

Department of Computing

Open-Ended Lab

SE-315: Cloud Computing

Lab 13 (PART I) : 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

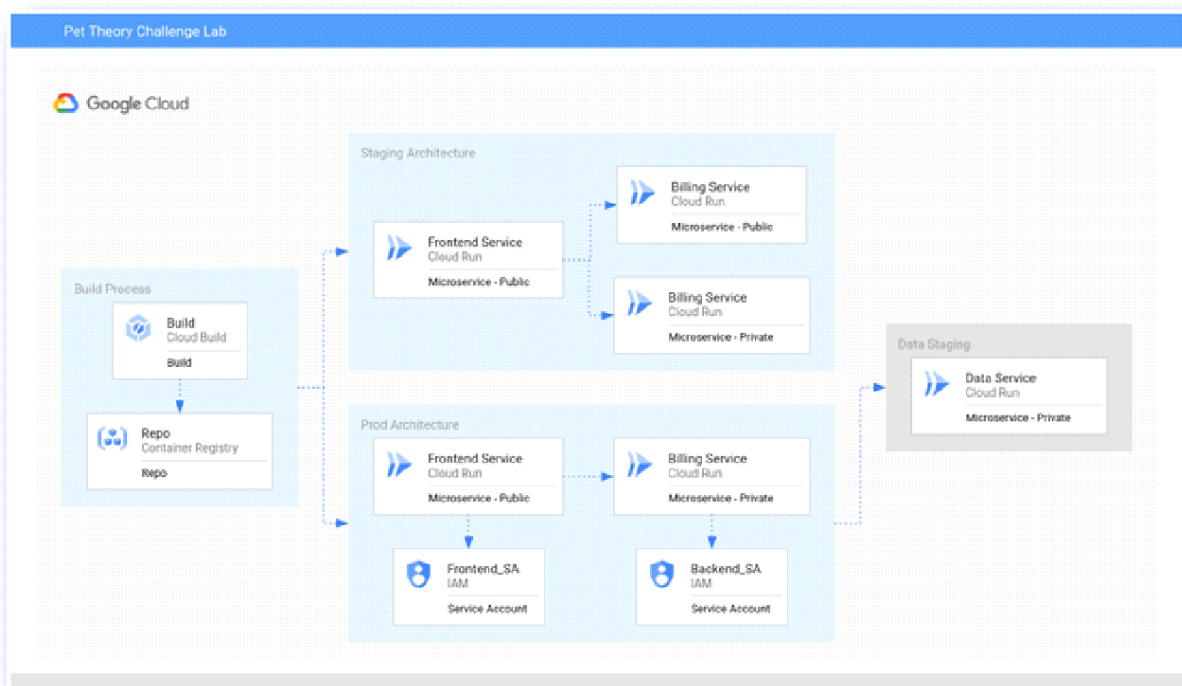
Lab 13: Serverless Cloud Run Development

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 1. Enable a public service

Objective: Deploy a public REST API for the billing service.

Clone the repository to get the necessary code.

```
sfatima_bese22seecs@cloudshell:~/pet-theory/lab07/unit-api-billing (massive-tea-433020-b2)$ git clone https://github.com/rosera/pet-theory.git && cd pet-theory/lab07/unit-api-billing
Cloning into 'pet-theory'...
remote: Enumerating objects: 8043, done.
remote: Counting objects: 100% (557/557), done.
remote: Compressing objects: 100% (319/319), done.
remote: Total 8043 (delta 281), reused 242 (delta 238), pack-reused 7486 (from 1)
```

Set up Cloud Build to build the Docker image for the billing service:

```
(massive-tea-433020-b2) x + v Editor
lab07/unit-api-billing (massive-tea-433020-b2)$ gcloud builds submit --tag gcr.io/$(gcloud config get-value project)/billing-staging-api:0.1 .
Your active configuration is: [cloudshell-26017]
Creating temporary archive of 6 file(s) totalling 1.4 KiB before compression.
Uploading tarball of [.] to [gs://massive-tea-433020-b2_cloudbuild/source/1734503538.959476-a2073aab6d604f07b5a8558ab5abcb28.tgz]
Created [https://cloudbuild.googleapis.com/v1/projects/massive-tea-433020-b2/locations/global/builds/51a9683f-82fa-4be1-95a0-4385c5629738].
Logs are available at [ https://console.cloud.google.com/cloud-build/builds/51a9683f-82fa-4be1-95a0-4385c5629738?project=597660719414 ].
Waiting for build to complete. Polling interval: 1 second(s).
----- REMOTE BUILD OUTPUT -----
starting build "51a9683f-82fa-4be1-95a0-4385c5629738"

FETCHSOURCE
Fetching storage object: gs://massive-tea-433020-b2_cloudbuild/source/1734503538.959476-a2073aab6d604f07b5a8558ab5abcb28.tgz#1734503539666627
Copying gs://massive-tea-433020-b2_cloudbuild/source/1734503538.959476-a2073aab6d604f07b5a8558ab5abcb28.tgz#1734503539666627...
```

Deploy the service to Cloud Run as an unauthenticated service:

```
lab07/unit-api-billing (massive-tea-433020-b2)$ gcloud run services list --platform managed --region us-central1
✓
SERVICE: billing-staging-api
REGION: us-central1
URL: https://billing-staging-api-597660719414.us-central1.run.app
LAST DEPLOYED BY: sfatima.bese22seecs@seecs.edu.pk
LAST DEPLOYED AT: 2024-12-18T06:37:55.131428Z
```

Test the service: After deployment, get the service URL:

THE SERVICE URL IS <https://billing-staging-api-597660719414.us-central1.run.app>

CURL RESULT:

```
sfatima_bese22seecs@cloudshell:~/pet-theory/lab07/unit-api-billing/pet-theory/  
lab07/unit-api-billing (massive-tea-433020-b2)$ curl $BILLING_URL  
{\"status\":\"Billing Rest API: Online\"}sfatima_bese22seecs@cloudshell:~/pet-theo
```

Task 2. Deploy a frontend service

Clone the frontend code:

```
lab07/unit-api-billing (massive-tea-433020-b2)$ git clone https://github.com/r  
osera/pet-theory.git && cd pet-theory/lab07/staging-frontend-billing  
Cloning into 'pet-theory'...  
remote: Enumerating objects: 8043, done.  
remote: Counting objects: 100% (557/557), done.  
remote: Compressing objects: 100% (319/319), done.  
remote: Total 8043 (delta 281), reused 242 (delta 238), pack-reused 7486 (from  
1)  
Receiving objects: 100% (8043/8043), 21.90 MiB | 13.92 MiB/s, done.  
Resolving deltas: 100% (4336/4336), done.  
sfatima_bese22seecs@cloudshell:~/pet-theory/lab07/unit-api-billing/pet-theory/
```

Build the Docker 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 projec  
t)/frontend-staging: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/1734  
504469.966729-06c3f2d0c6d0406981b75221bb5d99bf.tgz]  
Created [https://cloudbuild.googleapis.com/v1/projects/massive-tea-433020-b2/1  
ocations/global/builds/55165c55-e232-43a7-9228-9378b2bfd49e].  
Logs are available at [ https://console.cloud.google.com/cloud-build/builds/55  
165c55-e232-43a7-9228-9378b2bfd49e?project=597660719414 ].  
Waiting for build to complete. Polling interval: 1 second(s).  
----- REMOTE BUILD OUTPUT -----  
starting build "55165c55-e232-43a7-9228-9378b2bfd49e"  
  
FETCHSOURCE  
Fetching storage object: gs://massive-tea-433020-b2_cloudbuild/source/17345044  
69.966729-06c3f2d0c6d0406981b75221bb5d99bf.tgz#1734504472294690
```

Deploy the frontend service to Cloud Run as an unauthenticated service:

```
433020-b2)$ gcloud run deploy frontend-staging --image gcr.io/$(gcloud config
get-value project)/frontend-staging:0.1 --platform managed --region us-central1 --allow-unauthentic
on [us-central1]
\ Deploying new service...
\ Creating Revision...

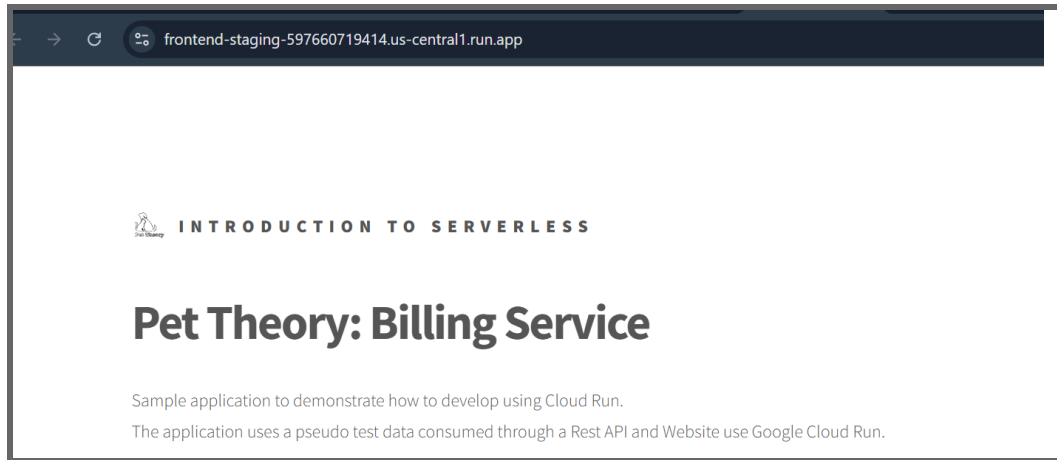
| Deploying new service...
/ Deploying new service...
- Deploying new service...
\ Deploying new service...
| Deploying new service...
/ Deploying new service...
- Deploying new service...
\ Deploying new service...
| Deploying new service...
/ Deploying new service...
- Deploying new service...
  ing new service...
    ting Revision...

OK Deploying new service... Done.
OK Creating Revision...
OK Routing traffic...
```

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

Testing the API through CURL:

```
i-billing/pet-theory/lab07/staging-frontend-billing (massive-tea-433020-b2)$ curl https://f
rontend-staging-597660719414.us-central1.run.app
<!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-sc
alable=no" />
    <link rel="stylesheet" href="assets/css/main.css" />
    <noscript><link rel="stylesheet" href="assets/css/noscript.css" /></noscrip
t>
    <!-- Link to app.js with defer till HTML render -->
```



Task 3. Deploy a private service

Delete the existing billing 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 run services delete billing-staging-api --platform managed --region us-central1
Service [billing-staging-api] will be deleted.

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

Deleting [billing-staging-api]...done.
Deleted service [billing-staging-api].
```

Build the updated Docker image for the private billing service:

```
(massive-tea-433020-b2) x + v Open Editor
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-staging-api:0.2 .
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/1734505124.43127-42b2920a294e4d4fb446cc84d147421a.tgz]
Created [https://cloudbuild.googleapis.com/v1/projects/massive-tea-433020-b2/locations/global/builds/742a6a98-47bc-44aa-bfaf-b84a26c2637c].
Logs are available at [ https://console.cloud.google.com/cloud-build/builds/742a6a98-47bc-44aa-bfaf-b84a26c2637c?project=597660719414 ].
Waiting for build to complete. Polling interval: 1 second(s).
----- REMOTE BUILD OUTPUT -----
starting build "742a6a98-47bc-44aa-bfaf-b84a26c2637c"

FETCHSOURCE
Fetching storage object: gs://massive-tea-433020-b2_cloudbuild/source/1734505124.43127-42b2920a294e4d4fb446cc84d147421a.tgz#1734505126751358
Copying gs://massive-tea-433020-b2_cloudbuild/source/1734505124.43127-42b2920a294e4d4fb446c
```

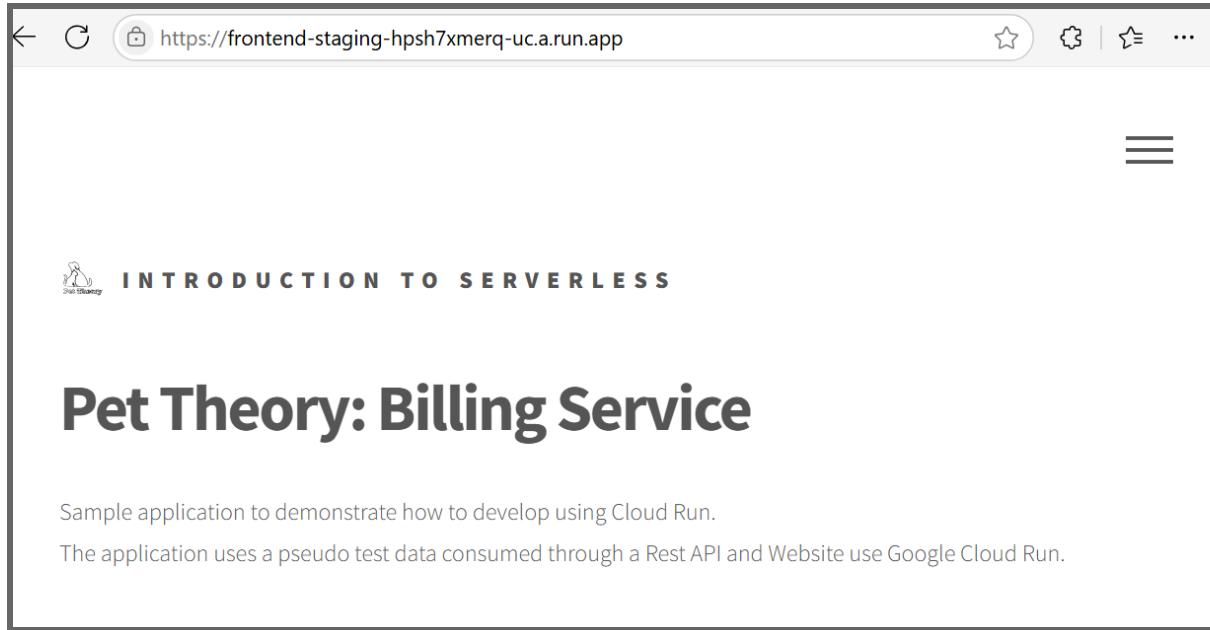
Deploy the private billing service with authentication required:

```
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 private-billing-service --image gcr.io/$(gcloud config get-value project)/billing-staging-api:0.2 --platform managed --region us-central1 --no-allow-unauthenticated
Your active configuration is: [cloudshell-26017]
Deploying container to Cloud Run service [private-billing-service] in project [massive-tea-433020-b2] region [us-central1]
OK Deploying new service... Done.
  OK Creating Revision...
  OK Routing traffic...
Done.
Service [private-billing-service] revision [private-billing-service-00001-ts6] has been deployed and is serving 100 percent of traffic.
Service URL: https://private-billing-service-597660719414.us-central1.run.app
```

Test the private service:

TESTING THE URL: <https://frontend-staging-hpsh7xmerq-uc.a.run.app>

```
i-billing/pet-theory/lab07/staging-frontend-billing (massive-tea-433020-b2)$ curl -X GET -H
"Authorization: Bearer $(gcloud auth print-identity-token)" $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>
    </head>
    <!-- Link to app.js with defer till HTML render -->
```



Remaining credits:

Credits								
ALL CREDITS								
View and download credit details here. Active committed use discounts are not included here and can be viewed on the Commitments page .								
<div><div><div></div><div>Filter</div></div><div>Filter credits</div><div><div>?</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—