

# Department of Computing

## Open-Ended Lab

### SE-315: Cloud Computing

#### **Lab 14 (PART II) : Serverless Cloud Run Development**

**CLO2:** **Apply** fundamental concepts in cloud infrastructures to understand the tradeoffs.

**CLO3:** **Distinguish** the various characteristics of public, private and hybrid cloud delivery models.

**Date: 18.12.24**

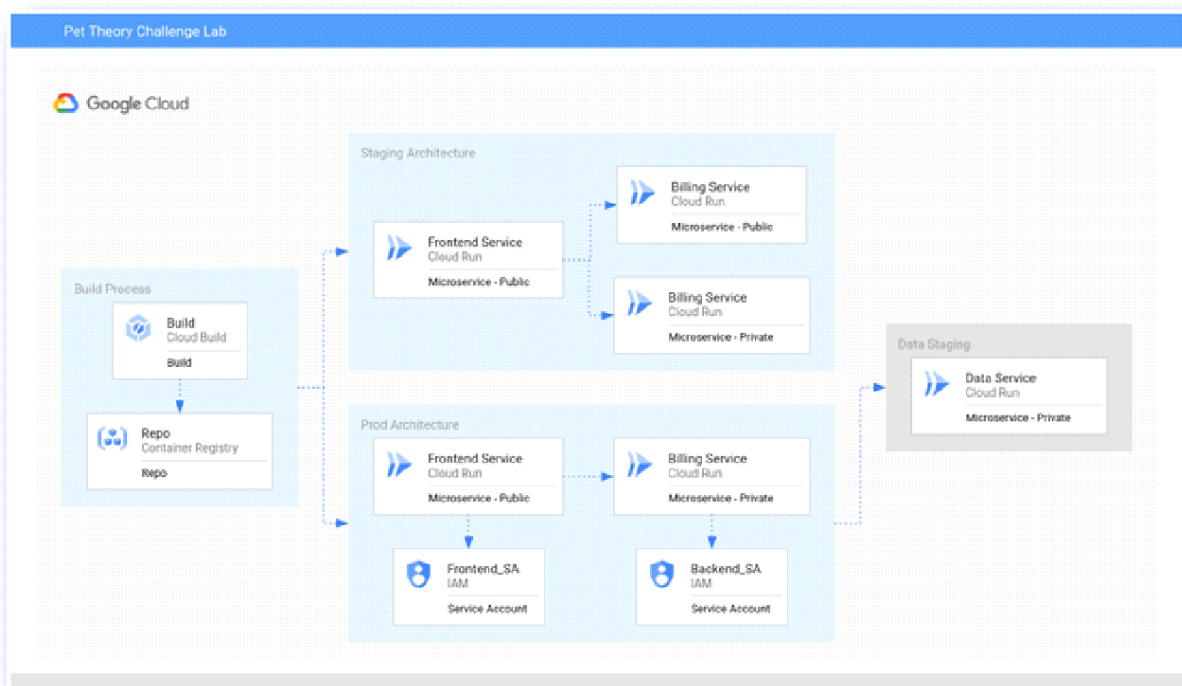
# Lab 14: Serverless Cloud Run Development

## Introduction:

In the open-ended lab (OEL), you are given a scenario and a set of tasks. The given scenario is a conversion of a typical monolithic application into microservices and deploying them in a cloud using serverless architecture. Use your skills and knowledge of cloud computing along with exploring and extending available solutions to solve these tasks. You are expected to extend your learned skills, like changing default values and reading and researching error messages to fix mistakes.

## Lab Task

Pet Theory, a veterinary practice, is eager to adopt serverless architecture for modernizing their current systems. In this OEL, as a member of the development team, you are responsible for transitioning services to a serverless framework. The proposed micro-service architecture is shown in the following figure.



For this project, Pet Theory has selected their current monolithic Billing application to undergo transformation into a serverless model. Throughout this lab, your responsibility is to execute this architectural upgrade, ensuring a seamless transition to the serverless design.

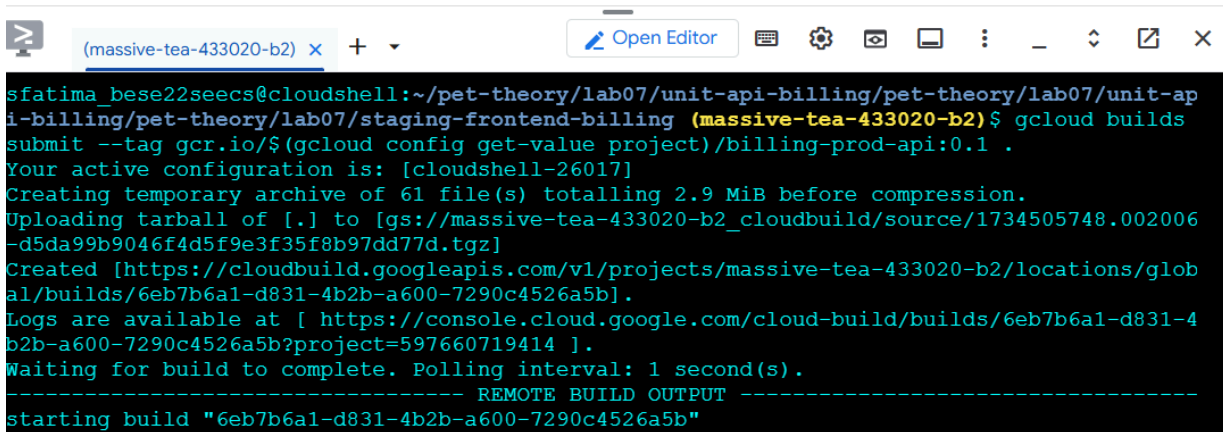
## Task 4. Create a billing service account

Create the billing service account:

```
i-billing/pet-theory/lab07/staging-frontend-billing (massive-tea-433020-b2)$ gcloud iam service-accounts create billing-service-account --display-name "Billing Service Cloud Run"
Created service account [billing-service-account].
```

## Task 5. Deploy the billing service

Build the production image:



The screenshot shows a Cloud Shell terminal window with the following output:

```
sfatima_bese22seecs@cloudshell:~/pet-theory/lab07/unit-api-billing/pet-theory/lab07/unit-api-billing/pet-theory/lab07/staging-frontend-billing (massive-tea-433020-b2)$ gcloud builds submit --tag gcr.io/$(gcloud config get-value project)/billing-prod-api:0.1 .
Your active configuration is: [cloudshell-26017]
Creating temporary archive of 61 file(s) totalling 2.9 MiB before compression.
Uploading tarball of [.] to [gs://massive-tea-433020-b2_cloudbuild/source/1734505748.002006-d5da99b9046f4d5f9e3f35f8b97dd77d.tgz]
Created [https://cloudbuild.googleapis.com/v1/projects/massive-tea-433020-b2/locations/global/builds/6eb7b6a1-d831-4b2b-a600-7290c4526a5b].
Logs are available at [ https://console.cloud.google.com/cloud-build/builds/6eb7b6a1-d831-4b2b-a600-7290c4526a5b?project=597660719414 ].
Waiting for build to complete. Polling interval: 1 second(s).
----- REMOTE BUILD OUTPUT -----
starting build "6eb7b6a1-d831-4b2b-a600-7290c4526a5b"
```

Assign the service account to the billing service and deploy it with authentication:

```
sfatima_bese22seecs@cloudshell:~/pet-theory/lab07/unit-api-billing/pet-theory/lab07/unit-api-billing/pet-theory/lab07/staging-frontend-billing (massive-tea-433020-b2)$ gcloud run deploy billing-prod-api --image gcr.io/$(gcloud config get-value project)/billing-prod-api:0.1 --platform managed --region us-central1 --service-account billing-service-account@$(gcloud config get-value project).iam.gserviceaccount.com --no-allow-unauthenticated
Your active configuration is: [cloudshell-26017]
Your active configuration is: [cloudshell-26017]
Deploying container to Cloud Run service [billing-prod-api] in project [massive-tea-433020-b2] region [us-central1]
OK Deploying new service... Done.
  OK Creating Revision...
  OK Routing traffic...
Done.
Service [billing-prod-api] revision [billing-prod-api-00001-x8n] has been deployed and is serving 100 percent of traffic.
Service URL: https://billing-prod-api-597660719414.us-central1.run.app
sfatima_bese22seecs@cloudshell:~/pet-theory/lab07/unit-api-billing/pet-theory/lab07/unit-api-billing/pet-theory/lab07/staging-frontend-billing (massive-tea-433020-b2)$
```

test the production billing service:

```

sfatima_bese22seecs@cloudshell:~/pet-theory/lab07/unit-api-billing/pet-theory/lab07/staging-frontend-billing (massive-tea-433020-b2)$ curl -X GET -H "Authorization: Bearer $(gcloud auth print-identity-token)" $PROD_BILLING_URL
<!DOCTYPE HTML>
<!--
    Phantom by HTML5 UP
    html5up.net | @ajlkn
    Free for personal and commercial use under the CCA 3.0 license (html5up.net/license)
-->
<html>
  <head>
    <title>Serverless Development</title>
    <meta charset="utf-8" />
    <meta name="viewport" content="width=device-width, initial-scale=1, user-scalable=no" />
    <link rel="stylesheet" href="assets/css/main.css" />
    <noscript><link rel="stylesheet" href="assets/css/noscript.css" /></noscript>
    <!-- Link to app.js with defer till HTML render -->
    <script defer src="app.js"></script>
  </head>

```

## Task 6. Frontend service account

Create the frontend service account:

```

sfatima_bese22seecs@cloudshell:~/pet-theory/lab07/unit-api-billing/pet-theory/lab07/staging-frontend-billing (massive-tea-433020-b2)$ gcloud iam service-accounts create frontend-service-account --display-name "Frontend Service Cloud Run Invoker"
Created service account [frontend-service-account].

```

Grant the run.invoker permission to the frontend service account:

```

sfatima_bese22seecs@cloudshell:~/pet-theory/lab07/unit-api-billing/pet-theory/lab07/staging-frontend-billing (massive-tea-433020-b2)$ gcloud projects add-iam-policy-binding $(gcloud config get-value project) --member serviceAccount:$(gcloud config get-value project).iam.gserviceaccount.com --role "roles/run.invoker"
Your active configuration is: [cloudshell-26017]
Your active configuration is: [cloudshell-26017]
Updated IAM policy for project [massive-tea-433020-b2].
bindings:
- members:
  - serviceAccount:service-597660719414@gcp-sa-artifactregistry.iam.gserviceaccount.com
  role: roles/artifactregistry.serviceAgent
- members:
  - serviceAccount:597660719414@cloudbuild.gserviceaccount.com
  role: roles/cloudbuild.builds.builder

```

## Task 7. Redeploy the frontend service

Build the production image for the frontend service:

```
sfatima_bese22seecs@cloudshell:~/pet-theory/lab07/unit-api-billing/pet-theory/lab07/unit-api-billing/pet-theory/lab07/staging-frontend-billing (massive-tea-433020-b2)$ gcloud builds submit --tag gcr.io/$(gcloud config get-value project)/frontend-prod:0.1 .
Your active configuration is: [cloudshell-26017]
Creating temporary archive of 61 file(s) totalling 2.9 MiB before compression.
Uploading tarball of [.] to [gs://massive-tea-433020-b2_cloudbuild/source/1734506529.597041-5c86eb0c97ac45ae8d9640947c8ce139.tgz]
Created [https://cloudbuild.googleapis.com/v1/projects/massive-tea-433020-b2/locations/global/builds/fa0e4a3e-a41a-4185-86ba-6fa240cd3051].
Logs are available at [ https://console.cloud.google.com/cloud-build/builds/fa0e4a3e-a41a-4185-86ba-6fa240cd3051?project=597660719414 ].
Waiting for build to complete. Polling interval: 1 second(s).
----- REMOTE BUILD OUTPUT -----
starting build "fa0e4a3e-a41a-4185-86ba-6fa240cd3051"

FETCHSOURCE
Fetching storage object: gs://massive-tea-433020-b2_cloudbuild/source/1734506529.597041-5c86eb0c97ac45ae8d9640947c8ce139.tgz#1734506532003659
Copying gs://massive-tea-433020-b2_cloudbuild/source/1734506529.597041-5c86eb0c97ac45ae8d9640947c8ce139.tgz
```

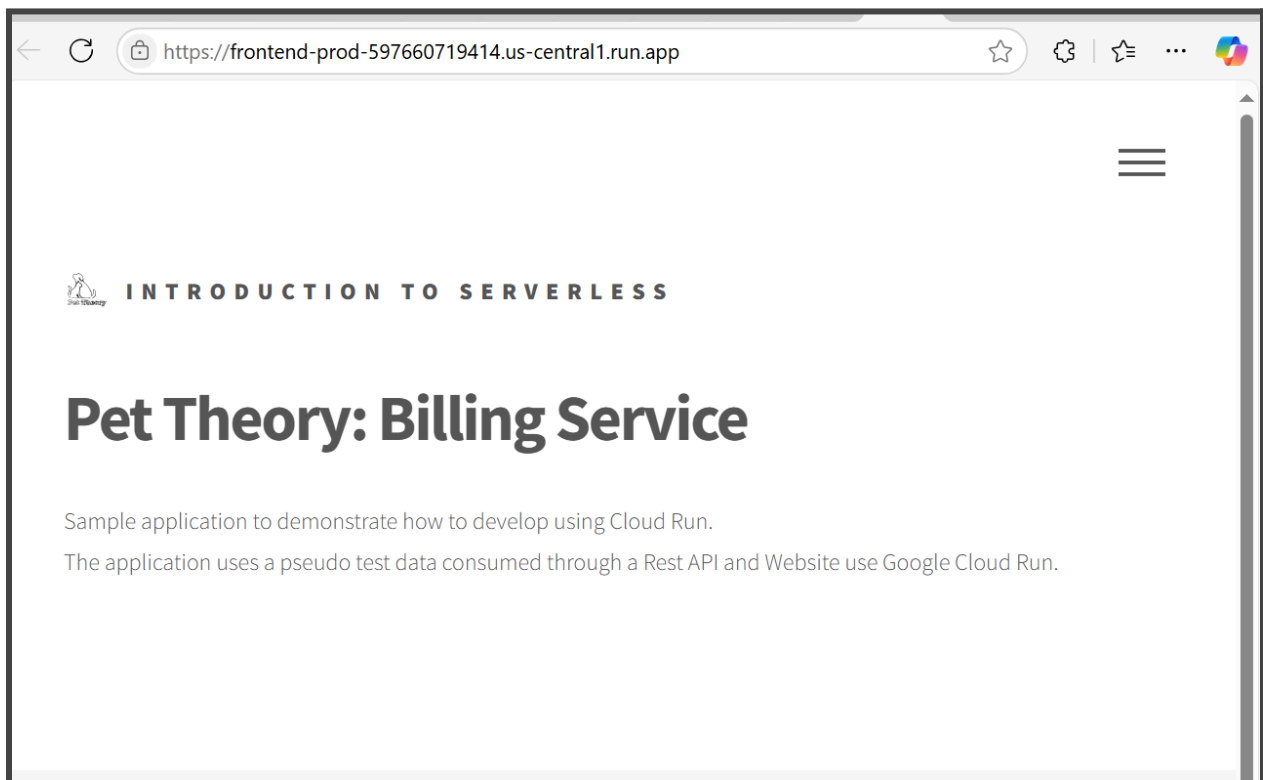
Deploy the frontend service with the new service account:

```
sfatima_bese22seecs@cloudshell:~/pet-theory/lab07/unit-api-billing/pet-theory/lab07/unit-api-billing/pet-theory/lab07/staging-frontend-billing (massive-tea-433020-b2)$ gcloud run deploy frontend-prod --image gcr.io/$(gcloud config get-value project)/frontend-prod:0.1 --platform managed --region us-central1 --service-account frontend-service-account@$(gcloud config get-value project).iam.gserviceaccount.com --allow-unauthenticated
Your active configuration is: [cloudshell-26017]
Your active configuration is: [cloudshell-26017]
Deploying container to Cloud Run service [frontend-prod] in project [massive-tea-433020-b2] region [us-central1]
OK Deploying new service... Done.
  OK Creating Revision...
  OK Routing traffic...
  OK Setting IAM Policy...
Done.
Service [frontend-prod] revision [frontend-prod-00001-18t] has been deployed and is serving 100 percent of traffic.
Service URL: https://frontend-prod-597660719414.us-central1.run.app
sfatima_bese22seecs@cloudshell:~/pet-theory/lab07/unit-api-billing/pet-theory/lab07/unit-api-billing/pet-theory/lab07/staging-frontend-billing (massive-tea-433020-b2)
```

Service URL: <https://frontend-prod-597660719414.us-central1.run.app>

Test the frontend service:

```
eory/lab07/staging-frontend-billing (massive-tea-433020-b2)$ curl $FRONTEND_URL
<!DOCTYPE HTML>
<!--
  Phantom by HTML5 UP
  html5up.net | @ajlkn
  Free for personal and commercial use under the CCA 3.0 license (html5up.net/license)
-->
<html>
  <head>
    <title>Serverless Development</title>
    <meta charset="utf-8" />
    <meta name="viewport" content="width=device-width, initial-scale=1, user-scalable=no" />
    <link rel="stylesheet" href="assets/css/main.css" />
    <noscript><link rel="stylesheet" href="assets/css/noscript.css" /></noscript>
    <!-- Link to app.js with defer till HTML render -->
    <script defer src="app.js"></script>
  </head>
  <body class="is-preload">
    <!-- Wrapper -->
```



**Deleting all the microservices created:**

```

sfatima_bese22seecs@cloudshell:~/pet-theory/lab07/unit-api-billing/pet-theory/lab07/unit-api-billing/pet-theory/lab07/staging-frontend-billing (massive-tea-433020-b2)$ gcloud run services delete billing-prod-api --platform managed --region us-central1
gcloud run services delete frontend-prod --platform managed --region us-central1
gcloud run services delete frontend-staging --platform managed --region us-central1
gcloud run services delete private-billing-service --platform managed --region us-central1
Service [billing-prod-api] will be deleted.

Do you want to continue (Y/n)? y

Deleting [billing-prod-api]...done.
Deleted service [billing-prod-api].
Service [frontend-prod] will be deleted.

Do you want to continue (Y/n)? y

Deleting [frontend-prod]...done.
Deleted service [frontend-prod].
Service [frontend-staging] will be deleted.

Do you want to continue (Y/n)? y

Deleting [frontend-staging]...done.
Deleted service [frontend-staging].
Service [private-billing-service] will be deleted.

Do you want to continue (Y/n)? y

Deleting [private-billing-service]...done.
Deleted service [private-billing-service].

```

## Remaining credits:

Credits								
<a href="#">ALL CREDITS</a>								
View and download credit details here. Active committed use discounts are not included here and can be viewed on the <a href="#">Commitments page</a> .								
<div> Filter Filter credits <div>?</div> <div>↓</div> <div>⋮</div> </div>								
Credit name	Status ↑	Percent remaining	Remaining value	Original value	Type	Credit ID		
SE315: Cloud Computing	✓ Available	<div><div></div></div> 96%	\$48.16	\$50.00	One-time	4BPQ3JFU...		▼

–The end–

