Contents

Creating Docker Image for NodeJS API:

1. Added NodeJS Project which has REST API connecting to MongoDB.
2. Create Dockerfile as follow:

```
FROM node:lts-alpine3.16

WORKDIR /app
COPY package*.json ./

RUN npm install
COPY . .
EXPOSE 3000
ENTRYPOINT [ "npm", "start" ]
```

It will first pull Linux Alpine Image. Copy package*.json files in /app folder. Run npm install to install all dependent packages. Copy rest of files in /app folder. Expose port 3000 and run npm start to start the server.

3. Now create an Ubuntu VM on google console and install docker on it. Once docker is installed, add user to Docker Group so that user don't get any permission issues while creating docker images.
4. Git clone to fetch code on VM. And run docker commands to create docker images.
5. Running image on docker, will not work here as we have environment variables setup in code for DB connection. We will just push the image in docker hub and use it later on Kubernetes cluster.
6. In the example below, we have created docker image with name as **kapoorpriyanka/web-application:3**
7. Git Repo Link is: https://github.com/PriyankaKapoor10/NAGP-Assignment
8. Docker Hub Link: kapoorpriyanka/web-application general | Docker Hub

Add Docker's official GPG key:

sudo apt-get update

sudo apt-get install ca-certificates curl

sudo install -m 0755 -d /etc/apt/keyrings

sudo curl -fsSL https://download.docker.com/linux/ubuntu/gpg -o /etc/apt/keyrings/docker.asc

sudo chmod a+r /etc/apt/keyrings/docker.asc

Add the repository to Apt sources:

echo \

"deb [arch=$(dpkg --print-architecture) signed-by=/etc/apt/keyrings/docker.asc] https://download.docker.com/linux/ubuntu \

$(. /etc/os-release && echo "$VERSION_CODENAME") stable" | \

sudo tee /etc/apt/sources.list.d/docker.list > /dev/null

sudo apt-get update

sudo apt-get install docker-ce docker-ce-cli containerd.io docker-buildx-plugin docker-compose-plugin

sudo docker run hello-world

This is to check if docker is working all fine by running hello-world docker image just for testing.

sudo groupadd docker

sudo usermod -aG docker priyankagrover2804

newgrp docker

docker run hello-world

git clone https://github.com/PriyankaKapoor10/NAGP-Assignment

cd NAGP-Assignment/node-project

docker image build -t kapoorpriyanka/web-application:3 .

docker images

docker run --name nodejs-container -p 80:3000 kapoorpriyanka/web-application:3

docker stop nodejs-container

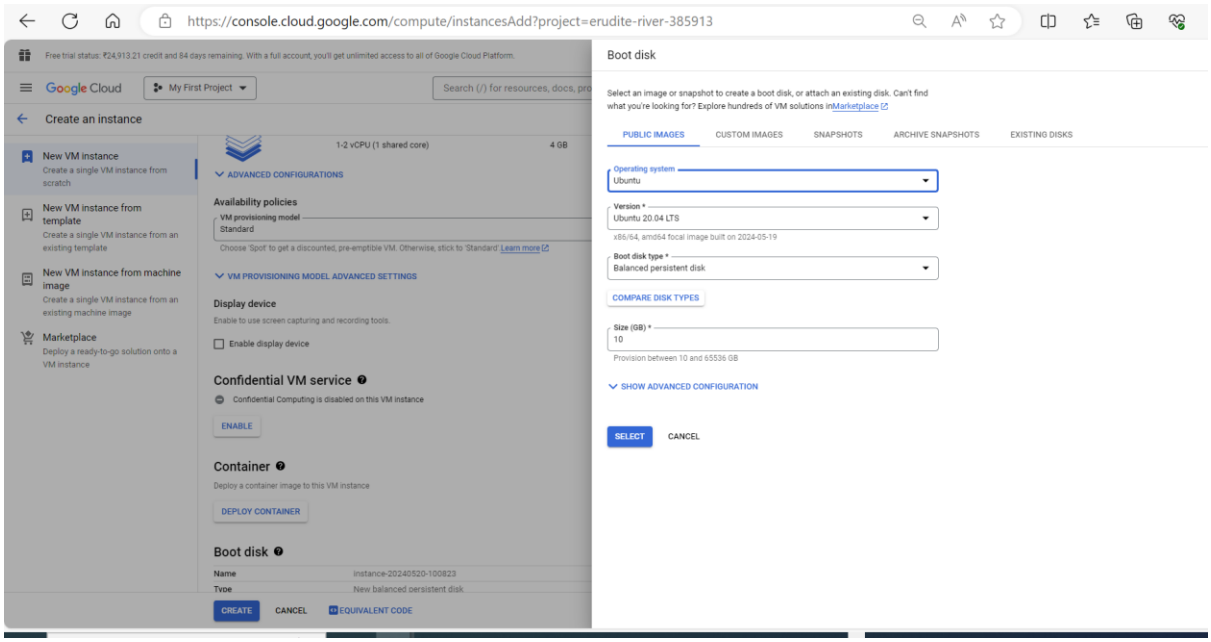
docker remove nodejs-container

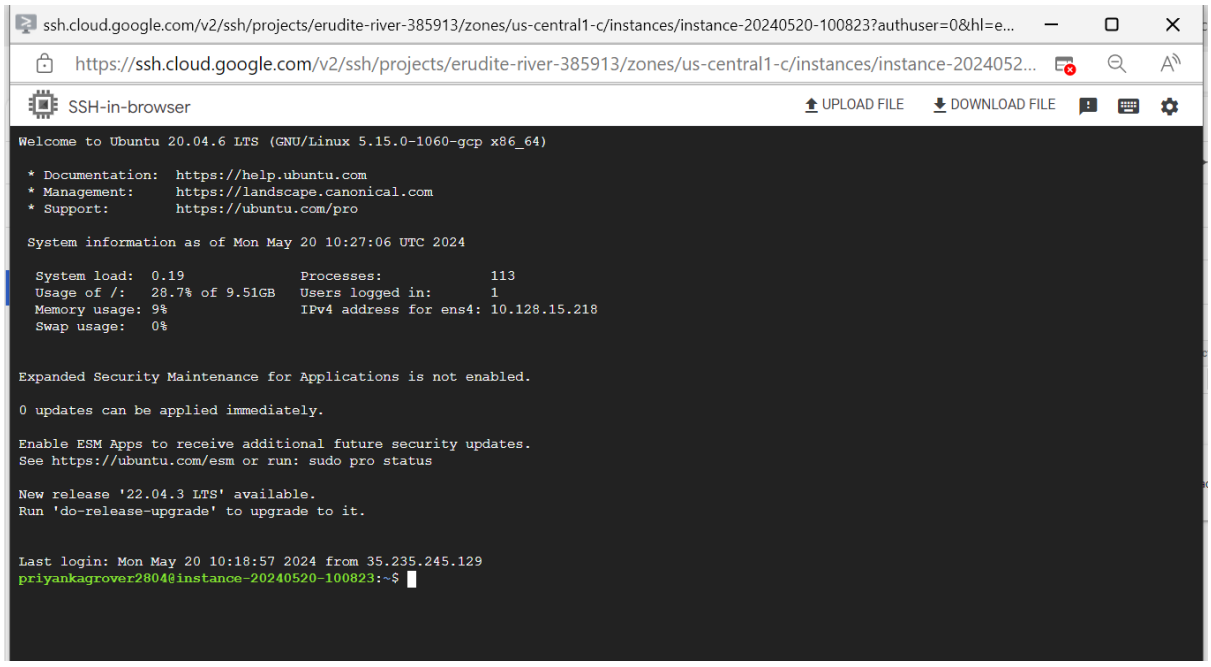
docker login

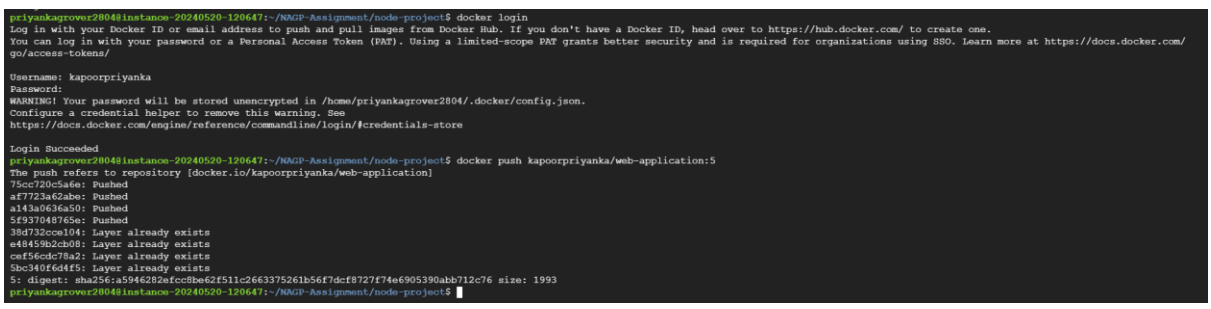
username: kapoorpriyanka

password: rS#10

docker push kapoorpriyanka/web-application:3


https://console.cloud.google.com/compute/instancesAdd?project=erudite-river-385913
Google Cloud
My First Project
Create an instance
New VM instance
Create a single VM instance from scratch
New VM instance from template
Create a single VM instance from an existing template
New VM instance from machine image
Create a single VM instance from an existing machine image
Marketplace
Deploy a ready-to-go solution onto a VM instance
1-2 vCPU (1 shared core)
4 GB
ADVANCED CONFIGURATIONS
Availability policies
VM provisioning model
Standard
VM PROVISIONING MODEL ADVANCED SETTINGS
Display device
Enable display device
Confidential VM service
Confidential Computing is disabled on this VM instance
ENABLE
Container
DEPLOY CONTAINER
Boot disk
Name
instance-20240520-100823
Type
New balanced persistent disk
CREATE
CANCEL
EQUIVALENT CODE
Boot disk
Select an image or snapshot to create a boot disk, or attach an existing disk. Can't find what you're looking for? Explore hundreds of VM solutions in Marketplace
PUBLIC IMAGES
CUSTOM IMAGES
SNAPSHOTS
ARCHIVE SNAPSHOTS
EXISTING DISKS
Operating system
Ubuntu
Version *
Ubuntu 20.04 LTS
x86/64, amd64 focal image built on 2024-05-19
Boot disk type *
Balanced persistent disk
COMPARE DISK TYPES
Size (GB) *
10
Provision between 10 and 65536 GB
SHOW ADVANCED CONFIGURATION
SELECT
CANCEL


ssh.cloud.google.com/v2/ssh/projects/erudite-river-385913/zones/us-central1-c/instances/instance-20240520-100823?authuser=0&hl=e...
https://ssh.cloud.google.com/v2/ssh/projects/erudite-river-385913/zones/us-central1-c/instances/instance-2024052...
SSH-in-browser
UPLOAD FILE
DOWNLOAD FILE
Welcome to Ubuntu 20.04.6 LTS (GNU/Linux 5.15.0-1060-gcp x86_64)
* Documentation: https://help.ubuntu.com
* Management: https://landscape.canonical.com
* Support: https://ubuntu.com/pro
System information as of Mon May 20 10:27:06 UTC 2024
System load: 0.19
Usage of /: 28.7% of 9.51GB
Memory usage: 9%
Swap usage: 0%
Processes: 113
Users logged in: 1
IPv4 address for ens4: 10.128.15.218
Expanded Security Maintenance for Applications is not enabled.
0 updates can be applied immediately.
Enable ESM Apps to receive additional future security updates.
See https://ubuntu.com/esm or run: sudo pro status
New release '22.04.3 LTS' available.
Run 'do-release-upgrade' to upgrade to it.
Last login: Mon May 20 10:18:57 2024 from 35.235.245.129
priyankagrover2804@instance-20240520-100823:~$


priyankagrover2804@instance-20240520-120647:~/NAGP-Assignment/node-project$ docker login
Log in with your Docker ID or email address to push and pull images from Docker Hub. If you don't have a Docker ID, head over to https://hub.docker.com/ to create one.
You can log in with your password or a Personal Access Token (PAT). Using a limited-scope PAT grants better security and is required for organizations using SSO. Learn more at https://docs.docker.com/go/access-tokens/
Username: kapoorpriyanka
Password:
WARNING! Your password will be stored unencrypted in /home/priyankagrover2804/.docker/config.json.
Configure a credential helper to remove this warning. See
https://docs.docker.com/engine/reference/commandline/login/#credentials-store
Login Succeeded
priyankagrover2804@instance-20240520-120647:~/NAGP-Assignment/node-project$ docker push kapoorpriyanka/web-application:5
The push refers to repository [docker.io/kapoorpriyanka/web-application]
75cc720c5a6e: Pushed
af7723a62abe: Pushed
a143a0636a50: Pushed
5f937048765e: Pushed
38d732cce104: Layer already exists
e48459b2cb08: Layer already exists
cef56cdc78a2: Layer already exists
5bc340f6d4f5: Layer already exists
5: digest: sha256:a5946282efcc8be62f511c2663375261b56f7dcf8727f74e6905390abb712c76 size: 1993
priyankagrover2804@instance-20240520-120647:~/NAGP-Assignment/node-project$

Create Kubernetes Resources for Deployment of REST API and MongoDB

Deployment.yaml

In deployment.yaml file, we have created 3 Kubernetes object.

1. K8 Deployment object, that will deploy our REST API on K8s cluster. It will create 3 Replicas of the application's pod and use config maps and secrets in order to fetch MongoDB Credentials and host urls.
2. LoadBalancer: It will expose our API to the outside world using IP Address
3. HPA: It will create Horizontal Auto Scaler, that will increase or decrease the pods deployed based on CPU utilization.

Below is the file for creating deployment of NodeJS Rest API.

```yaml
apiVersion: apps/v1
kind: Deployment
metadata:
  name: node-app-deployment
  namespace: default
  labels:
    app: node-app
spec:
  replicas: 3
  selector:
    matchLabels:
      app: node-app
  template:
    metadata:
      labels:
        app: node-app
    spec:
      containers:
      - name: nodejs-container
        image: kapoorpriyanka/web-application:3

        ports:
        - name: http
          containerPort: 3000
          protocol: TCP
        envFrom:
        - configMapRef:
            name: app-settings
        - secretRef:
            name: mongodb-pass
```

Load Balancer Service for Application:

It will expose our API to the outside world using External IP Address

```yaml
---
apiVersion: v1
kind: Service
metadata:
  name: node-service-lb
  namespace: default
  labels:
    app: node-service-lb
spec:
  ports:
  - protocol: "TCP"
    port: 80
    targetPort: 3000
  selector:
    app: node-app
  type: LoadBalancer

---
apiVersion: autoscaling/v2
```

Horizontal Pod Auto Scaler

It will create Horizontal Auto Scaler, that will increase or decrease the pods deployed based on CPU utilization.

```yaml
---
apiVersion: autoscaling/v2
kind: HorizontalPodAutoscaler
metadata:
  namespace: default
  name: node-app-deployment-autoscale
spec:
  scaleTargetRef:
    apiVersion: apps/v1
    kind: Deployment
    name: node-app-deployment
  minReplicas: 1
  maxReplicas: 4
  metrics:
  - type: Resource
    resource:
      name: cpu
      target:
        type: Utilization
        averageUtilization: 20
  behavior:
    scaleDown:
      stabilizationWindowSeconds: 5
```

ConfigMaps:

configmap.yaml

```yaml
apiVersion: "v1"
kind: "ConfigMap"
metadata:
  name: "app-settings"
  namespace: "default"
  labels:
    app: "app-settings"
data:
  DB_URL: "mongodb://mongodb:27017/testDatabase"
  DB_USERNAME: "priyankagrover2804"

```

Kubernetes Secret for MongoDB Connection:

secret.yaml

```yaml
apiVersion: "v1"
kind: "Secret"
metadata:
  name: "mongodb-pass"
  namespace: "default"
data:
  DB_PASSWORD: "bngxaXJKZXNwRnJBSXRuTg=="
type: Opaque
```

MongoDB Deployment:

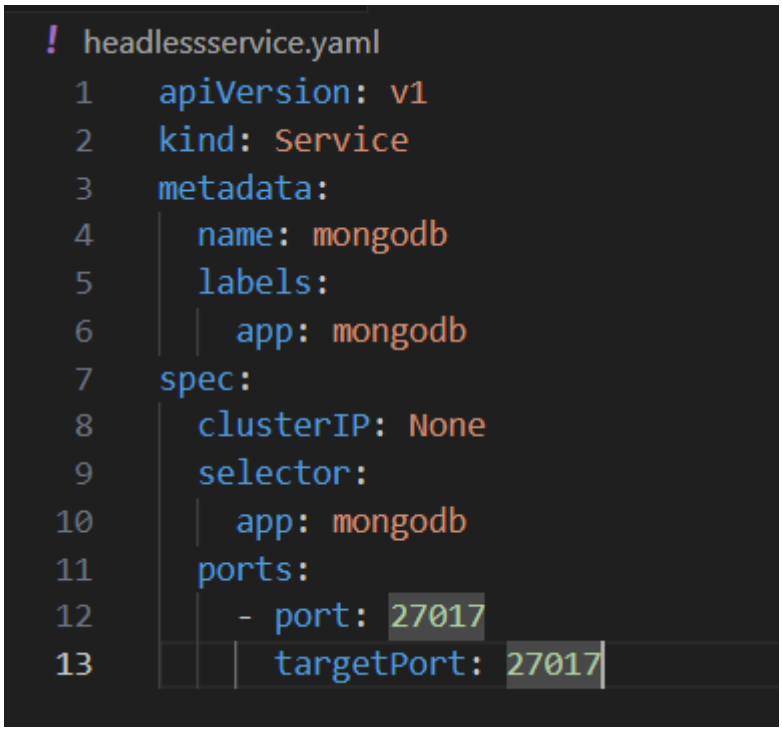
MongoDB needs persistent storage so we will deploy MongoDB Pods using Stateful Sets instead of deployment and expose MongoDB inside K8 Cluster only using Headless Service.

The below mongodb deployment will deploy StatefulSet for only 1 mongodb pod.

! mongodb.yaml

```yaml
apiVersion: apps/v1
kind: StatefulSet
metadata:
  name: mongodb
spec:
  serviceName: mongodb
  replicas: 3
  selector:
    matchLabels:
      app: mongodb
  template:
    metadata:
      labels:
        app: mongodb
    spec:
      containers:
      - name: mongodb
        image: mongo:4.0.17
        ports:
          - containerPort: 27017
        volumeMounts:
          - name: pvc
            mountPath: /data/db
  volumeClaimTemplates:
    - metadata:
        name: pvc
      spec:
        accessModes:
          - ReadWriteOnce
        resources:
          requests:
            storage: 1Gi
```

Headless Service:



We will create a temporary mongoshell pod to try connecting to the mongodb pod created .

Command to run temporary mongoshell pod is as follow:

kubectl run -it mongo-shell --image=mongo:4.0.17 --rm -- /bin/bash

Now try connecting to mongodb-0 from inside mongo-shell pod

#mongo mongodb-0.mongodb

show dbs

admin 0.000GB

config 0.000GB

local 0.000GB

testDatabase 0.000GB

> db.datas.find()

> db.datas.insert({"name":"Mohan","age":27})

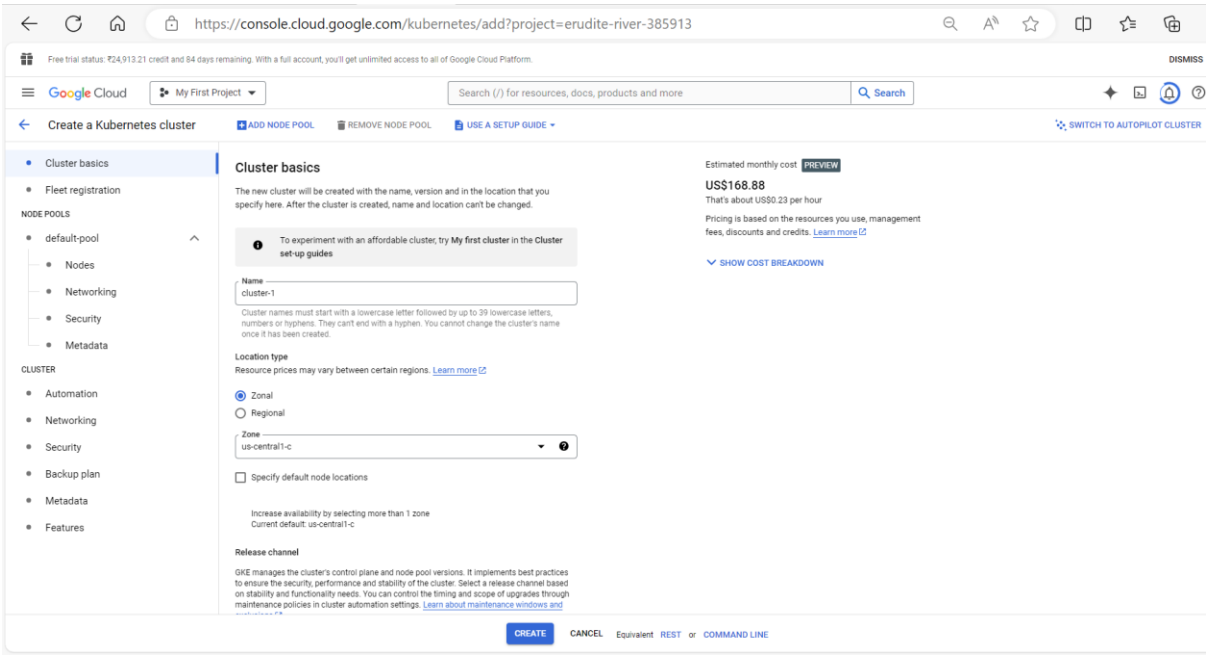
WriteResult({ "nInserted" : 1 })

Exit

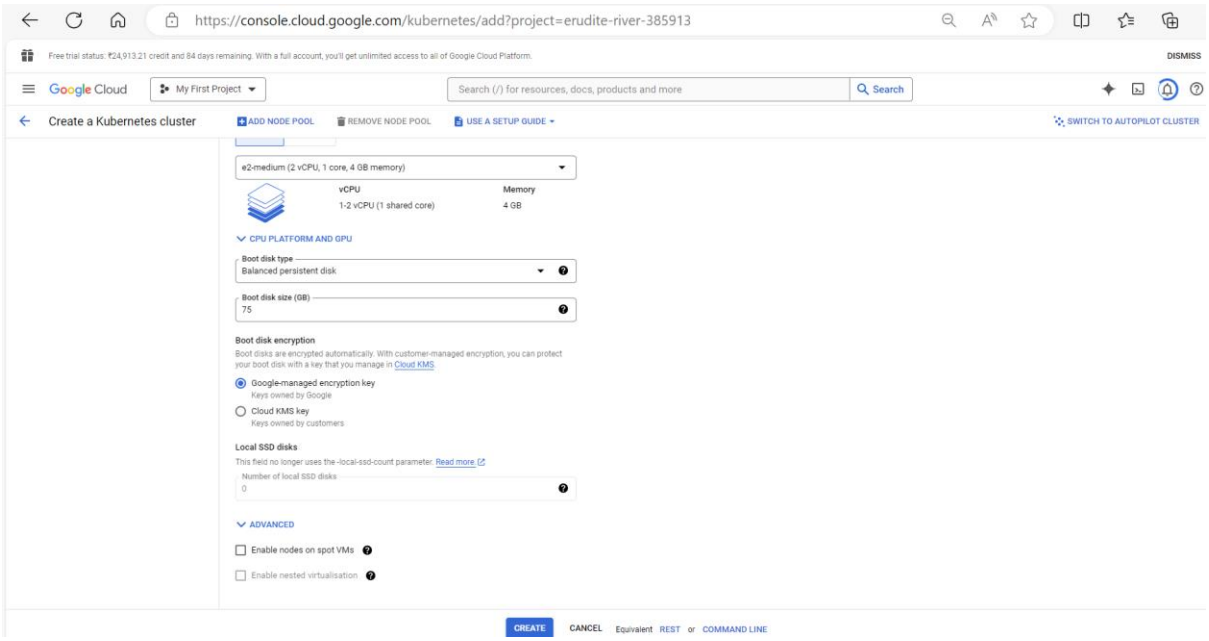
Executing yaml using Kubectl

We will now create K8 standard cluster in Google console. Try changing size of node to 75 Gi or number of nodes to 2 so that we can have a cluster provisioned within Free Credits on Google console.

`Standard Cluster Creation:`



`Change Node size to 75 each.`



`Click on Create. It will create a new Standard Cluster for you.`

Now, open terminal window of Google cloud and connect to this cluster using following command:

```
gcloud container clusters get-credentials cluster-1 --zone us-central1-c --project erudite-river-385913
```

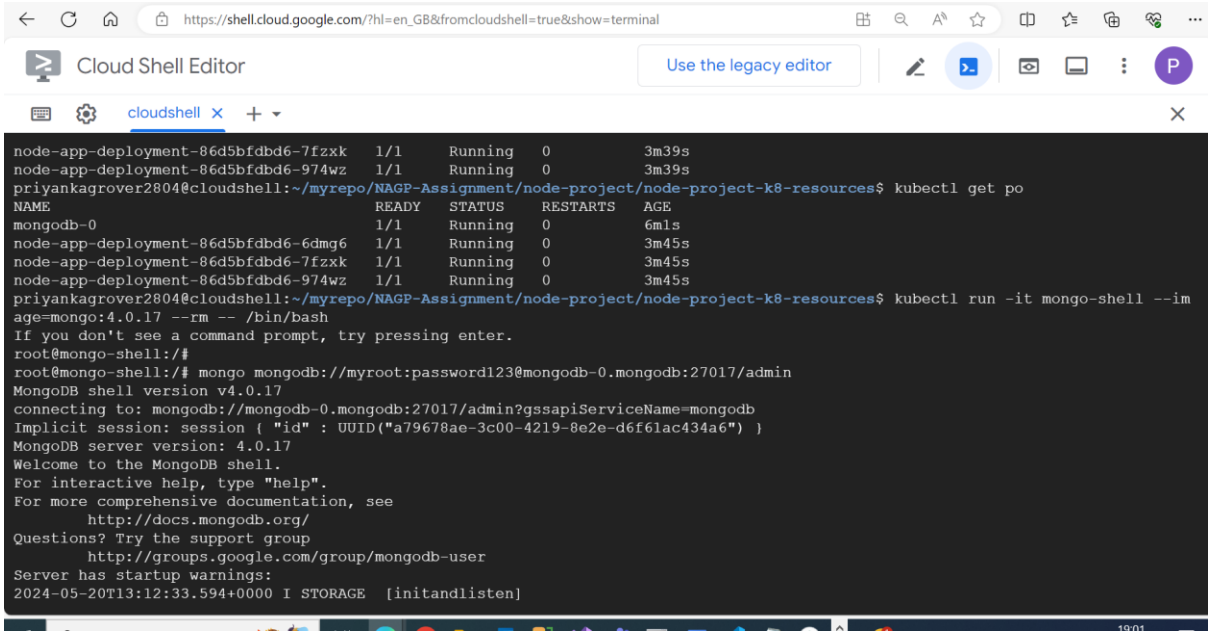
Once done, we will start executing the kubectl commands to deploy the application and mongodb.

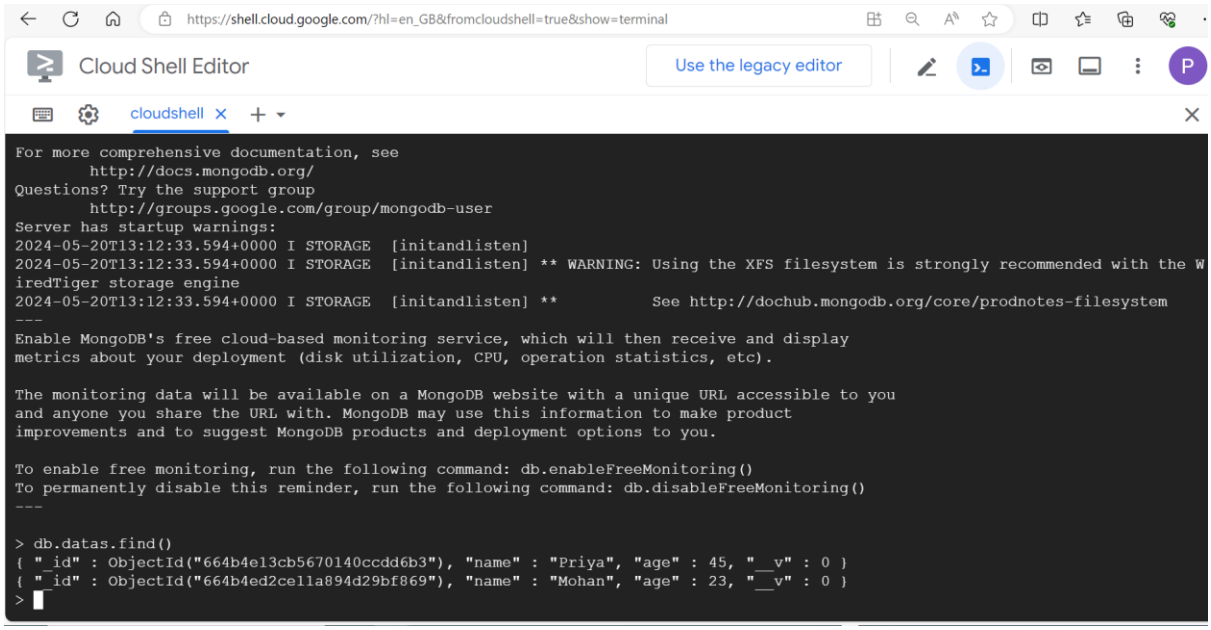
```
priyankagrover2804@cloudshell:~/assignment$ ls

configmap.yaml  deplo.yaml  deployment.yaml  headlessservice.yaml  mongodb.yaml  pod.yaml  secret.yaml

priyankagrover2804@cloudshell:~/assignment$ kubectl apply -f mongodb.yaml

statefulset.apps/mongodb created

priyankagrover2804@cloudshell:~/assignment$ kubectl apply -f headlessservice.yaml

service/mongodb created

priyankagrover2804@cloudshell:~/assignment$ kubectl apply -f configmap.yaml

configmap/app-settings unchanged

priyankagrover2804@cloudshell:~/assignment$ kubectl apply -f secret.yaml

secret/mongodb-pass unchanged

priyankagrover2804@cloudshell:~/assignment$ kubectl apply -f deployment.yaml

deployment.apps/node-app-deployment created

service/node-service-lb created

horizontalpodautoscaler.autoscaling/node-app-deployment-autoscale created

priyankagrover2804@cloudshell:~/assignment$ kubectl get po

NAME                                  READY   STATUS    RESTARTS   AGE

mongodb-0                             1/1     Running   0          10m

node-app-deployment-676bd54868-wdsnf   1/1     Running   0          6m25s

priyankagrover2804@cloudshell:~/assignment$ kubectl logs -f node-app-deployment-676bd54868-wdsnf
```

If we see list of pods using command kubectl get po, we can see only two pods, one is of mongodb and another is for Web application.

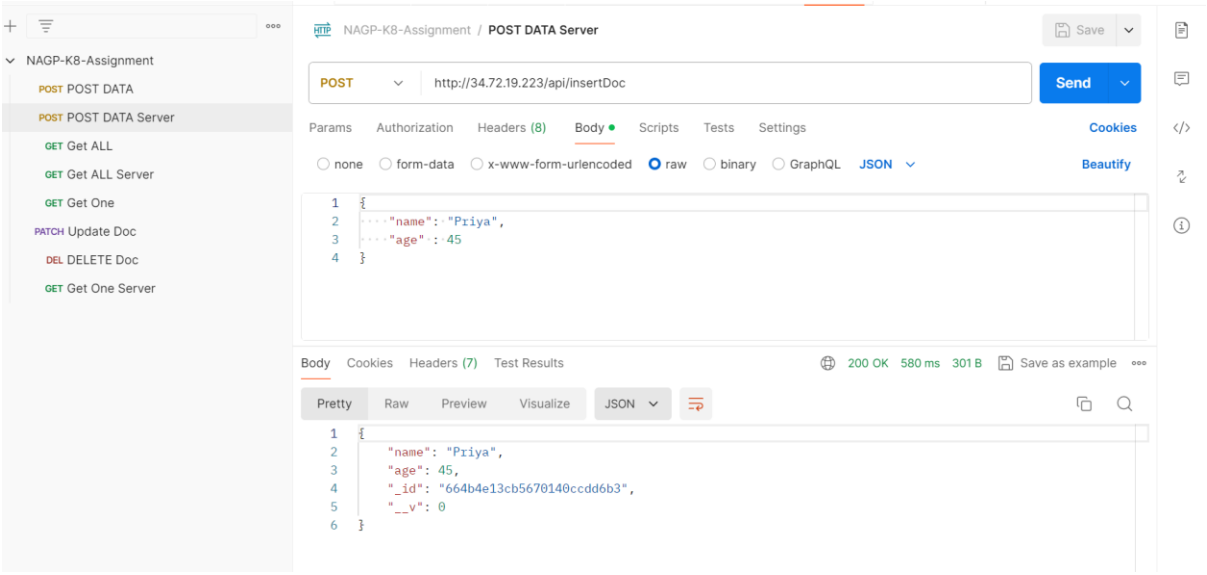
Initially the pods created were 3, but since CPU utilization was very less, HPA reduced the number of pods to 1.

MongoDB on K8

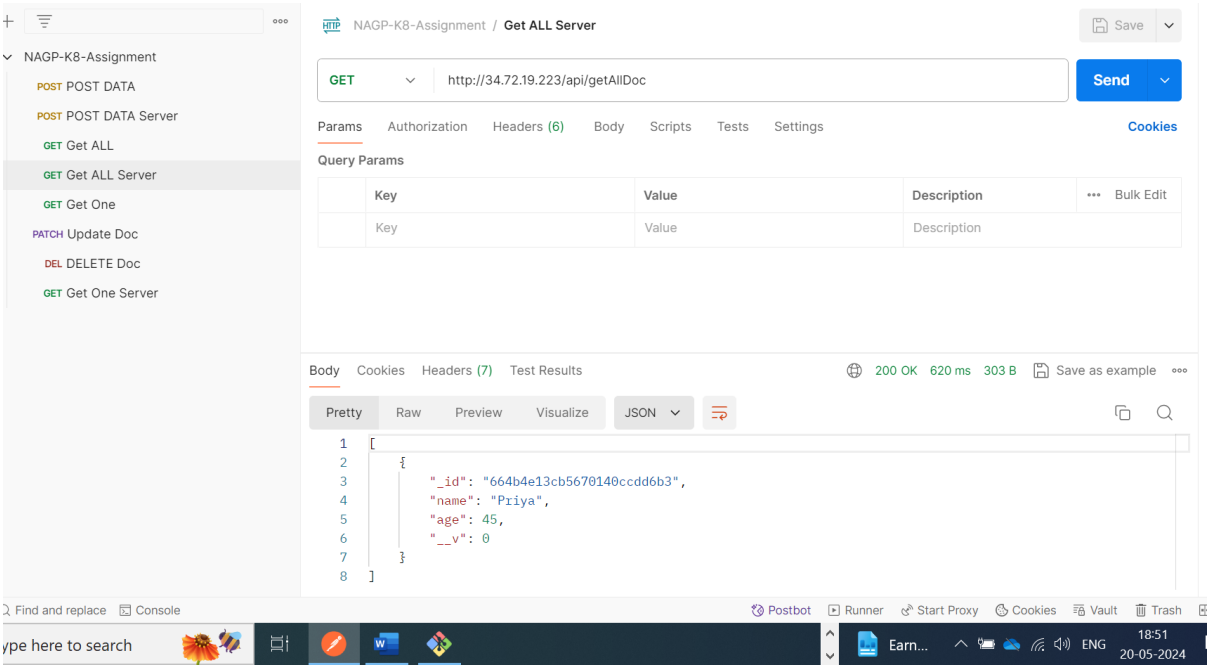




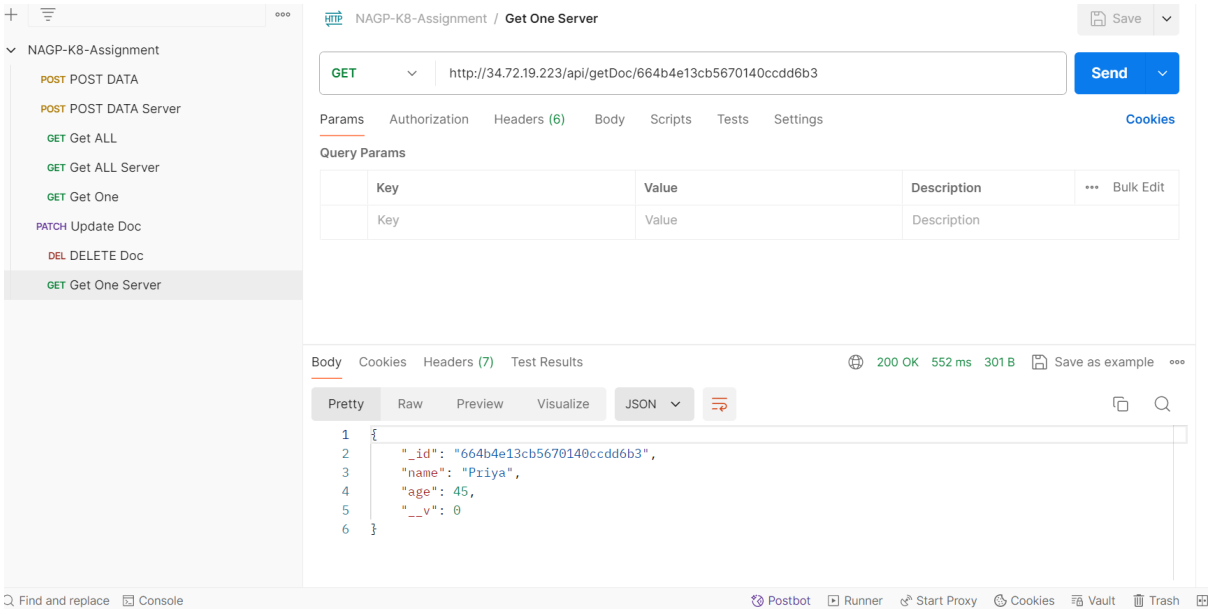
APIs Demo:



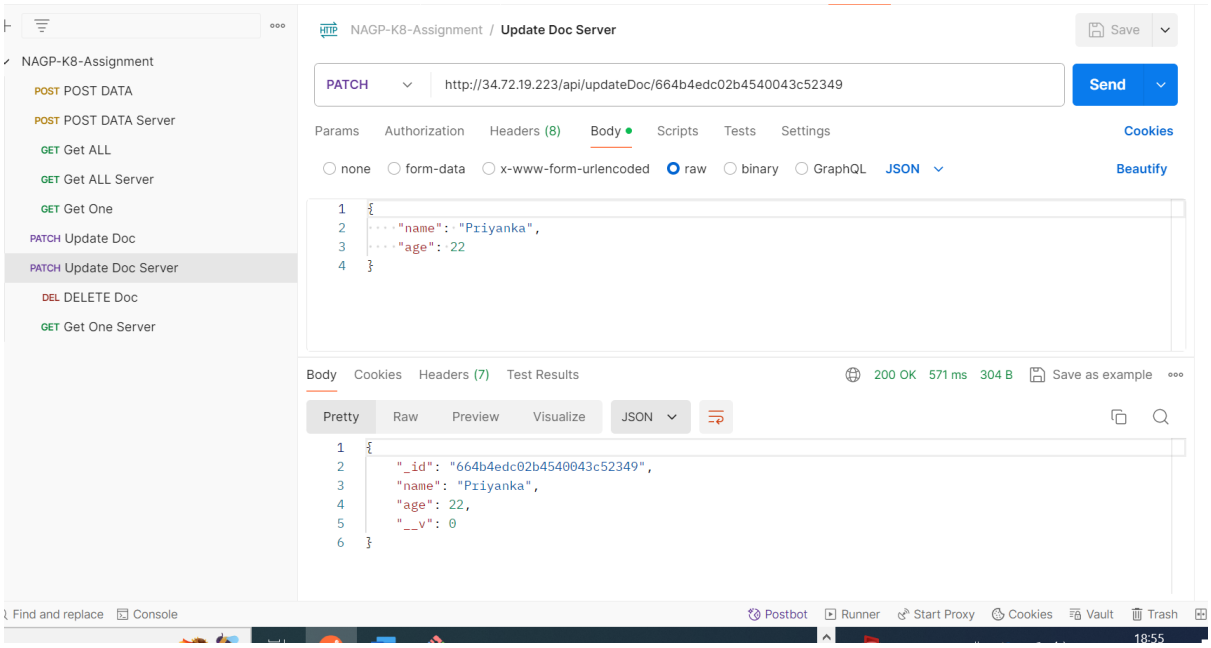
Get All Document:



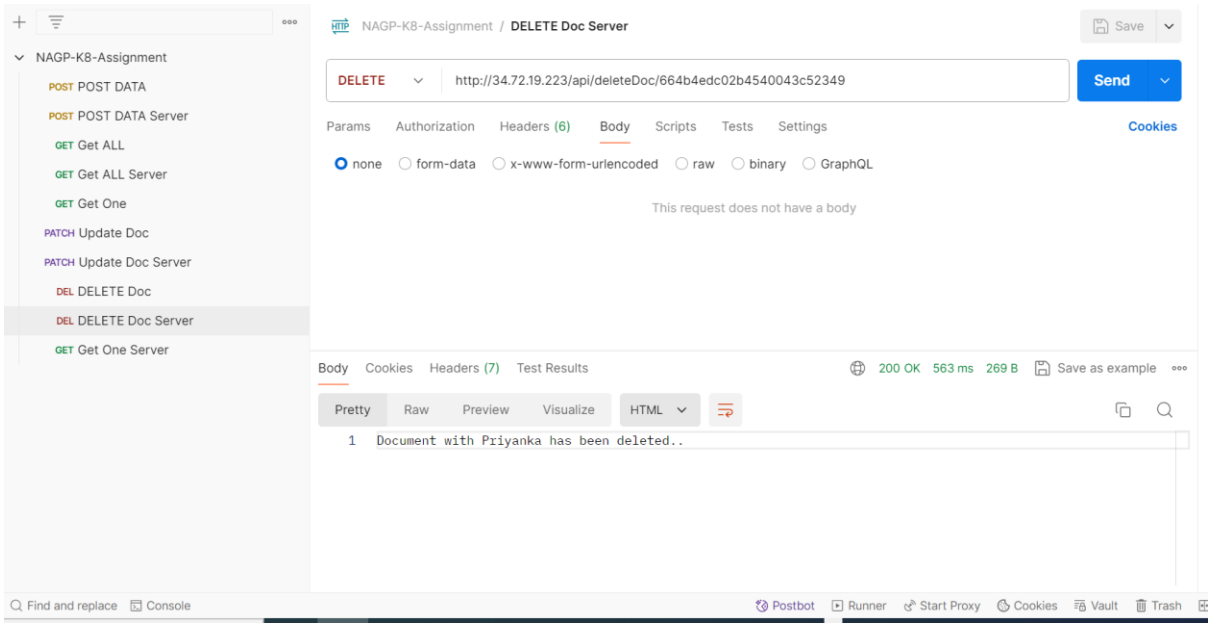
Get Doc By ID:



Update by ID:



Delete By ID:



Deleting MongoDb Instance and Recreating

We have deleted the existing instance of mongodb and recreated:

priyankagrover2804@cloudshell:~/myrepo/NAGP-Assignment/node-project/node-project-k8-resources$ kubectl get statefulset

NAME READY AGE

mongodb 1/1 20m

priyankagrover2804@cloudshell:~/myrepo/NAGP-Assignment/node-project/node-project-k8-resources$ kubectl delete statefulset mongodb

statefulset.apps "mongodb" deleted

priyankagrover2804@cloudshell:~/myrepo/NAGP-Assignment/node-project/node-project-k8-resources$ kubectl get statefulset

No resources found in default namespace.

priyankagrover2804@cloudshell:~/myrepo/NAGP-Assignment/node-project/node-project-k8-resources$ kubectl apply mongodb_with_cred.yaml

error: Unexpected args: [mongodb_with_cred.yaml]

See 'kubectl apply -h' for help and examples

priyankagrover2804@cloudshell:~/myrepo/NAGP-Assignment/node-project/node-project-k8-resources$ kubectl get po

```
NAME                          READY   STATUS    RESTARTS   AGE
node-app-deployment-86d5bfdbd6-6dmg6   1/1     Running   0          19m
node-app-deployment-86d5bfdbd6-7fzxk   1/1     Running   0          19m
node-app-deployment-86d5bfdbd6-974wz   1/1     Running   0          19m
priyankagrover2804@cloudshell:~/myrepo/NAGP-Assignment/node-project/node-project-k8-resources$ kubectl apply -f mongodb_with_cr
ed.yaml
statefulset.apps/mongodb created
priyankagrover2804@cloudshell:~/myrepo/NAGP-Assignment/node-project/node-project-k8-resources$ kubectl get po
NAME                          READY   STATUS              RESTARTS   AGE
mongodb-0                     0/1     ContainerCreating   0          6s
node-app-deployment-86d5bfdbd6-6dmg6   1/1     Running             0          19m
node-app-deployment-86d5bfdbd6-7fzxk   1/1     Running             0          19m
node-app-deployment-86d5bfdbd6-974wz   1/1     Running             0          19m
priyankagrover2804@cloudshell:~/myrepo/NAGP-Assignment/node-project/node-project-k8-resources$ kubectl get po
NAME                          READY   STATUS    RESTARTS   AGE
mongodb-0                     1/1     Running   0          11s
node-app-deployment-86d5bfdbd6-6dmg6   1/1     Running   0          19m
node-app-deployment-86d5bfdbd6-7fzxk   1/1     Running   0          19m
node-app-deployment-86d5bfdbd6-974wz   1/1     Running   0          19m
priyankagrover2804@cloudshell:~/myrepo/NAGP-Assignment/node-project/node-project-k8-resources$
```

Now checking if data persists.

```
priyankagrover2804@cloudshell:~/myrepo/NAGP-Assignment/node-project/node-project-k8-resources$ kubectl delete statefulset mongodb
statefulset.apps "mongodb" deleted
priyankagrover2804@cloudshell:~/myrepo/NAGP-Assignment/node-project/node-project-k8-resources$ kubectl get statefulset
No resources found in default namespace.
```

priyankagrover2804@cloudshell:~/myrepo/NAGP-Assignment/node-project/node-project-k8-resources$ kubectl apply mongodb_with_cred.yaml

error: Unexpected args: [mongodb_with_cred.yaml]

See 'kubectl apply -h' for help and examples

priyankagrover2804@cloudshell:~/myrepo/NAGP-Assignment/node-project/node-project-k8-resources$ kubectl get po

NAME READY STATUS RESTARTS AGE

node-app-deployment-86d5bfdbd6-6dmg6 1/1 Running 0 19m

node-app-deployment-86d5bfdbd6-7fzxk 1/1 Running 0 19m

node-app-deployment-86d5bfdbd6-974wz 1/1 Running 0 19m

priyankagrover2804@cloudshell:~/myrepo/NAGP-Assignment/node-project/node-project-k8-resources$ kubectl apply -f mongodb_with_cr

ed.yaml

statefulset.apps/mongodb created

priyankagrover2804@cloudshell:~/myrepo/NAGP-Assignment/node-project/node-project-k8-resources$ kubectl get po

NAME READY STATUS RESTARTS AGE

mongodb-0 0/1 ContainerCreating 0 6s

node-app-deployment-86d5bfdbd6-6dmg6 1/1 Running 0 19m

node-app-deployment-86d5bfdbd6-7fzxk 1/1 Running 0 19m

node-app-deployment-86d5bfdbd6-974wz 1/1 Running 0 19m

priyankagrover2804@cloudshell:~/myrepo/NAGP-Assignment/node-project/node-project-k8-resources$ kubectl get po

NAME READY STATUS RESTARTS AGE

mongodb-0 1/1 Running 0 11s

node-app-deployment-86d5bfdbd6-6dmg6 1/1 Running 0 19m

node-app-deployment-86d5bfdbd6-7fzxk 1/1 Running 0 19m

node-app-deployment-86d5bfdbd6-974wz 1/1 Running 0 19m

priyankagrover2804@cloudshell:~/myrepo/NAGP-Assignment/node-project/node-project-k8-resources$ ^C

priyankagrover2804@cloudshell:~/myrepo/NAGP-Assignment/node-project/node-project-k8-resources$ kubectl run -it mongo-shell --image=mongo:4.0.17 --rm -- /bin/bash

If you don't see a command prompt, try pressing enter.

root@mongo-shell:/#

root@mongo-shell:/# mongo mongodb://myroot:password123@mongodb-0.mongodb:27017/admin

MongoDB shell version v4.0.17

connecting to: mongodb://mongodb-0.mongodb:27017/admin?gssapiServiceName=mongodb

Implicit session: session { "id" : UUID("e5a815b8-6878-4e30-a3d7-6a602b0d90d3") }

MongoDB server version: 4.0.17

Welcome to the MongoDB shell.

For interactive help, type "help".

For more comprehensive documentation, see

http://docs.mongodb.org/

Questions? Try the support group

http://groups.google.com/group/mongodb-user

Server has startup warnings:

2024-05-20T13:34:20.763+0000 I STORAGE [initandlisten]

2024-05-20T13:34:20.764+0000 I STORAGE [initandlisten] ** WARNING: Using the XFS filesystem is strongly recommended with the WiredTiger storage engine

2024-05-20T13:34:20.764+0000 I STORAGE [initandlisten] ** See http://dochub.mongodb.org/core/prodnotes-filesystem

---

Enable MongoDB's free cloud-based monitoring service, which will then receive and display

metrics about your deployment (disk utilization, CPU, operation statistics, etc).

The monitoring data will be available on a MongoDB website with a unique URL accessible to you

and anyone you share the URL with. MongoDB may use this information to make product

improvements and to suggest MongoDB products and deployment options to you.

To enable free monitoring, run the following command: db.enableFreeMonitoring()

To permanently disable this reminder, run the following command: db.disableFreeMonitoring()

> db.datas.find()

{ "_id" : ObjectId("664b4e13cb5670140ccdd6b3"), "name" : "Priya", "age" : 45, "__v" : 0 }

{ "_id" : ObjectId("664b4ed2ce11a894d29bf869"), "name" : "Mohan", "age" : 23, "__v" : 0 }

>

Data still persist and name of pod is also old one.

bye

root@mongo-shell:/# exit

exit

Session ended, resume using 'kubectl attach mongo-shell -c mongo-shell -i -t' command when the pod is running

pod "mongo-shell" deleted

Deployment Rolling Updates

Currently we have 3 pods of web application running.

To list your Deployments, run the `get deployments` subcommand: **`kubectl get deployments`**

To list the running Pods, run the `get pods` subcommand:

`kubectl get pods`

To view the current image version of the app, run the `describe pods` subcommand and look for the `Image` field:

`kubectl describe pods`

To update the image of the application to version 3, use the `set image` subcommand, followed by the deployment name and the new image version:

`kubectl set image deployment/node-app-deployment nodejs-container=kapoorpriyanka/web-application:3`

The command notified the Deployment to use a different image for your app and initiated a rolling update. Check the status of the new Pods, and view the old one terminating with the `get pods` subcommand:

`kubectl get pods`

To check Rollout status of deployment:

kubectl rollout status deployment/node-app-deployment

To check Rollout history of deployment:

kubectl rollout history deployment/node-app-deployment

Below are logs of execution to showcase Deployment Rolling Updates:

priyankagrover2804@cloudshell:~/myrepo/NAGP-Assignment/node-project/node-project-k8-resources$ **kubectl set image deployment/node-app-deployment nodejs-container=kapoorpriyanka/web-application:5**

deployment.apps/node-app-deployment image updated

priyankagrover2804@cloudshell:~/myrepo/NAGP-Assignment/node-project/node-project-k8-resources$ kubectl get po

NAME READY STATUS RESTARTS AGE

mongodb-0 1/1 Running 0 41m

node-app-deployment-5985ffbc98-cc8qs 1/1 Running 0 3m32s

node-app-deployment-5985ffbc98-zmmdr 1/1 Running 0 3m35s

node-app-deployment-7586bc4768-pvjmx 1/1 Running 0 4s

node-app-deployment-7586bc4768-z6qqv 0/1 **ContainerCreating** 0 2s

priyankagrover2804@cloudshell:~/myrepo/NAGP-Assignment/node-project/node-project-k8-resources$ kubectl get po

NAME READY STATUS RESTARTS AGE

mongodb-0 1/1 Running 0 41m

node-app-deployment-7586bc4768-l2g4k 1/1 Running 0 4s

node-app-deployment-7586bc4768-pvjmx 1/1 Running 0 8s

node-app-deployment-7586bc4768-z6qqv 1/1 Running 0 6s

priyankagrover2804@cloudshell:~/myrepo/NAGP-Assignment/node-project/node-project-k8-resources$ kubectl get po

NAME READY STATUS RESTARTS AGE

mongodb-0 1/1 Running 0 41m

node-app-deployment-7586bc4768-l2g4k 1/1 Running 0 7s

node-app-deployment-7586bc4768-pvjmx 1/1 Running 0 11s

node-app-deployment-7586bc4768-z6qqv 1/1 Running 0 9s

priyankagrover2804@cloudshell:~/myrepo/NAGP-Assignment/node-project/node-project-k8-resources$ kubectl get po

NAME READY STATUS RESTARTS AGE

mongodb-0 1/1 Running 0 41m

node-app-deployment-7586bc4768-l2g4k 1/1 Running 0 12s

node-app-deployment-7586bc4768-pvjmx 1/1 Running 0 16s

node-app-deployment-7586bc4768-z6qqv 1/1 Running 0 14s

priyankagrover2804@cloudshell:~/myrepo/NAGP-Assignment/node-project/node-project-k8-resources$

priyankagrover2804@cloudshell:~/myrepo/NAGP-Assignment/node-project/node-project-k8-resources$ **kubectl rollout status deployment/node-app-deployment**

deployment "node-app-deployment" successfully rolled out

priyankagrover2804@cloudshell:~/myrepo/NAGP-Assignment/node-project/node-project-k8-resources$ ^C

priyankagrover2804@cloudshell:~/myrepo/NAGP-Assignment/node-project/node-project-k8-resources$ **kubectl rollout history deployment/node-app-deployment**

deployment.apps/node-app-deployment

REVISION CHANGE-CAUSE

2 <none>

3 <none>

5 <none>

6 <none>

7 <none>

Increase / Decrease Load on Pods of Web Application

We have implemented **Horizontal Pod Autoscaler** with CPU utilization as resource metrics. We have also mentioned scaleDown behavior to scale down the pods.

Kubectl apply -f hpa.yaml

Below are logs stating how pods replica are reduced to 1 when cpu utilization was less than 10% and when cpu utilization increases more than 10%, it increase pods replicas to 4.

priyankagrover2804@cloudshell:~/myrepo/NAGP-Assignment/node-project/node-project-k8-resources$ kubectl get hpa

NAME REFERENCE TARGETS MINPODS MAXPODS REPLICAS AGE

node-app-deployment-autoscale Deployment/node-app-deployment <unknown>/10% 1 4 3 103m

priyankagrover2804@cloudshell:~/myrepo/NAGP-Assignment/node-project/node-project-k8-resources$ kubectl get hpa

NAME REFERENCE TARGETS MINPODS MAXPODS REPLICAS AGE

node-app-deployment-autoscale Deployment/node-app-deployment <unknown>/10% 1 4 3 103m

priyankagrover2804@cloudshell:~/myrepo/NAGP-Assignment/node-project/node-project-k8-resources$ kubectl get po

NAME READY STATUS RESTARTS AGE

mongodb-0 1/1 Running 0 84m

node-app-deployment-789fcbf864-hfc6h 1/1 Running 0 48s

node-app-deployment-789fcbf864-m4ljh 1/1 Running 0 44s

node-app-deployment-789fcbf864-rlnd5 1/1 Running 0 46s

priyankagrover2804@cloudshell:~/myrepo/NAGP-Assignment/node-project/node-project-k8-resources$ kubectl get po

NAME READY STATUS RESTARTS AGE

mongodb-0 1/1 Running 0 84m

node-app-deployment-789fcbf864-hfc6h 1/1 Running 0 51s

node-app-deployment-789fcbf864-m4ljh 1/1 Running 0 47s

node-app-deployment-789fcbf864-rlnd5 1/1 Running 0 49s

priyankagrover2804@cloudshell:~/myrepo/NAGP-Assignment/node-project/node-project-k8-resources$ kubectl get po

```
NAME                    READY  STATUS   RESTARTS  AGE
mongodb-0               1/1    Running  0         84m
node-app-deployment-789fcbf864-hfc6h  1/1    Running  0         55s
node-app-deployment-789fcbf864-rlnd5  1/1    Running  0         53s
priyankagrover2804@cloudshell:~/myrepo/NAGP-Assignment/node-project/node-project-k8-resources$ kubectl get po
NAME                    READY  STATUS   RESTARTS  AGE
mongodb-0               1/1    Running  0         84m
node-app-deployment-789fcbf864-hfc6h  1/1    Running  0         58s
node-app-deployment-789fcbf864-rlnd5  1/1    Running  0         56s
priyankagrover2804@cloudshell:~/myrepo/NAGP-Assignment/node-project/node-project-k8-resources$ kubectl get po
NAME                    READY  STATUS   RESTARTS  AGE
mongodb-0               1/1    Running  0         84m
node-app-deployment-789fcbf864-hfc6h  1/1    Running  0         61s
node-app-deployment-789fcbf864-rlnd5  1/1    Running  0         59s
priyankagrover2804@cloudshell:~/myrepo/NAGP-Assignment/node-project/node-project-k8-resources$ kubectl get po
NAME                    READY  STATUS   RESTARTS  AGE
mongodb-0               1/1    Running  0         84m
node-app-deployment-789fcbf864-hfc6h  1/1    Running  0         65s
node-app-deployment-789fcbf864-rlnd5  1/1    Running  0         63s
priyankagrover2804@cloudshell:~/myrepo/NAGP-Assignment/node-project/node-project-k8-resources$ kubectl get hpa
NAME                    REFERENCE                     TARGETS   MINPODS   MAXPODS   REPLICAS   AGE
node-app-deployment-autoscale   Deployment/node-app-deployment   4%/10%    1         4         2          104m
priyankagrover2804@cloudshell:~/myrepo/NAGP-Assignment/node-project/node-project-k8-resources$ kubectl get hpa
NAME                    REFERENCE                     TARGETS   MINPODS   MAXPODS   REPLICAS   AGE
node-app-deployment-autoscale   Deployment/node-app-deployment   4%/10%    1         4         2          104m
priyankagrover2804@cloudshell:~/myrepo/NAGP-Assignment/node-project/node-project-k8-resources$ kubectl get po
```

```
NAME                       READY   STATUS    RESTARTS   AGE
mongodb-0                  1/1     Running   0          85m
node-app-deployment-789fcbf864-hfc6h   1/1     Running   0          82s
priyankagrover2804@cloudshell:~/myrepo/NAGP-Assignment/node-project/node-project-k8-resources$
priyankagrover2804@cloudshell:~/myrepo/NAGP-Assignment/node-project/node-project-k8-resources$ kubectl get po
NAME                       READY   STATUS    RESTARTS   AGE
mongodb-0                  1/1     Running   0          85m
node-app-deployment-789fcbf864-hfc6h   1/1     Running   0          2m17s
priyankagrover2804@cloudshell:~/myrepo/NAGP-Assignment/node-project/node-project-k8-resources$ kubectl exec -it node-app-deployment-789fcbf864-hfc6h -- sh
/app # node
Welcome to Node.js v18.16.0.
Type ".help" for more information.
> function fibo(n){
...     if(n<2)
...         return 1;
...     else
...         return fibo(n-2)+fibo(n-1)
... }
undefined
> fibo(100)


>
/app # exit
priyankagrover2804@cloudshell:~/myrepo/NAGP-Assignment/node-project/node-project-k8-resources$ kubectl get po
NAME                       READY   STATUS    RESTARTS   AGE
mongodb-0                  1/1     Running   0          88m
node-app-deployment-789fcbf864-4bm7r   1/1     Running   0          64s
node-app-deployment-789fcbf864-hfc6h   1/1     Running   0          4m57s
```

node-app-deployment-789fcbf864-srm5x 1/1 Running 0 64s

node-app-deployment-789fcbf864-xfrz4 1/1 Running 0 64s

priyankagrover2804@cloudshell:~/myrepo/NAGP-Assignment/node-project/node-project-k8-resources$ kubectl get hpa

NAME REFERENCE TARGETS MINPODS MAXPODS REPLICAS AGE

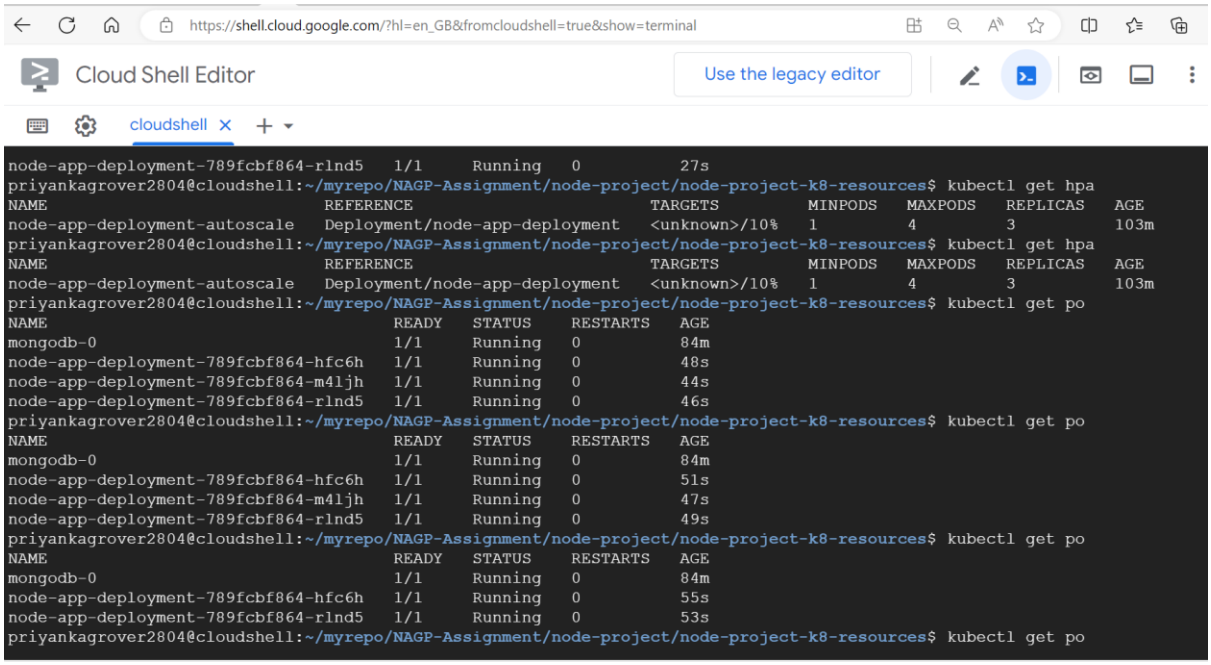
node-app-deployment-autoscale Deployment/node-app-deployment 52%/10% 1 4 4 108m

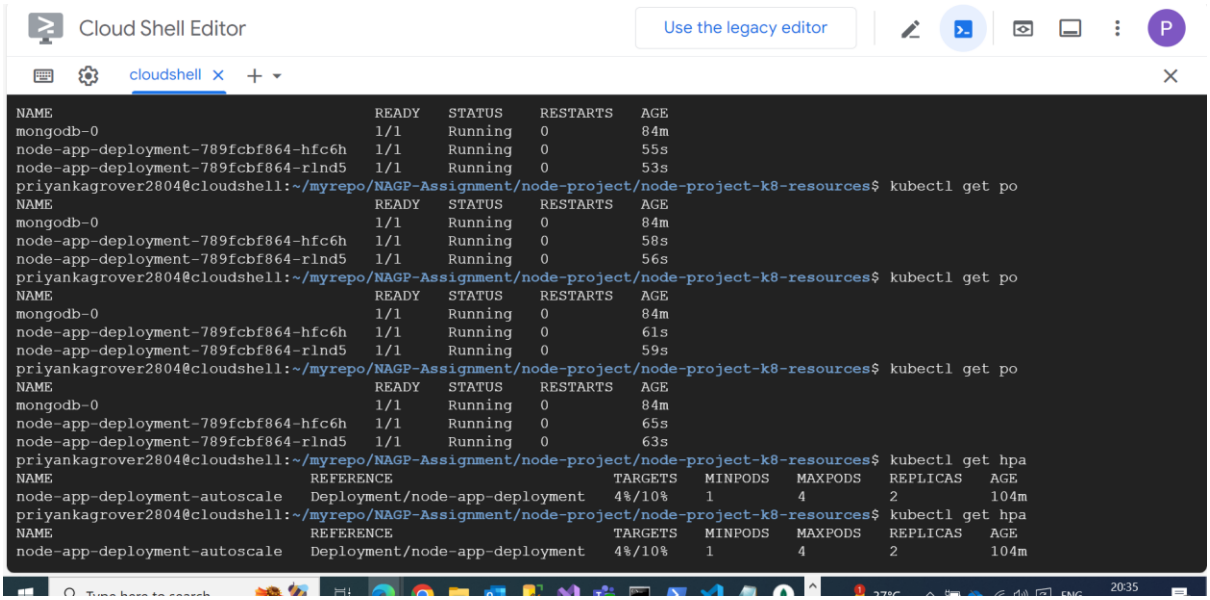
priyankagrover2804@cloudshell:~/myrepo/NAGP-Assignment/node-project/node-project-k8-resources$

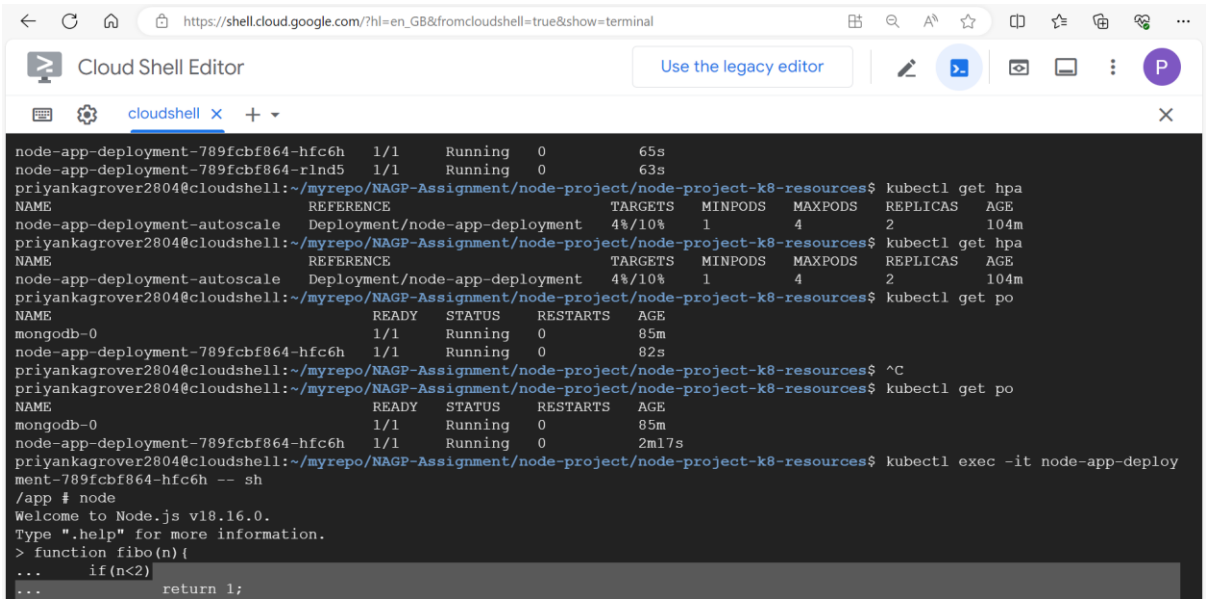
Scale UP:

```
/app # exit
priyankagrover2804@cloudshell:~/myrepo/NAGP-Assignment/node-project/node-project-k8-resources$ kubectl get po
NAME                                  READY   STATUS    RESTARTS   AGE
mongodb-0                             1/1     Running   0          88m
node-app-deployment-789fcbf864-4bm7r  1/1     Running   0          64s
node-app-deployment-789fcbf864-hfc6h  1/1     Running   0          4m57s
node-app-deployment-789fcbf864-srm5x  1/1     Running   0          64s
node-app-deployment-789fcbf864-xfrz4  1/1     Running   0          64s
priyankagrover2804@cloudshell:~/myrepo/NAGP-Assignment/node-project/node-project-k8-resources$ kubectl get hpa
NAME                          REFERENCE                          TARGETS   MINPODS   MAXPODS   REPLICAS   AGE
node-app-deployment-autoscale   Deployment/node-app-deployment   52%/10%   1         4         4          108m
priyankagrover2804@cloudshell:~/myrepo/NAGP-Assignment/node-project/node-project-k8-resources$ ^C
priyankagrover2804@cloudshell:~/myrepo/NAGP-Assignment/node-project/node-project-k8-resources$
```

Scale Down:




Cloud Shell Editor
Use the legacy editor
cloudshell
NAME READY STATUS RESTARTS AGE
mongodb-0 1/1 Running 0 84m
node-app-deployment-789fcbf864-hfc6h 1/1 Running 0 55s
node-app-deployment-789fcbf864-rlnd5 1/1 Running 0 53s
priyankagrover2804@cloudshell:~/myrepo/NAGP-Assignment/node-project/node-project-k8-resources$ kubectl get po
NAME READY STATUS RESTARTS AGE
mongodb-0 1/1 Running 0 84m
node-app-deployment-789fcbf864-hfc6h 1/1 Running 0 58s
node-app-deployment-789fcbf864-rlnd5 1/1 Running 0 56s
priyankagrover2804@cloudshell:~/myrepo/NAGP-Assignment/node-project/node-project-k8-resources$ kubectl get po
NAME READY STATUS RESTARTS AGE
mongodb-0 1/1 Running 0 84m
node-app-deployment-789fcbf864-hfc6h 1/1 Running 0 61s
node-app-deployment-789fcbf864-rlnd5 1/1 Running 0 59s
priyankagrover2804@cloudshell:~/myrepo/NAGP-Assignment/node-project/node-project-k8-resources$ kubectl get po
NAME READY STATUS RESTARTS AGE
mongodb-0 1/1 Running 0 84m
node-app-deployment-789fcbf864-hfc6h 1/1 Running 0 65s
node-app-deployment-789fcbf864-rlnd5 1/1 Running 0 63s
priyankagrover2804@cloudshell:~/myrepo/NAGP-Assignment/node-project/node-project-k8-resources$ kubectl get hpa
NAME REFERENCE TARGETS MINPODS MAXPODS REPLICAS AGE
node-app-deployment-autoscale Deployment/node-app-deployment 4%/10% 1 4 2 104m
priyankagrover2804@cloudshell:~/myrepo/NAGP-Assignment/node-project/node-project-k8-resources$ kubectl get hpa
NAME REFERENCE TARGETS MINPODS MAXPODS REPLICAS AGE
node-app-deployment-autoscale Deployment/node-app-deployment 4%/10% 1 4 2 104m


https://shell.cloud.google.com/?hl=en_GB&fromcloudshell=true&show=terminal
Cloud Shell Editor
Use the legacy editor
cloudshell
node-app-deployment-789fcbf864-hfc6h 1/1 Running 0 65s
node-app-deployment-789fcbf864-rlnd5 1/1 Running 0 63s
priyankagrover2804@cloudshell:~/myrepo/NAGP-Assignment/node-project/node-project-k8-resources$ kubectl get hpa
NAME REFERENCE TARGETS MINPODS MAXPODS REPLICAS AGE
node-app-deployment-autoscale Deployment/node-app-deployment 4%/10% 1 4 2 104m
priyankagrover2804@cloudshell:~/myrepo/NAGP-Assignment/node-project/node-project-k8-resources$ kubectl get hpa
NAME REFERENCE TARGETS MINPODS MAXPODS REPLICAS AGE
node-app-deployment-autoscale Deployment/node-app-deployment 4%/10% 1 4 2 104m
priyankagrover2804@cloudshell:~/myrepo/NAGP-Assignment/node-project/node-project-k8-resources$ kubectl get po
NAME READY STATUS RESTARTS AGE
mongodb-0 1/1 Running 0 85m
node-app-deployment-789fcbf864-hfc6h 1/1 Running 0 82s
priyankagrover2804@cloudshell:~/myrepo/NAGP-Assignment/node-project/node-project-k8-resources$ ^C
priyankagrover2804@cloudshell:~/myrepo/NAGP-Assignment/node-project/node-project-k8-resources$ kubectl get po
NAME READY STATUS RESTARTS AGE
mongodb-0 1/1 Running 0 85m
node-app-deployment-789fcbf864-hfc6h 1/1 Running 0 2m17s
priyankagrover2804@cloudshell:~/myrepo/NAGP-Assignment/node-project/node-project-k8-resources$ kubectl exec -it node-app-deploy
ment-789fcbf864-hfc6h -- sh
/app # node
Welcome to Node.js v18.16.0.
Type ".help" for more information.
> function fibo(n){
... if(n<2)
... return 1;