-app:1.0.0



```
7cd52847ad77: Layer already exists
6f420902848d: Pushed
1.0.0: digest: sha256:b5bc896b2c2e011af981d216f0b6d9b006e84b2d9aef9fce90f00af82d7338c8 size: 2206
DONE
------------------------------------------------------------------------------------------------------------------------------------------------------------------------
ID                                    CREATE_TIME                DURATION  SOURCE
            IMAGES                                                                                        STATUS
df4ca346-334b-4599-a3a2-2006060f8b17  2023-03-25T11:40:28+00:00  2M12S     gs://at1xuior6obet2v08788vh0bhguprg_cloudbuild/source/1679744426.590851-d8cca988a9f44d6abc3c8cf8ee
1f0461.tgz  europe-southwest1-docker.pkg.dev/at1xuior6obet2v08788vh0bhguprg/docker-repo/vue-app:1.0.0  SUCCESS
albert@albert-B250-HD3P:~/dev/mediamarkt/mediamarkt_repo$
```

2. Generating a YAML file for Docker Composer.

Now it’s time to create our compose file in order to run the application:

```
version: "3"
services:
  web:
    container_name: vue-app
    image: vue-app:1.0.0
    ports:
      - “3000:3000”
```

From this yaml file using kompose we can create the yaml deployment files, for the service and the deployment objects.

We are using version 3 of docker-compose, as we are going to run only 1 container we instance 1 service called web, the container created will have the name vue-app, the image which creates the container is the one in the registry, vue-app:1.0.0.

3. Generate the Terraform files in order to have the infrastructure as code and be able to deploy with Kubernetes.

Now it’s time to provision the infrastructure required to deploy our app. First of all we are going to create a VPC and then a Kubernetes cluster all of that using Terraform.

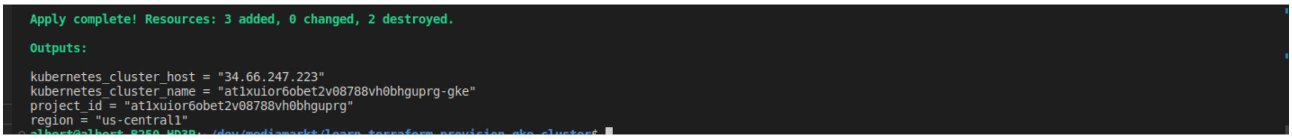
By creating a VPC, we create an envirnment where our cluster will reside, so it is isolated from other resources.

Before creating all this infra, we have to configure some things: enable Compute engine API and install gcloud auth plugin.

```
gcloud services enable servicemanagement.googleapis.com
servicecontrol.googleapis.com cloudresourcemanager.googleapis.com
compute.googleapis.com container.googleapis.com containerregistry.googleapis.com
cloudbuild.googleapis.com
```

sudo apt-get install google-cloud-sdk-gke-gcloud-auth-plugin

Now we can start provisioning our infrastructure. In our terraform configuration file we define a resource VPC and a GKE resource, define all required variables and providers. Then we initialize the environment with terraform init and follow the workflow , terraform plan and terraform apply. So our infra is created:

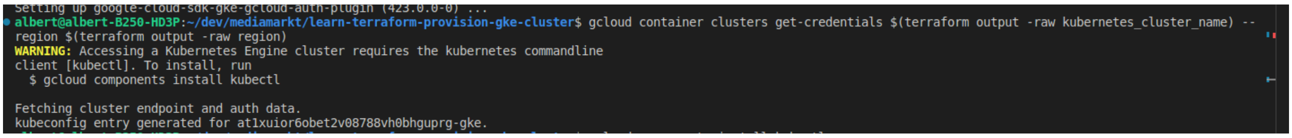


```
Apply complete! Resources: 3 added, 0 changed, 2 destroyed.

Outputs:

kubernetes_cluster_host = "34.66.247.223"
kubernetes_cluster_name = "at1xuior6obet2v08788vh0bhguprg-gke"
project_id = "at1xuior6obet2v08788vh0bhguprg"
region = "us-central1"
albert@albert-B250-HD3P:~/dev/mediamarkt/learn-terraform-provision-gke-cluster$
```

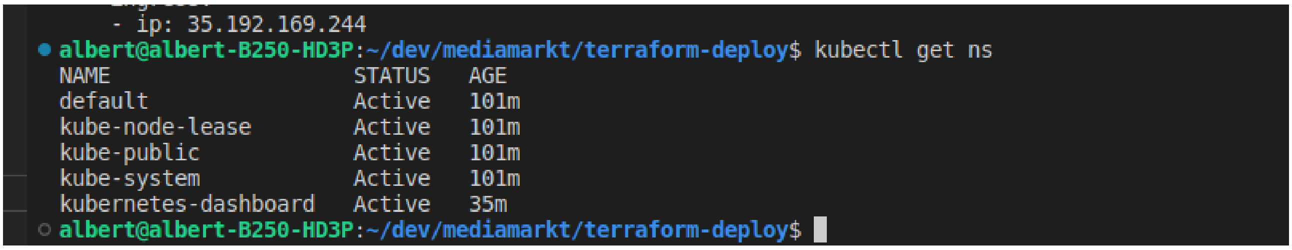
To connect to our cluster we must configure kubectl client



```
Setting up google-cloud-sdk-gke-gcloud-auth-plugin (423.0.0-0) ...
albert@albert-B250-HD3P:~/dev/mediamarkt/learn-terraform-provision-gke-cluster$ gcloud container clusters get-credentials $(terraform output -raw kubernetes_cluster_name) --
region $(terraform output -raw region)
WARNING: Accessing a Kubernetes Engine cluster requires the kubernetes commandline
client [kubectl]. To install, run
  $ gcloud components install kubectl

Fetching cluster endpoint and auth data.
kubeconfig entry generated for at1xuior6obet2v08788vh0bhguprg-gke.
```

Then confirm that we have access to the cluster:



```
    - ip: 35.192.169.244
albert@albert-B250-HD3P:~/dev/mediamarkt/terraform-deploy$ kubectl get ns
NAME                   STATUS   AGE
default                Active   101m
kube-node-lease        Active   101m
kube-public            Active   101m
kube-system            Active   101m
kubernetes-dashboard   Active   35m
albert@albert-B250-HD3P:~/dev/mediamarkt/terraform-deploy$
```

Now that we have created our cluster inside a VPC its time to deploy the application as a pod in our kubernetes cluster.

This could be done with a simple kubectl apply -f <file_name.yaml> but we are going to use terraform to deploy the deployment. We are going to deploy a deployment instead of a pod to give robustness to the app, as our deployment will have 2 replicas. Then it supports more traffic and in case one replica falls, we will continue giving service.

So we need another terraform configuration file for our deployment, inside it we are going to define a new resource of type kubernetes_deployment.
Also we need to define the providers used, in this case gcloud and kubernetes.

**Note: it is important to mark that, at the time of deploying the app, the kubelet could not pull the image from the registry, so we had to add in our gke terraform conf file the following lines in order to kubelet have permissions to pull the image:

```
oauth_scopes = [
      "https://www.googleapis.com/auth/cloud-platform"
    ]
```

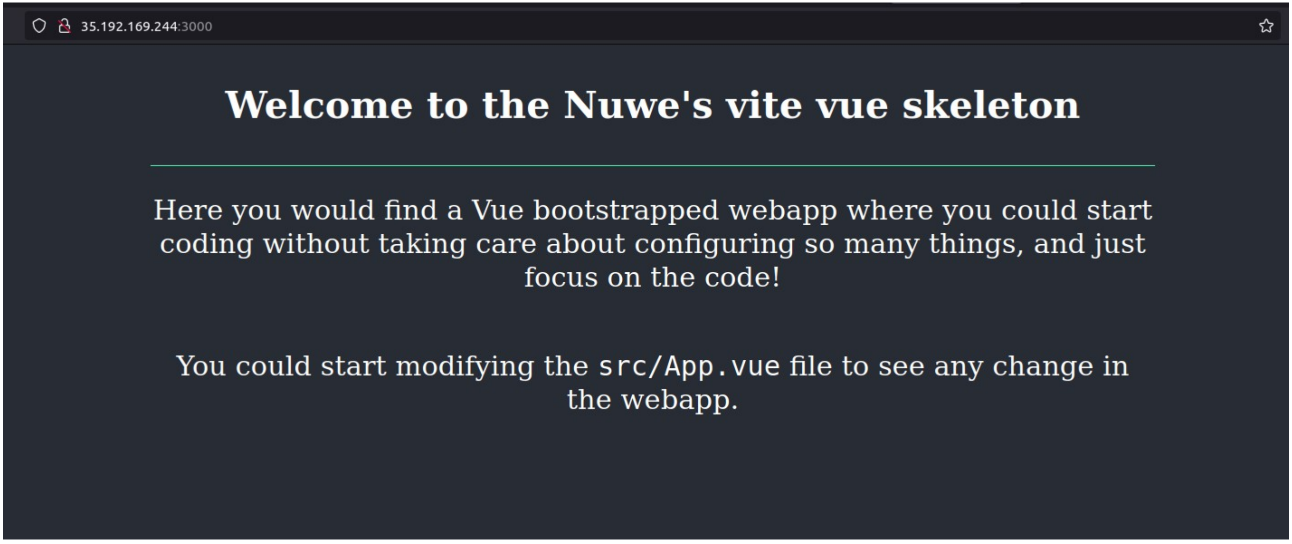
(All Terraform files are provided in the solution)

Then we have to make our app accesible to the internet, so we have 2 options here:

1- Provision a service of type ClusterIP and an ingress in order to expose our pod.
2- Provision a service of type LoadBalancer

We opt for the second one, as we only need to provision one resource. So we proceed to deploy our LoadBalancer service type with terraform.
As done before, we add the code to instanciate our service in the same conf file where we defined our deployment.

Finally accesing our LoadBalancer external IP providing the port of the app, we can connect to our application:



Welcome to the Nuwe's vite vue skeleton

Here you would find a Vue bootstrapped webapp where you could start coding without taking care about configuring so many things, and just focus on the code!

You could start modifying the `src/App.vue` file to see any change in the webapp.

4. Answer the question to check the understanding of the Minimum Least Priviledge in the Roles assignment.

For a Devops role, it is a must to have permissions of all services used along the CI/CD process. This includes having permissions to the secret manager. As the process followed in this documentation is nice, but it would be better if we can connect from our GitHub repository , which is a common practice in companies, instead of having to clone locally the repo and then use Cloud Build to build and push the image. In other words, if we want our GitHub repo to be the SCM, we need to configure it with our CI tool , in this case Cloud Build.

Focusing on the cuestion, the roles for a devops in order to create clusters in kubernetes should be: roles/container as this role enables permissions to administer clusters and acces to all API objects.

For a Finance workers, the correct role should be roles/ billing. As it brings full access to the billing accounts and administer them.

```
gcloud projects add-iam-policy-binding $PROJECTID --member user:$USERID –role=roles/container.admin
gcloud projects add-iam-policy-binding $PROJECTID --member user:$USERID --role=roles/billing.admin
```

If the devops need to use other services, then we should create a new role:

```
gcloud iam roles create devops --project $PROJECTID --permissions "compute.instances.create,compute.instances.delete,compute.instances.start,compute.instances.stop,compute.instances.update,compute.disks.create,compute.subnetworks.use,compute.subnetworks.useExternalIp,compute.instances.setMetadata,compute.instances.setServiceAccount, roles/builds.editor,roles/container.admin,roles/source.admin"
```

In this case permisions for compute instances, kubernetes engine, cloud build and repo.

```
gcloud projects add-iam-policy-binding $PROJECTID --member user:$USERID --role=roles/iam.serviceAccountUser
```

```
gcloud projects add-iam-policy-binding $PROJECTID --member user:$USERID --role=projects/$PROJECTID/roles/devops
```

DOCUMENTATION

Terraform GKE module:

https://registry.terraform.io/providers/hashicorp/google/latest/docs/resources/container_cluster#argument-reference

https://registry.terraform.io/providers/hashicorp/google/latest/docs/resources/container_node_pool