

SIT323 - Cloud Native Application Development

10.1P: Monitoring and Visibility

GitHub Repository Link

<https://github.com/11Ruben/sit323-2025-prac10p.git>

Steps to complete this task:

1. Create a GCP Kubernetes cluster

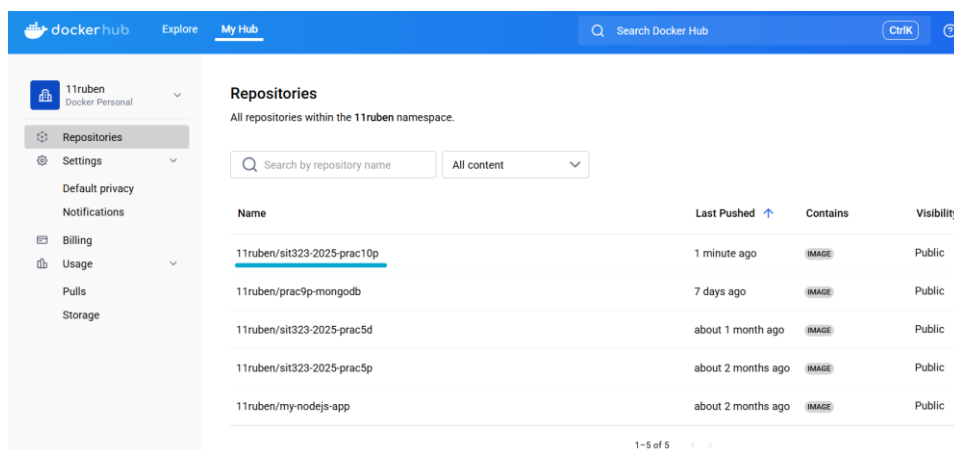
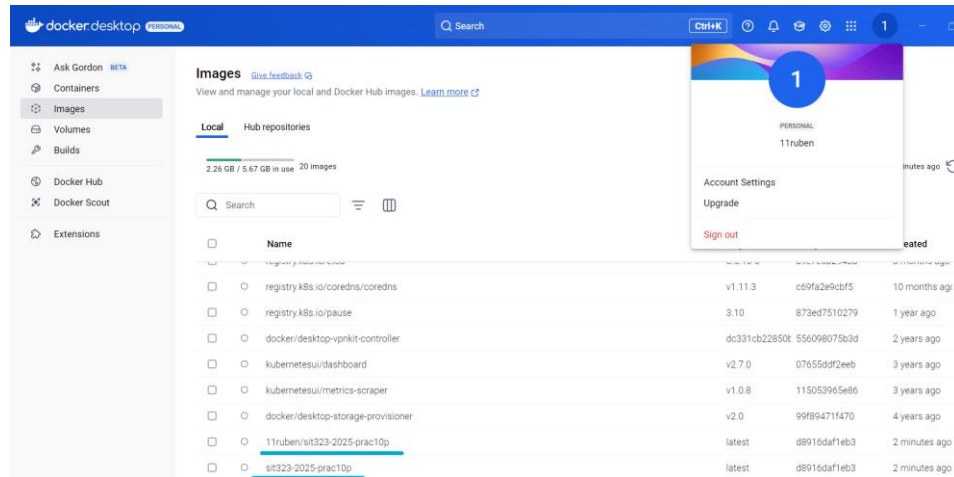
- 1) Ensure to select the 1st version of the list instead of the default
(In the example below, select “1.32.3-gke.1927002” instead of “1.32.3-gke.1785003 (default)”)

The screenshot shows the Google Cloud console interface. At the top, a 'Target version' dropdown menu is open, displaying a list of Kubernetes versions. The first option, '1.32.3-gke.1927002', is highlighted with a blue border, indicating it is the selected version. The second option, '1.32.3-gke.1785003 (default)', is currently selected. Other visible options include '1.31.7-gke.1390000', '1.31.7-gke.1265000', '1.30.11-gke.1217000', and '1.30.11-gke.1157000'. Below the dropdown, the 'cluster-1' details page is visible. The page shows the cluster's configuration, including its name, tier, mode, location type, region, default node zones, total size, release channel, version, current COS version, end of standard support, end of extended support, and rollout sequence.

Cluster basics		
Name	cluster-1	🔒
Tier ?	Standard	✎
Mode ?	Standard	🔒
Location type	Regional	🔒
Region	australia-southeast2	🔒
Default node zones ?	australia-southeast2-b australia-southeast2-a australia-southeast2-c	✎
Total size	9	①
Release channel ?	Regular channel	✎
Version ?	1.32.3-gke.1927002	✎
Current COS version	cos-117-18613-164-109	①
End of standard support ?	Apr 11, 2026	①
End of extended support ?	Feb 11, 2027	①
Rollout sequence ?	To use rollout sequencing, register your cluster to a fleet	🔒

2. Build & Push the docker image to Docker Hub

- `docker build -t sit323-2025-prac10p .`
- `docker tag sit323-2025-prac10p 11ruben/sit323-2025-prac10p`
- `docker push 11ruben/sit323-2025-prac10p`



3. Login to GCP and set project

1) gcloud auth login

```
C:\Users\Ruben\Desktop\Deakin\Year2\Sem1\SIT_323_CAD\Task 10\sit323-2025-prac10p>gcloud auth login
Your browser has been opened to visit:
https://accounts.google.com/o/oauth2/auth?response_type=code&client_id=32555940559.apps.googleusercontent.com&redirect_uri=http%3A%2F%2Flocalhost%3A8085%2F&scope=openid+https%3A%2F%2Fwww.googleapis.com%2Fauth%2Fuserinfo.email+https%3A%2F%2Fwww.googleapis.com%2Fauth%2Fcloud-platform+https%3A%2F%2Fwww.googleapis.com%2Fauth%2Fappengine.admin+https%3A%2F%2Fwww.googleapis.com%2Fauth%2Fsqlservice.login+https%3A%2F%2Fwww.googleapis.com%2Fauth%2Fcompute+https%3A%2F%2Fwww.googleapis.com%2Fauth%2Faccounts.reauth&state=BXGBSoF98iF4Rhq8JLe8XXczBGUoIZ&access_type=offline&code_challenge=F4cPt3ypMMK_GbSq b7zomFJHuNMLVVtRa-nc6yLF70I&code_challenge_method=S256

You are now logged in as [s223960951@deakin.edu.au].
Your current project is [sit323-25t1-ruben-ooi-318b5cc]. You can change this setting by running:
$ gcloud config set project PROJECT_ID
```

2) gcloud config set project sit323-25t1-ruben-ooi-318b5cc

```
C:\Users\Ruben\Desktop\Deakin\Year2\Sem1\SIT_323_CAD\Task 10\sit323-2025-prac10p>gcloud config set project sit323-25t1-ruben-ooi-318b5cc
Updated property [core/project].
C:\Users\Ruben\Desktop\Deakin\Year2\Sem1\SIT_323_CAD\Task 10\sit323-2025-prac10p>
```

4. Configure Kubernetes to use GCP cluster

- gcloud container clusters get-credentials cluster-1 --region australia-southeast2

```
C:\Users\Ruben\Desktop\Deakin\Year2\Sem1\SIT_323_CAD\Task 10\sit323-2025-prac10p>gcloud container clusters
get-credentials cluster-1 --region australia-southeast2
Fetching cluster endpoint and auth data.
kubeconfig entry generated for cluster-1.
```

5. Apply the MongoDB yaml files

```
C:\Users\Ruben\Desktop\Deakin\Year2\Sem1\SIT_323_CAD\Task 10\sit323-2025-prac10p>kubectl apply -f mongo-pv.yaml
persistentvolumeclaim/mongo-pv created

C:\Users\Ruben\Desktop\Deakin\Year2\Sem1\SIT_323_CAD\Task 10\sit323-2025-prac10p>kubectl apply -f mongo-pvc.yaml
persistentvolumeclaim/mongo-pvc created

C:\Users\Ruben\Desktop\Deakin\Year2\Sem1\SIT_323_CAD\Task 10\sit323-2025-prac10p>kubectl apply -f mongo-deployment.yaml
deployment.apps/mongo created

C:\Users\Ruben\Desktop\Deakin\Year2\Sem1\SIT_323_CAD\Task 10\sit323-2025-prac10p>kubectl apply -f mongo-service.yaml
service/mongo created

C:\Users\Ruben\Desktop\Deakin\Year2\Sem1\SIT_323_CAD\Task 10\sit323-2025-prac10p>kubectl get pods
NAME                                READY   STATUS             RESTARTS   AGE
mongo-54b85c45f4-xd6vn             0/1     ContainerCreating   0           14s

C:\Users\Ruben\Desktop\Deakin\Year2\Sem1\SIT_323_CAD\Task 10\sit323-2025-prac10p>kubectl get deployment
NAME    READY   UP-TO-DATE   AVAILABLE   AGE
mongo  0/1     1            0           23s

C:\Users\Ruben\Desktop\Deakin\Year2\Sem1\SIT_323_CAD\Task 10\sit323-2025-prac10p>kubectl get pods
NAME                                READY   STATUS    RESTARTS   AGE
mongo-54b85c45f4-xd6vn             1/1     Running   0           76s

C:\Users\Ruben\Desktop\Deakin\Year2\Sem1\SIT_323_CAD\Task 10\sit323-2025-prac10p>kubectl get deployment
NAME    READY   UP-TO-DATE   AVAILABLE   AGE
mongo  1/1     1            1           81s
```

6. Create a MongoDB user

```
C:\Users\Ruben\Desktop\Deakin\Year2\Sem1\SIT_323_CAD\Task 10\sit323-2025-prac10p>kubectl get pods
NAME                                READY   STATUS    RESTARTS   AGE
mongo-54b85c45f4-xd6vn             1/1     Running   0           5m38s

C:\Users\Ruben\Desktop\Deakin\Year2\Sem1\SIT_323_CAD\Task 10\sit323-2025-prac10p>kubectl exec -it mongo
-54b85c45f4-xd6vn -- bash
root@mongo-54b85c45f4-xd6vn:/# mongosh
Current Mongosh Log ID: 682a81a75943fe499bd861df
Connecting to:      mongodb://127.0.0.1:27017/?directConnection=true&serverSelectionTimeoutMS=2000&
appName=mongosh+2.5.0
Using MongoDB:      8.0.9
Using Mongosh:      2.5.0
mongosh 2.5.1 is available for download: https://www.mongodb.com/try/download/shell

For mongosh info see: https://www.mongodb.com/docs/mongodb-shell/

-----
The server generated these startup warnings when booting
2025-05-19T00:50:58.410+00:00: Using the XFS filesystem is strongly recommended with the WiredTiger
storage engine. See http://dochub.mongodb.org/core/prodnotes-filesystem
2025-05-19T00:50:58.663+00:00: Access control is not enabled for the database. Read and write access
to data and configuration is unrestricted
2025-05-19T00:50:58.663+00:00: For customers running the current memory allocator, we suggest changi
ng the contents of the following sysfsFile
2025-05-19T00:50:58.663+00:00: For customers running the current memory allocator, we suggest changi
ng the contents of the following sysfsFile
2025-05-19T00:50:58.663+00:00: We suggest setting the contents of sysfsFile to 0.
2025-05-19T00:50:58.663+00:00: vm.max_map_count is too low
-----

test> use myDB
switched to db myDB
myDB> db.createUser({
... user: "admin",
... pwd: "password113",
... roles: [ { role: "readWrite", db: "myDB" } ]
... })
myDB>
myDB> |
```

7. Apply the deployment.yaml file

- 1) `kubectl apply -f deployment.yaml`

```
C:\Users\Ruben\Desktop\Deakin\Year2\Sem1\SIT_323_CAD\Task 10\sit323-2025-prac10p>kubectl apply -f mongo-secret.yaml
secret/mongo-secret created

C:\Users\Ruben\Desktop\Deakin\Year2\Sem1\SIT_323_CAD\Task 10\sit323-2025-prac10p>kubectl apply -f deployment.yaml
deployment.apps/sit323-2025-prac10p created
```

8. Ensure the pods are running

- 1) `kubectl get pods`
- 2) `kubectl get deployment`

```
C:\Users\Ruben\Desktop\Deakin\Year2\Sem1\SIT_323_CAD\Task 10\sit323-2025-prac10p>kubectl get pods
NAME                                READY   STATUS    RESTARTS   AGE
mongo-54b85c45f4-xd6vn             1/1     Running   0           12m
sit323-2025-prac10p-678689964-mnhbr 1/1     Running   0           73s

C:\Users\Ruben\Desktop\Deakin\Year2\Sem1\SIT_323_CAD\Task 10\sit323-2025-prac10p>kubectl get deployment
NAME                                READY   UP-TO-DATE   AVAILABLE   AGE
mongo                              1/1     1             1           12m
sit323-2025-prac10p               1/1     1             1           79s
```

The screenshot shows the Google Cloud console interface for Kubernetes Engine. The left sidebar contains navigation links for 'All Fleets', 'Overview', 'Clusters', 'Workloads' (selected), 'Teams', 'Applications', and 'AI/ML'. The main content area is titled 'Workloads' and includes a 'Refresh' button, '+ Deploy' button, '+ Create Job' button, and a 'Delete' button. Below these are filters for 'Cluster' and 'Namespace'. The 'Overview' tab is active, showing a table of workloads. The table has columns for 'Name', 'Status', 'Type', 'Pods', 'Namespace', and 'Cluster'. Two workloads are listed: 'mongo' and 'sit323-2025-prac10p', both with a status of 'OK' and 1/1 pods.

Name	Status	Type	Pods	Namespace	Cluster
mongo	OK	Deployment	1/1	default	cluster-1
sit323-2025-prac10p	OK	Deployment	1/1	default	cluster-1

9. Expose to external IP

- 1) `kubectl expose deployment sit323-2025-prac10p --type=LoadBalancer --port=80 --target-port=3040`

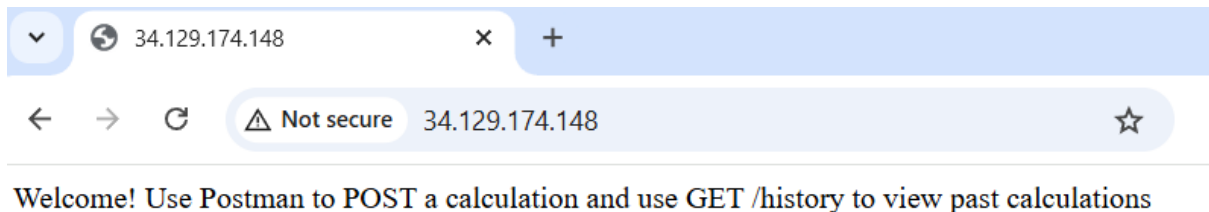
```
C:\Users\Ruben\Desktop\Deakin\Year2\Sem1\SIT_323_CAD\Task 10\sit323-2025-prac10p>kubectl expose deployment sit323-2025-prac10p --type=LoadBalancer --port=80 --target-port=3040
service/sit323-2025-prac10p exposed
```

10. Get service & access to application

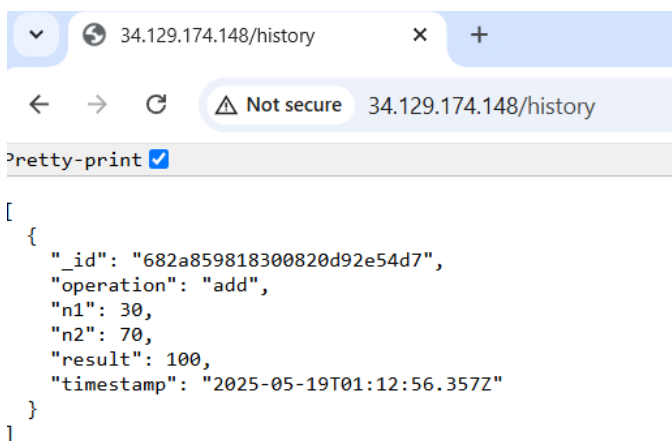
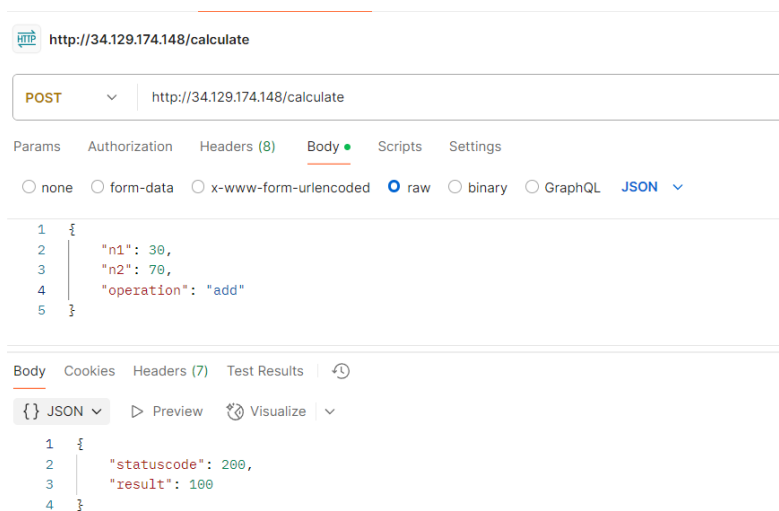
1) `kubectl get service`

```
C:\Users\Ruben\Desktop\Deakin\Year2\Sem1\SIT_323_CAD\Task 10\sit323-2025-prac10p>kubectl get service
NAME            TYPE          CLUSTER-IP    EXTERNAL-IP    PORT(S)          AGE
kubernetes      ClusterIP     34.118.224.1  <none>         443/TCP          36m
mongo           ClusterIP     34.118.234.94 <none>         27017/TCP        15m
sit323-2025-prac10p LoadBalancer 34.118.235.126 34.129.174.148 80:30106/TCP    67s
```

- <http://34.129.174.148/>

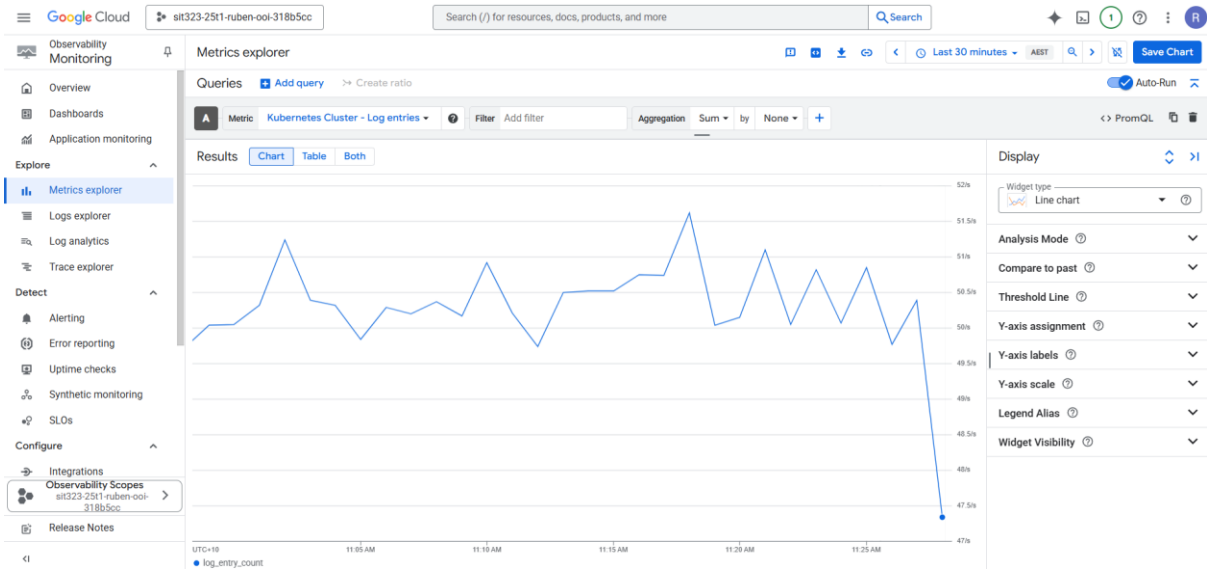


11. Perform CRUD operation

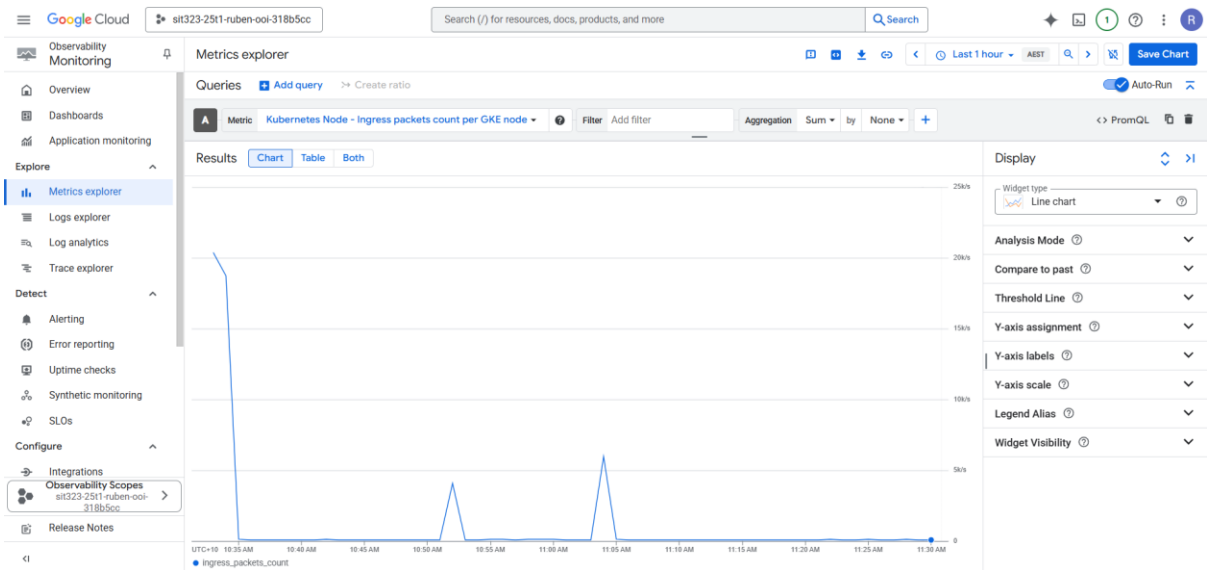


12. Monitor the application

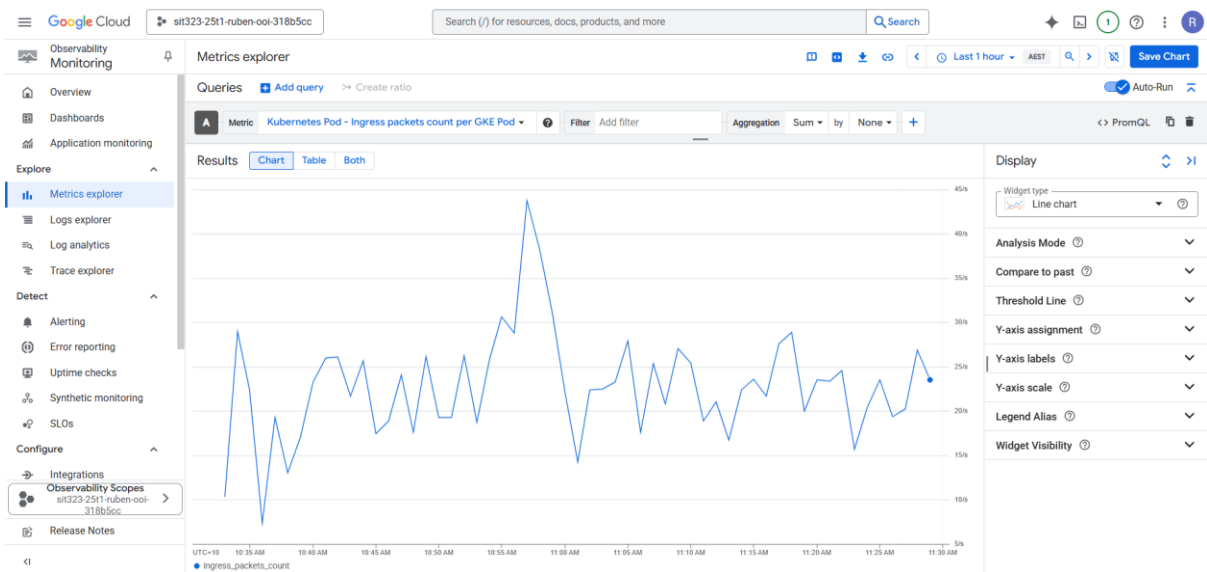
1) Chart 1: Kubernetes Cluster – Log Entries



2) Chart 2: Kubernetes Node – Ingress packets count per GKE node



3) Chart 3: Kubernetes Pod – Ingress packets count per GKE Pod



4) kubectl top nodes

```
C:\Users\Ruben\Desktop\Deakin\Year2\Sem1\SIT_323_CAD\Task 10\sit323-2025-prac10p>kubectl top nodes
```

NAME	CPU(cores)	CPU(%)	MEMORY(bytes)	MEMORY(%)
gke-cluster-1-default-pool-79996477-4970	71m	7%	684Mi	24%
gke-cluster-1-default-pool-79996477-rvxv	38m	4%	1226Mi	43%
gke-cluster-1-default-pool-79996477-t380	72m	7%	898Mi	32%
gke-cluster-1-default-pool-ba93a66e-j1cq	50m	5%	682Mi	24%
gke-cluster-1-default-pool-ba93a66e-l930	65m	6%	698Mi	24%
gke-cluster-1-default-pool-ba93a66e-zpw1	52m	5%	702Mi	25%
gke-cluster-1-default-pool-dda8e1a2-87cc	59m	6%	931Mi	33%
gke-cluster-1-default-pool-dda8e1a2-cbm7	72m	7%	1349Mi	48%
gke-cluster-1-default-pool-dda8e1a2-nkkc	57m	6%	935Mi	33%

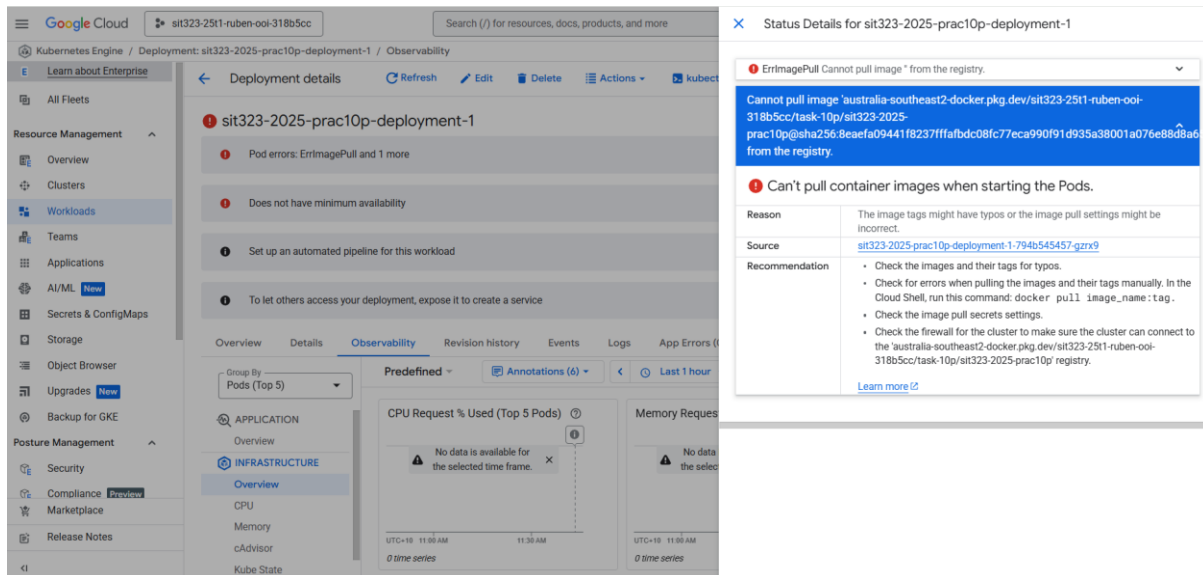
5) kubectl top pods

```
C:\Users\Ruben\Desktop\Deakin\Year2\Sem1\SIT_323_CAD\Task 10\sit323-2025-prac10p>kubectl top pods
```

NAME	CPU(cores)	MEMORY(bytes)
mongo-54b85c45f4-xd6vn	5m	86Mi
sit323-2025-prac10p-678689964-mnhbr	1m	40Mi

Issues Encountered

Issue 1: ImagePullBackOff Error



The screenshot displays the Google Cloud Kubernetes Engine console. The main panel shows the 'Deployment details' for 'sit323-2025-prac10p-deployment-1'. A red error icon indicates a problem. The 'Pod errors' section shows 'ErrImagePull' and '1 more'. The 'Details' tab is selected, showing a table of pod errors. The error message is: 'Cannot pull image 'australia-southeast2-docker.pkg.dev/sit323-2511-ruben-ool-318b5cc/task-10p/sit323-2025-prac10p@sha256:8eaeaf09441f8237ffafbd08fc77eca990f91d935a38001a07e88d8a6' from the registry.' The 'Reason' is 'Can't pull container images when starting the Pods.' The 'Source' is 'sit323-2025-prac10p-deployment-1-794b545457-gzrx9'. The 'Recommendation' section lists several steps to resolve the issue: check image tags for typos, check for errors when pulling images, check image pull secrets settings, and check the firewall for the cluster.

Reason	Source	Recommendation
Can't pull container images when starting the Pods.	sit323-2025-prac10p-deployment-1-794b545457-gzrx9	<ul style="list-style-type: none">Check the images and their tags for typos.Check for errors when pulling the images and their tags manually. In the Cloud Shell, run this command: <code>docker pull image_name:tag</code>.Check the image pull secrets settings.Check the firewall for the cluster to make sure the cluster can connect to the 'australia-southeast2-docker.pkg.dev/sit323-2511-ruben-ool-318b5cc/task-10p/sit323-2025-prac10p' registry.

When I was trying to deploy my application from the Artifact Registry to the GKE Cluster but I have encountered `ImagePullBackOff` Error and `ErrImagePull` which it doesn't allow me to pull my image from the Artifact Registry due to permission issue. Therefore, for the solution, I have built and push my docker image to Docker Hub as suggested by the teaching team and deployed the application through `kubectld deployment.yaml` file, which solve the permission issue and allowed the image to be pull by the GKE Cluster successfully.

Issue 2: gke-gcloud-auth-plugin Not Installed

```
C:\Users\Ruben\Desktop\Deakin\Year2\Sem1\SIT_323_CAD\Task 10\sit323-2025-prac10p>gcloud container clusters
get-credentials cluster-1 --region australia-southeast2
Fetching cluster endpoint and auth data.
CRITICAL: ACTION REQUIRED: gke-gcloud-auth-plugin, which is needed for continued use of kubectl, was not f
ound or is not executable. Install gke-gcloud-auth-plugin for use with kubectl by following https://cloud.
google.com/kubernetes-engine/docs/how-to/cluster-access-for-kubectl#install_plugin
kubeconfig entry generated for cluster-1.
```

```
C:\Users\Ruben\Desktop\Deakin\Year2\Sem1\SIT_323_CAD\Task 10\sit323-2025-prac10p>gcloud components install
gke-gcloud-auth-plugin

Restarting command:
$ gcloud components install gke-gcloud-auth-plugin

C:\Users\Ruben\Desktop\Deakin\Year2\Sem1\SIT_323_CAD\Task 10\sit323-2025-prac10p>gke-gcloud-auth-plugin --
version
Kubernetes v1.30.0+03fcd0f8cb9eac57e97a3ed59c702bad8c73be81

C:\Users\Ruben\Desktop\Deakin\Year2\Sem1\SIT_323_CAD\Task 10\sit323-2025-prac10p>gcloud container clusters
get-credentials cluster-1 --region australia-southeast2
Fetching cluster endpoint and auth data.
kubeconfig entry generated for cluster-1.
```

When I was trying to configure Kubernetes to use GKE cluster, I have encountered as I haven't installed the plugin to use the `kubectl` command. So I have search up the Google Cloud Platform Documentation to find the installation command which is `gcloud components install gke-gcloud-auth-plugin`. After installing the plugin, I have checked the version of the plugin with `gke-gcloud-auth-plugin --version` to verified if the plugin was installed successfully. The version was displayed and I am able to configure Kubernetes to use the GKE cluster.

Issue 3: Missing Kubernetes Secret Referencing

```
C:\Users\Ruben\Desktop\Deakin\Year2\Sem1\SIT_323_CAD\Task 10\sit323-2025-prac10p>kubectl get pods
NAME                                READY   STATUS              RESTARTS   AGE
sit323-2025-prac10p-678689964-5f5hj 0/1     CreateContainerConfigError 0           71s
```

```
Events:
Type      Reason      Age      From      Message
-----
Normal    Scheduled   95s      default-scheduler   Successfully assigned default/sit323-2025-prac10p-678689964-5f5hj to gke-cluster-1-default-pool-7e496e43-wxt2
Normal    Pulled      68s      kubelet    Successfully pulled image "11ruben/sit323-2025-prac10p:latest" in 27.378s (27.378s including waiting)
Normal    Pulled      67s      kubelet    Successfully pulled image "11ruben/sit323-2025-prac10p:latest" in 479ms (479ms including waiting)
Normal    Pulled      54s      kubelet    Successfully pulled image "11ruben/sit323-2025-prac10p:latest" in 334ms (334ms including waiting)
Normal    Pulled      43s      kubelet    Successfully pulled image "11ruben/sit323-2025-prac10p:latest" in 204ms (204ms including waiting)
Normal    Pulled      28s      kubelet    Successfully pulled image "11ruben/sit323-2025-prac10p:latest" in 658ms (658ms including waiting)
Normal    Pulled      12s      kubelet    Successfully pulled image "11ruben/sit323-2025-prac10p:latest" in 668ms (668ms including waiting)
Normal    Pulling     0s (x7 over 95s) kubelet    Pulling image "11ruben/sit323-2025-prac10p:latest"
Warning   Failed      0s (x7 over 68s) kubelet    Error: secret "mongo-secret" not found
Normal    Pulled      0s      kubelet    Successfully pulled image "11ruben/sit323-2025-prac10p:latest" in 215ms (215ms including waiting)
```

```
C:\Users\Ruben\Desktop\Deakin\Year2\Sem1\SIT_323_CAD\Task 10\sit323-2025-prac10p>kubectl apply -f mongo-secret.yaml
secret/mongo-secret created
```

```
C:\Users\Ruben\Desktop\Deakin\Year2\Sem1\SIT_323_CAD\Task 10\sit323-2025-prac10p>kubectl delete -f deployment.yaml
deployment.apps "sit323-2025-prac10p" deleted
```

```
C:\Users\Ruben\Desktop\Deakin\Year2\Sem1\SIT_323_CAD\Task 10\sit323-2025-prac10p>kubectl apply -f deployment.yaml
deployment.apps/sit323-2025-prac10p created
```

```
C:\Users\Ruben\Desktop\Deakin\Year2\Sem1\SIT_323_CAD\Task 10\sit323-2025-prac10p>kubectl get pods
NAME                                READY   STATUS    RESTARTS   AGE
sit323-2025-prac10p-678689964-fc2ll 1/1     Running   0           6s
```

After I have applied the `deployment.yaml` file to deploy the application to the GKE Cluster and checked whether the pod is running. It turns out that the pod is not running due to `CreateContainerConfigError`, so I went ahead and check the events of the pod and I found out that it is due to `deployment.yaml` references environment variables sourced from a Kubernetes Secret file – `mongo-secret.yaml`. So the solution for this issue is to apply the `mongo-secret.yaml` file and reapplied the `deployment.yaml`. After doing these steps, the pod is running as intended shown in the image above.

Clean Up

After deployment, it is important to clean up as it will cost money to run the resources in the background.

Steps to clean up:

1. Delete the services

```
C:\Users\Ruben\Desktop\Deakin\Year2\Sem1\SIT_323_CAD\Task 10\sit323-2025-prac10p>kubectl get service
NAME                TYPE        CLUSTER-IP    EXTERNAL-IP    PORT(S)          AGE
kubernetes           ClusterIP   34.118.224.1   <none>          443/TCP          112m
mongo                ClusterIP   34.118.234.94  <none>          27017/TCP        91m
sit323-2025-prac10p  LoadBalancer 34.118.235.126 34.129.174.148 80:30106/TCP     77m

C:\Users\Ruben\Desktop\Deakin\Year2\Sem1\SIT_323_CAD\Task 10\sit323-2025-prac10p>kubectl delete service sit323-2025-prac10p
service "sit323-2025-prac10p" deleted

C:\Users\Ruben\Desktop\Deakin\Year2\Sem1\SIT_323_CAD\Task 10\sit323-2025-prac10p>kubectl delete service mongo
service "mongo" deleted
```

2. Delete the deployments

```
C:\Users\Ruben\Desktop\Deakin\Year2\Sem1\SIT_323_CAD\Task 10\sit323-2025-prac10p>kubectl get deployment
NAME    READY   UP-TO-DATE   AVAILABLE   AGE
mongo   1/1     1             1           93m
sit323-2025-prac10p 1/1     1             1           81m

C:\Users\Ruben\Desktop\Deakin\Year2\Sem1\SIT_323_CAD\Task 10\sit323-2025-prac10p>kubectl delete deployment sit323-2025-prac10p
deployment.apps "sit323-2025-prac10p" deleted

C:\Users\Ruben\Desktop\Deakin\Year2\Sem1\SIT_323_CAD\Task 10\sit323-2025-prac10p>kubectl delete deployment mongo
deployment.apps "mongo" deleted
```

3. Delete the GKE cluster

```
C:\Users\Ruben\Desktop\Deakin\Year2\Sem1\SIT_323_CAD\Task 10\sit323-2025-prac10p>gcloud container clusters
delete cluster-1 --region=australia-southeast2
The following clusters will be deleted.
- [cluster-1] in [australia-southeast2]

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

Deleting cluster cluster-1...done.
Deleted [https://container.googleapis.com/v1/projects/sit323-25t1-ruben-ooi-318b5cc/zones/australia-southeast2/clusters/cluster-1].
```