Article
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Open Exchange

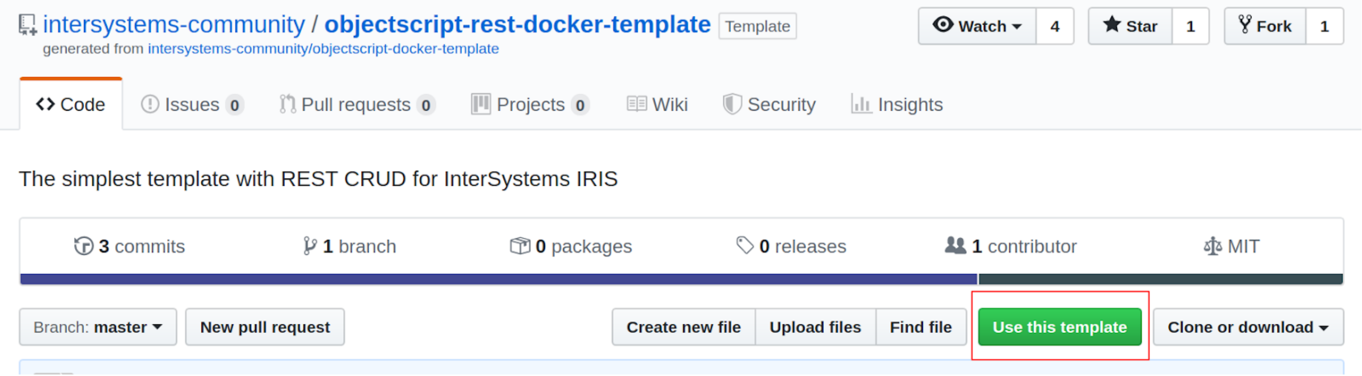
Deploying InterSystems IRIS Solution into GCP Kubernetes Cluster GKE Using CircleCI

Most of us are more or less familiar with Docker. Those who use it like it for the way it lets us easily deploy almost any application, play with it, break something and then restore the application with a simple restart of the Docker container.
InterSystems also likes Docker. The InterSystems OpenExchange project contains a number of examples that run InterSystems IRIS images in Docker containers that are easy to download and run. You ’ ll also find other useful components, such as the Visual Studio IRIS plugin.
It ’ s easy enough to run IRIS in Docker with additional code for specific use cases, but if you want to share your solutions with others, you ’ ll need some way to run commands and repeat them after each code update. In this article, we ’ ll see how to use Continuous Integration/Continuous Delivery (CI/CD) practices to simplify that process.

Setting Up

We ’ ll start with a simple REST API application based on IRIS. The details of the application can be found in the video Creating REST API with InterSystems IRIS, ObjectScript and Docker. Let ’ s see how we could share similar applications with others using CI/CD.

Initially, we ’ ll clone the code into a personal GitHub repository. If you don ’ t have an account on GitHub sign up for one. For convenience, add access via SSH so you don ’ t need to enter a password with each pull or push. Then go to the intersystems-community/objectscript-rest-docker-template project page on GitHub and click the "Use this Template" button to create your own version of the repo based on the template. Give it a name like “ my-objectscript-rest-docker-template ” .


intersystems-community / objectscript-rest-docker-template
generated from intersystems-community/objectscript-docker-template

The simplest template with REST CRUD for InterSystems IRIS

Now pull the project to your local machine:

```
$ git clone git@github.com:<youraccount>/my-objectscript-rest-docker-template.git
```

Next, we ’ ll add a REST endpoint in the spirit of “ hello, world! ” .

Endpoints are defined in the *src/cls/Sample/PersonREST.cls* class. Our endpoint will look like this (defined before the first <Route>):

```
<Route Url="/helloworld" Method="GET" Call="HelloWorld"/>
<Route Url="/all" Method="GET" Call="GetAllPersons"/>
...
```

It calls the HelloWorld method:

```
ClassMethod HelloWorld() As %Status
{
  Write "Hello, world!"
  Quit $$$OK
}
```

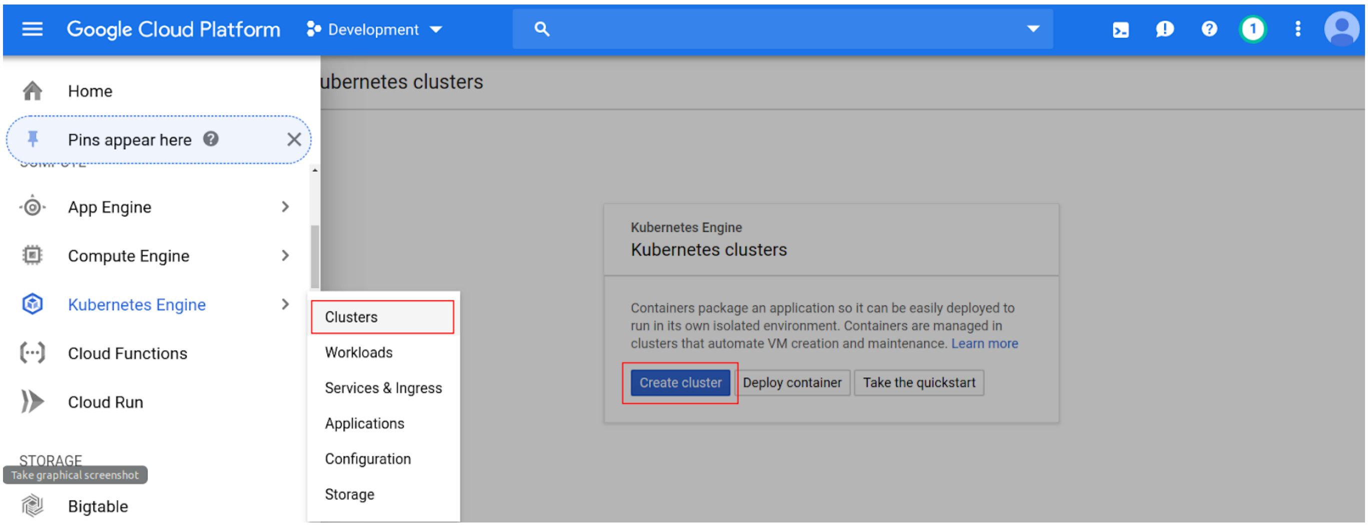
Now we need to consider how this works when pushing to a remote repository. We need to:

1. Build a Docker image.
2. Save the Docker image.
3. Run the container based on this image.

We ’ ll use the CircleCI service, which is already integrated with GitHub, to build the Docker image. And we ’ ll use Google Cloud, which allows you to store Docker images and run containers based on them in Kubernetes. Let ’ s delve into this a little.

Google Cloud Prerequisites

Let ’ s assume you ’ ve registered for an account with Google Cloud, which provides a free tier of services. Create a project with the name "Development", then create a Kubernetes cluster by clicking the "Create cluster" button:



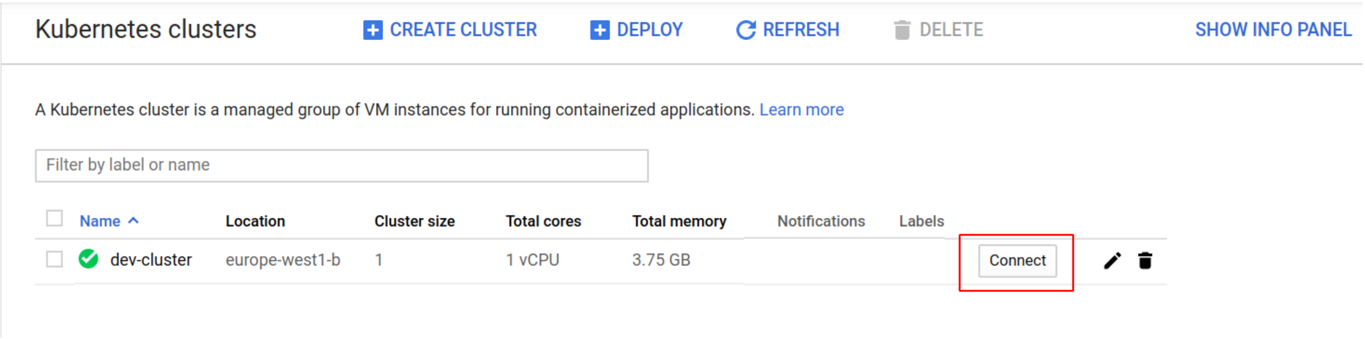
Containers package an application so it can be easily deployed to run in its own isolated environment. Containers are managed in clusters that automate VM creation and maintenance. Learn more

For the demo, select "Your first cluster" on the left. Choose a newer version of Kubernetes and a machine type of n1-standard-1. For our purposes, one machine should be enough.

Click the Create button, then set up a connection to the cluster. We ’ ll use the kubectl and gcloud utilities:

```
$ gcloud init
[2] Create a new configuration
Configuration name. “ development ”
[2] Log in with a new account
Pick cloud project to use
configure a default Compute Region and Zone? (Y/n)? y
Here europe-west-1b was chosen

$ gcloud container clusters get-credentials dev-cluster --zone europe-west1-b --project
<projectid>
```

You can get the last command by clicking the "Connect" button:



A Kubernetes cluster is a managed group of VM instances for running containerized applications. Learn more

Filter by label or name

□	Name ^	Location	Cluster size	Total cores	Total memory	Notifications	Labels		
□	✓ dev-cluster	europe-west1-b	1	1 vCPU	3.75 GB			Connect	✎ 🗑

Check the status from kubectl:

```
$ kubectl config current-context
gke_possible-symbol-254507_europe-west1-b_dev-cluster

$ kubectl get nodes
NAME  STATUS  ROLES  AGE  VERSION
gke-dev-cluster-pool-2-8096d93c-fw5w  Ready  <none>  17m  v1.14.7-gke.10
```

Now create a directory called k8s/ under the root project directory to hold the three files that describe the future application in Kubernetes: Namespace, which describes the workspace, Deployment, and Service:

```
$ cat namespace.yaml
apiVersion: v1
kind: Namespace
metadata:
  name: iris

$ cat deployment.yaml
apiVersion: apps/v1beta1
kind: Deployment
metadata:
  name: iris-rest
  namespace: iris
spec:
  replicas: 1
  strategy:
  type: Recreate
  selector:
  matchLabels:
  app: iris
  template:
  metadata:
  labels:
  app: iris
  spec:
  containers:
  - image: eu.gcr.io/iris-rest:v1
  name: iris-rest
  ports:
```

```
 - containerPort: 52773
 name: web

$ cat service.yaml
apiVersion: v1
kind: Service
metadata:
 name: iris-rest
 namespace: iris
spec:
 selector:
 app: iris
 ports:
 - protocol: TCP
 port: 52773
 targetPort: 52773
 type: LoadBalancer
```

Send those definitions from your k8s/ directory to the Google Kubernetes Engine (GKE):

```
$ kubectl apply -f namespace.yaml
$ kubectl apply -f deployment.yaml -f service.yaml
```

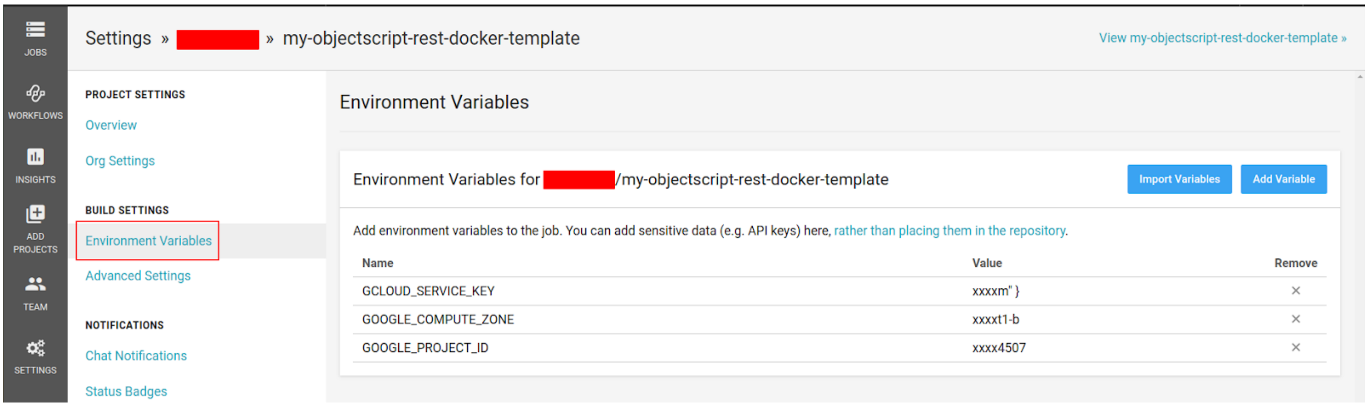
Things won ’ t be working correctly yet, since we haven ’ t yet sent the *eu.gcr.io/iris-rest:v1* image to the Docker registry, so we see an error:

```
$ kubectl -n iris get po
NAME  READY  STATUS  RESTARTS  AGE
iris-rest-64cdb48f78-5g9hb  0/1  ErrImagePull  0  50s

$ kubectl -n iris get svc
NAME  TYPE  CLUSTER-IP  EXTERNAL-IP  PORT(S)  AGE
iris-rest  LoadBalancer  10.0.13.219  <pending>  52773:31425/TCP  20s
```

When Kubernetes sees a LoadBalancer service, it tries to create a balancer in the Google Cloud environment. If it succeeds, the service will get a real IP address instead of External IP = <pending>.

Before leaving Kubernetes for a bit, let's give CircleCI the ability to push Docker images into the registry and restart Kubernetes deployments by creating a service account. Give your service account EDITOR permission to the project. You ’ ll find information here on creating and storing a service account.

A bit later, when we create and set up the project in CircleCI, you ’ ll need to add the following three environment variables:



Settings » [redacted] » my-objectscript-rest-docker-template

View my-objectscript-rest-docker-template »

PROJECT SETTINGS
Overview
Org Settings

BUILD SETTINGS
Environment Variables
Advanced Settings

NOTIFICATIONS
Chat Notifications
Status Badges

Environment Variables

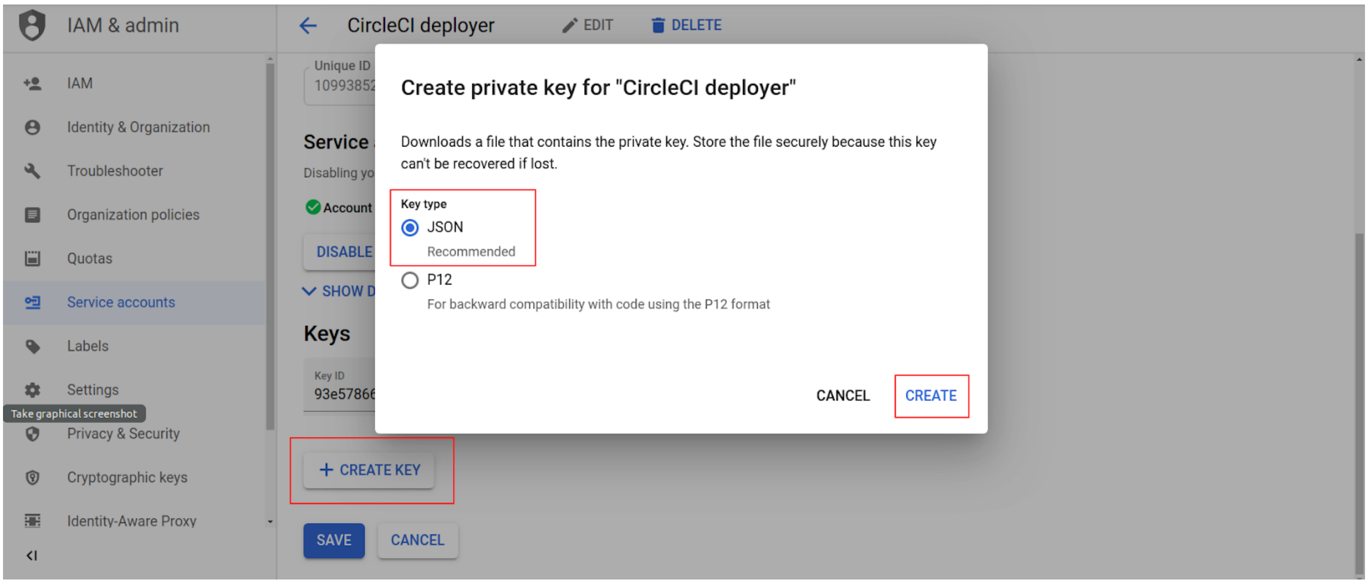
Environment Variables for [redacted]/my-objectscript-rest-docker-template

Import Variables Add Variable

Add environment variables to the job. You can add sensitive data (e.g. API keys) here, rather than placing them in the repository.

Name	Value	Remove
GCLOUD_SERVICE_KEY	xxxxm" }	×
GOOGLE_COMPUTE_ZONE	xxxxt1-b	×
GOOGLE_PROJECT_ID	xxxx4507	×

The names of these variables speak for themselves. The value of GCLOUDSERVICEKEY is the JSON structure Google sends you when you press " Create key " and select a key in the JSON format after creating the Service Account:



Create private key for "CircleCI deployer"

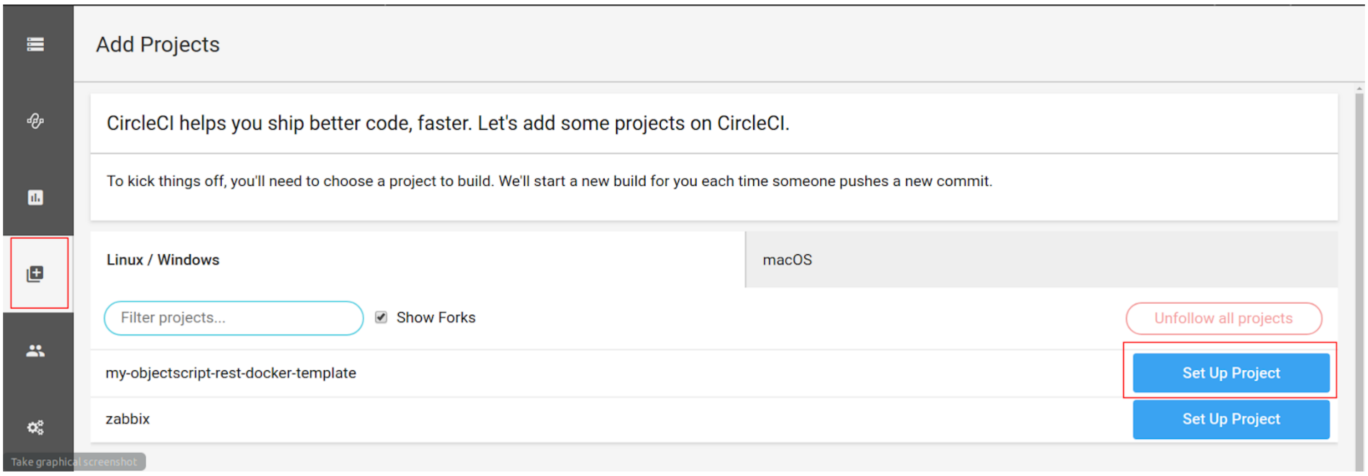
Downloads a file that contains the private key. Store the file securely because this key can't be recovered if lost.

Key type
● JSON
Recommended
○ P12
For backward compatibility with code using the P12 format

CANCEL CREATE

CircleCI

Let's turn our attention to CircleCI now, where we ' ll register using our GitHub account (click Sign Up, then Sign Up with GitHub). After registration, you ' ll see the dashboard with projects from your GitHub repository listed on the Add Project tab. Click the Set Up Project button for " my-objectscript-rest-docker-template " or whatever you named the repository created from the objectscript-rest-docker-template repo:



CircleCI helps you ship better code, faster. Let's add some projects on CircleCI.

To kick things off, you'll need to choose a project to build. We'll start a new build for you each time someone pushes a new commit.

☑ Show Forks

my-objectscript-rest-docker-template

zabbix

Note: all CircleCI screenshots are made as of October 2019. Changes may occur in new versions.

The page that opens tells you how to make your project work with CircleCI. The first step is to create a folder called .circleci and add a file named config.yml to it. The structure of this configuration file is well described in the official documentation. Here are the basic steps the file will contain:

1. Pull the repository
2. Build the Docker image

3. Authenticate with Google Cloud
4. Upload image to Google Docker Registry
5. Run the container based on this image in GKE

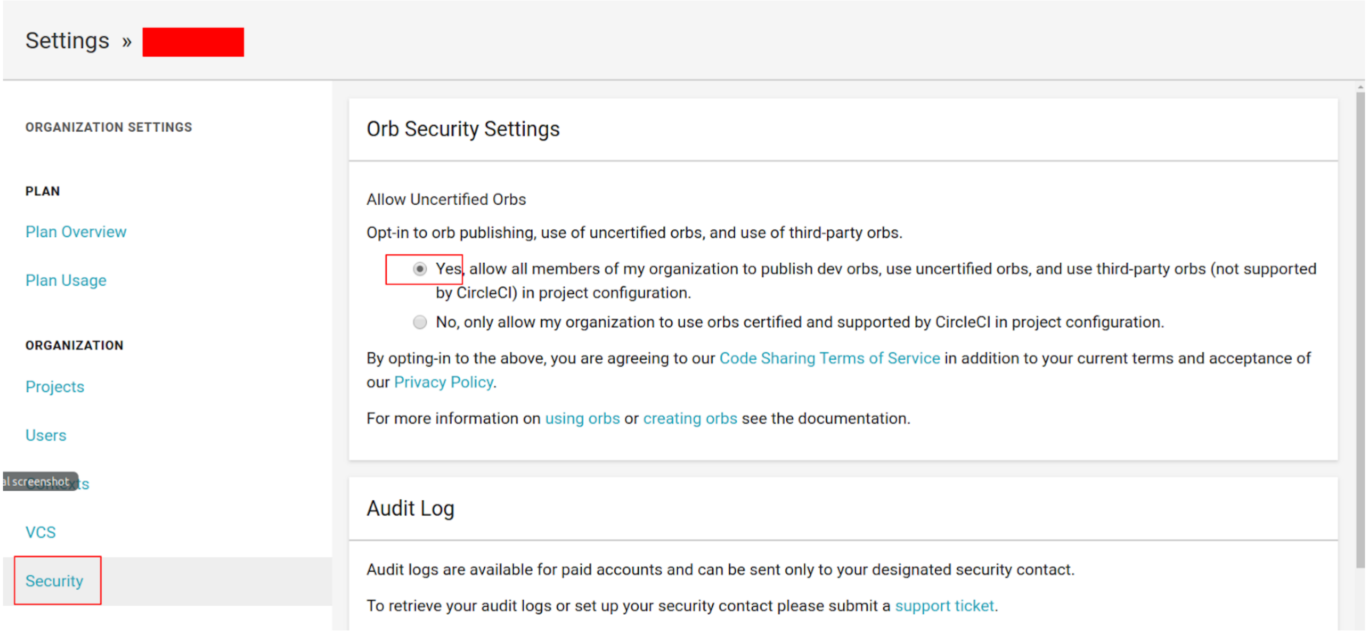
With any luck, we ’ ll find some already created configurations (calledorbs) we can use. There are certified orbs and third-party ones. The certified GCP-GKE orb has a number of limitations, so let's take a third-party orb — duksis — that meets our needs. Using it, the configuration file turns into (replace names — for example, the cluster name — with correct ones for your implementation):

```
$ cat .circleci/config.yml
version: 2.1
orbs:
  gcp-gke: duksis/gcp-gke@0.1.9
workflows:
  main:
  jobs:
  - gcp-gke/publish-and-rollout-image:
  google-project-id: GOOGLEPROJECTID
  gcloud-service-key: GCLOUDSERVICEKEY
  registry-url: eu.gcr.io
  image: iris-rest
  tag: ${CIRCLESHA1}
  cluster: dev-cluster
  namespace: iris
  deployment: iris-rest
  container: iris-rest
```

The initial configuration of the publish-and-rollout-image task can be viewed on the project page.

We don ’ t actually need the final three notification steps of this orb, which is good because they won ’ t work anyway without some additional variables. Ideally, you can prepare your own orb once and use it many times, but we won ’ t get into that now.

Note that the use of third-party orbs has to be specifically allowed on the "Organization settings" tab in CircleCI:



Settings » [redacted]

Orb Security Settings

Allow Uncertified Orbs

Opt-in to orb publishing, use of uncertified orbs, and use of third-party orbs.

● Yes, allow all members of my organization to publish dev orbs, use uncertified orbs, and use third-party orbs (not supported by CircleCI) in project configuration.

○ No, only allow my organization to use orbs certified and supported by CircleCI in project configuration.

By opting-in to the above, you are agreeing to our Code Sharing Terms of Service in addition to your current terms and acceptance of our Privacy Policy.

For more information on using orbs or creating orbs see the documentation.

Audit Log

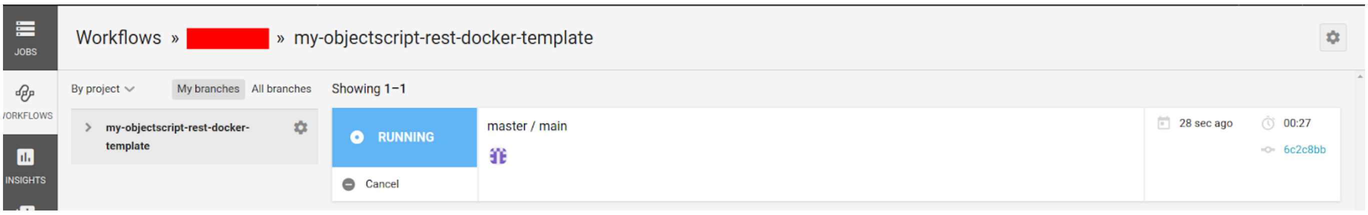
Audit logs are available for paid accounts and can be sent only to your designated security contact.

To retrieve your audit logs or set up your security contact please submit a support ticket.

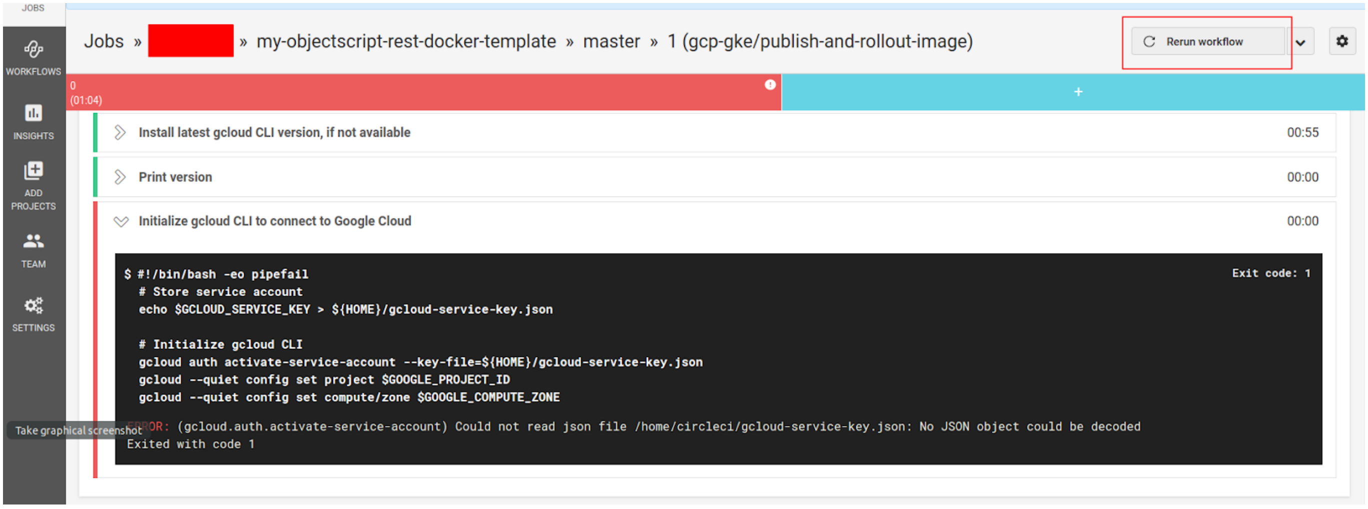
Finally, it ’ s time to send all our changes to GitHub and CircleCI:

```
$ git add .circleci/ k8s/ src/cls/Sample/PersonREST.cls
$ git commit -m "Deploy project to GKE using CircleCI"
$ git push
```

Let ’ s check the CircleCI dashboard:



If you forgot to add Google Service Account keys, here ’ s what you ’ ll soon see:


JOBS
WORKFLOWS
INSIGHTS
ADD PROJECTS
TEAM
SETTINGS
Jobs » [redacted] » my-objectscript-rest-docker-template » master » 1 (gcp-gke/publish-and-rollout-image)
Rerun workflow
0
(01:04)
+
Take graphical screenshot

Install latest gcloud CLI version, if not available 00:55

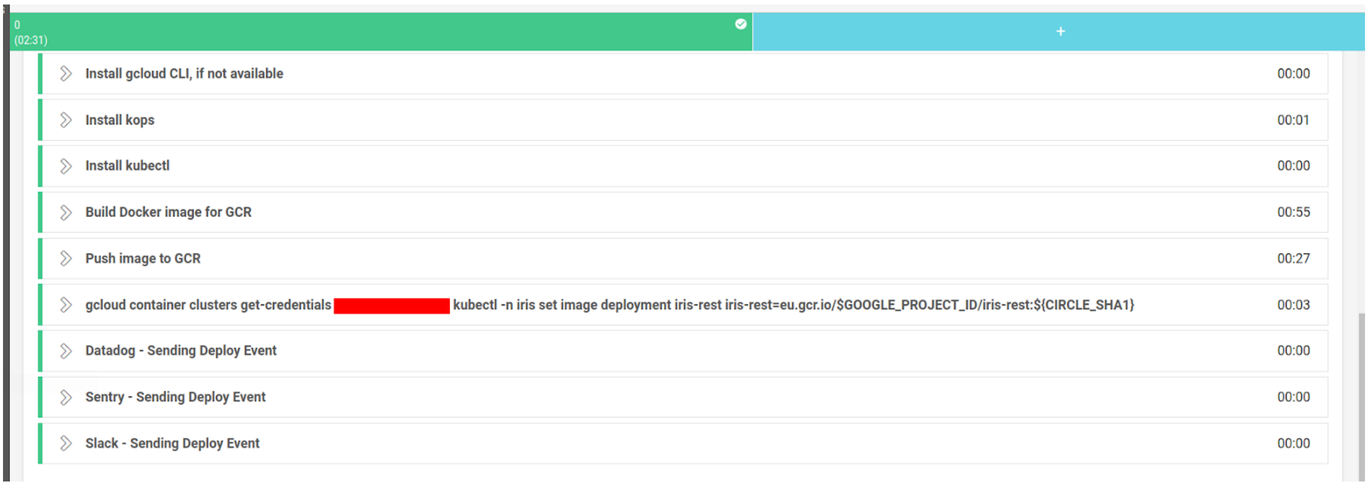
Print version 00:00

Initialize gcloud CLI to connect to Google Cloud 00:00

```
$ #!/bin/bash -eo pipefail                                                                              Exit code: 1
  # Store service account
  echo $GCLOUD_SERVICE_KEY > ${HOME}/gcloud-service-key.json

  # Initialize gcloud CLI
  gcloud auth activate-service-account --key-file=${HOME}/gcloud-service-key.json
  gcloud --quiet config set project $GOOGLE_PROJECT_ID
  gcloud --quiet config set compute/zone $GOOGLE_COMPUTE_ZONE

ERROR: (gcloud.auth.activate-service-account) Could not read json file /home/circleci/gcloud-service-key.json: No JSON object could be decoded
Exited with code 1
```

So don ’ t forget to add those environment variables as described in the end of the Google Cloud Prerequisites section. If you forgot, update that information, then click "Rerun workflow."

If the build is successful you ’ ll see a green bar:



Install gcloud CLI, if not available 00:00

Install kops 00:01

Install kubectl 00:00

Build Docker image for GCR 00:55

Push image to GCR 00:27

gcloud container clusters get-credentials [redacted] kubectl -n iris set image deployment iris-rest iris-rest=eu.gcr.io/$GOOGLE_PROJECT_ID/iris-rest:${CIRCLE_SHA1} 00:03

Datadog - Sending Deploy Event 00:00

Sentry - Sending Deploy Event 00:00

Slack - Sending Deploy Event 00:00

You can also check the Kubernetes pod state separately from the CircleCI Web UI:

```
$ kubectl -n iris get po -w
NAME  READY  STATUS  RESTARTS  AGE
```

```
iris-rest-64chdb48f78-q5sbw  0/1  ImagePullBackOff  0  15m
…
iris-rest-5c9c86c768-vt7c9  1/1  Running  0  23s
```

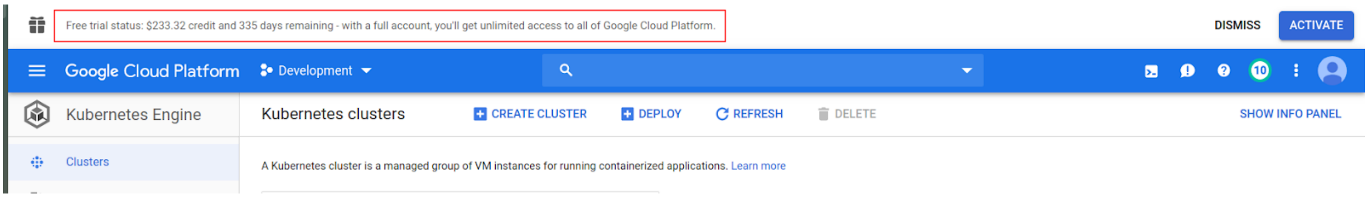
That last line — 1/1 Running — is a good sign.

Let ’ s test it. Remember, your IP address will differ from mine. Also, you ’ ll have to figure out about passwords over HTTP yourself as it ’ s out of scope for this article.

```
$ kubectl -n iris get svc
NAME  TYPE  CLUSTER-IP  EXTERNAL-IP  PORT(S)  AGE
iris-rest  LoadBalancer  10.0.4.242  23.251.143.124  52773:30948/TCP  18m

$ curl -XGET -u system:SYS 23.251.143.124:52773/person/helloworld
Hello, world!

$ curl -XPOST -H "Content-Type: application/json" -u system:SYS
23.251.143.124:52773/person/ -d '{"Name":"John Dou"}'

$ curl -XGET -u system:SYS 23.251.143.124:52773/person/all
[{"Name":"John Dou"},]
```

It seems the application works. You can continue with tests described on project page.

In sum, the combination of using GitHub, CircleCI, and Google Cloud Kubernetes Engine looks quite promising for testing and deployment of IRIS applications, even though it ’ s not completely free. Also, do not forget that running Kubernetes cluster can gradually eat your virtual (and then real) money. We are not responsible for any charges you may incur.



Free trial status: $233.32 credit and 335 days remaining - with a full account, you'll get unlimited access to all of Google Cloud Platform.

A Kubernetes cluster is a managed group of VM instances for running containerized applications. Learn more

#Best Practices #Cloud #Containerization #DevOps #Docker #GCP #Kubernetes #InterSystems IRIS #Open Exchange
Check the related application on InterSystems Open Exchange

Source URL:https://community.intersystems.com/post/deploying-intersystems-iris-solution-gcp-kubernetes-cluster-gke-using-circleci