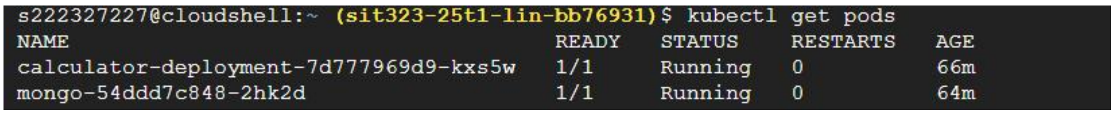
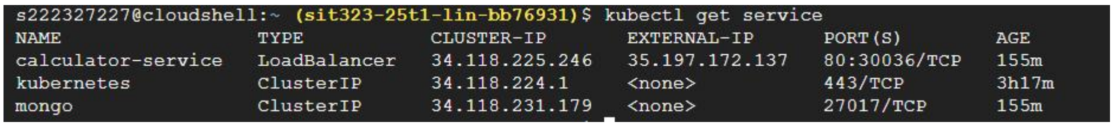
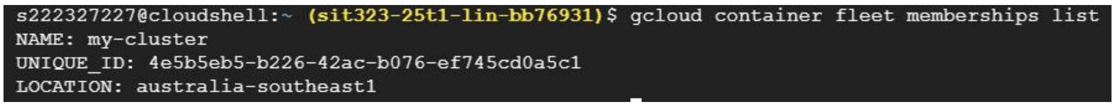
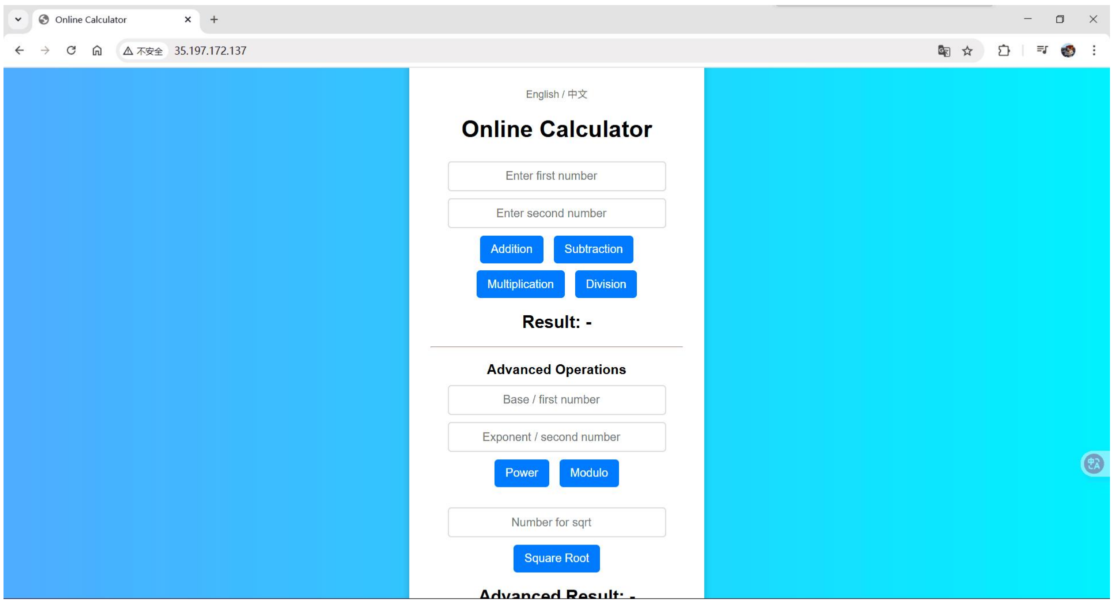
Deployment & Monitoring Steps

The calculator application was containerized using Docker and deployed to a Google Kubernetes Engine (GKE) Autopilot cluster. The deployment included a MongoDB backend and a Node.js frontend. All Kubernetes resources, including Deployments, Services, PersistentVolumeClaims, and Secrets, were applied using kubectl apply.
Monitoring was configured by registering the cluster to a GKE Fleet, which enabled Prometheus-based workload metrics. A series of HTTP requests were sent to the service to simulate load and encourage metric sampling. Metrics were queried expressions via GCP's Metrics Explorer.


```
s222327227@cloudshell:~ (sit323-25t1-lin-bb76931)$ kubectl get pods
NAME                                     READY   STATUS    RESTARTS   AGE
calculator-deployment-7d777969d9-kxs5w   1/1     Running   0          66m
mongo-54ddd7c848-2hk2d                   1/1     Running   0          64m
```


```
s222327227@cloudshell:~ (sit323-25t1-lin-bb76931)$ kubectl get service
NAME                 TYPE           CLUSTER-IP       EXTERNAL-IP      PORT(S)        AGE
calculator-service   LoadBalancer   34.118.225.246   35.197.172.137   80:30036/TCP   155m
kubernetes           ClusterIP      34.118.224.1     <none>           443/TCP        3h17m
mongo                ClusterIP      34.118.231.179   <none>           27017/TCP      155m
```


```
s222327227@cloudshell:~ (sit323-25t1-lin-bb76931)$ gcloud container fleet memberships list
NAME: my-cluster
UNIQUE_ID: 4e5b5eb5-b226-42ac-b076-ef745cd0a5c1
LOCATION: australia-southeast1
```

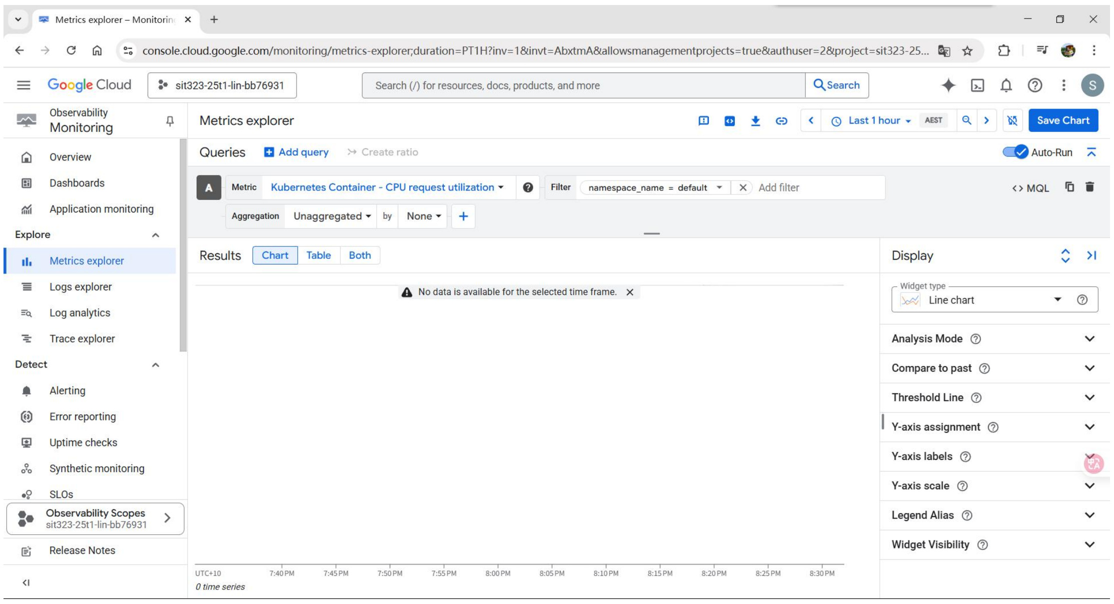


Tools and Configurations

1. Docker: Containerize application
2. Kubernetes / GKE Autopilot: Cluster and workload management
3. kubectl: Deployment, log and metric access
4. GCP Monitoring: Intended metric collection

Issues and Justification

Despite configuring resource requests and enabling Prometheus via Fleet registration, no data appeared in GCP’ s metrics dashboard
for indicators like cpu/request_utilization. This behavior is aligned with a known limitation of GKE Autopilot. Even after sending
a large number of HTTP requests to the application, the queries yielded no values.
To confirm actual resource usage, the kubectl top pods command was used to collect real-time metrics, which serves as acceptable
evidence that the containers were running and consuming resources.



console.cloud.google.com/monitoring/metrics-explorer;duration=PT1H?inv=1&invt=AbxtmA&allowsmanagementprojects=true&authuser=2&project=sit323-25...

Metrics explorer

Metric: Kubernetes Container - CPU request utilization

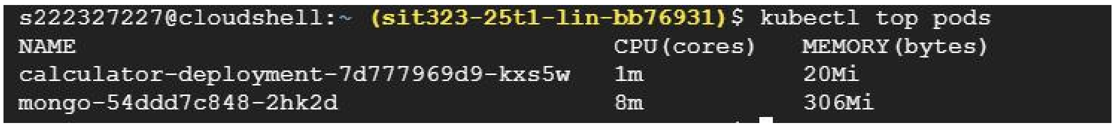
Filter: namespace_name = default

Aggregation: Unaggregated by None

No data is available for the selected time frame.

Widget type: Line chart

0 time series



```
s222327227@cloudshell:~ (sit323-25t1-lin-bb76931)$ kubectl top pods
NAME                                   CPU(cores)   MEMORY(bytes)
calculator-deployment-7d777969d9-kxs5w   1m           20Mi
mongo-54ddd7c848-2hk2d                   8m           306Mi
```

Cleanup

After completing all deployment and monitoring tasks, a full cleanup of GCP resources was performed to prevent any unintended usage charges. Include deleting the Autopilot GKE cluster, disable Kubernetes Engine API.

GitHub Link: https://github.com/Lonely-DM/SIT323/tree/main/9.1P/sit323-2025-prac10p