CSE 322

CLOUD COMPUTING

LAB 9

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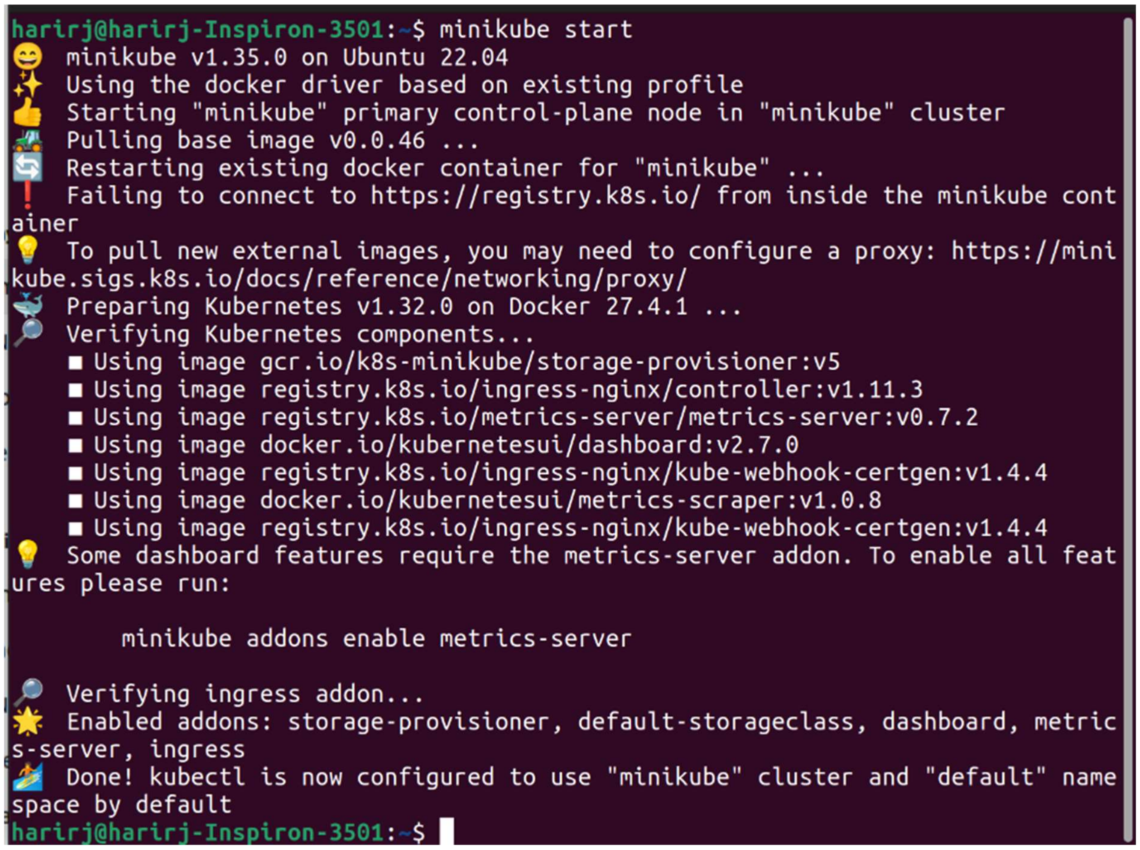
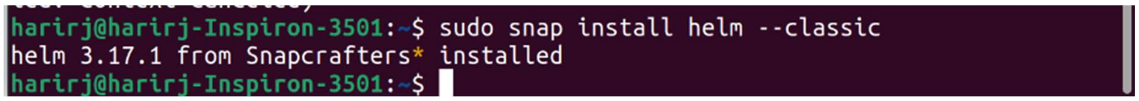
Task 1: Install Prometheus tool and identify the performance metrics of working pods/containers (running on top of minikube).

Step 1: Start Minikube



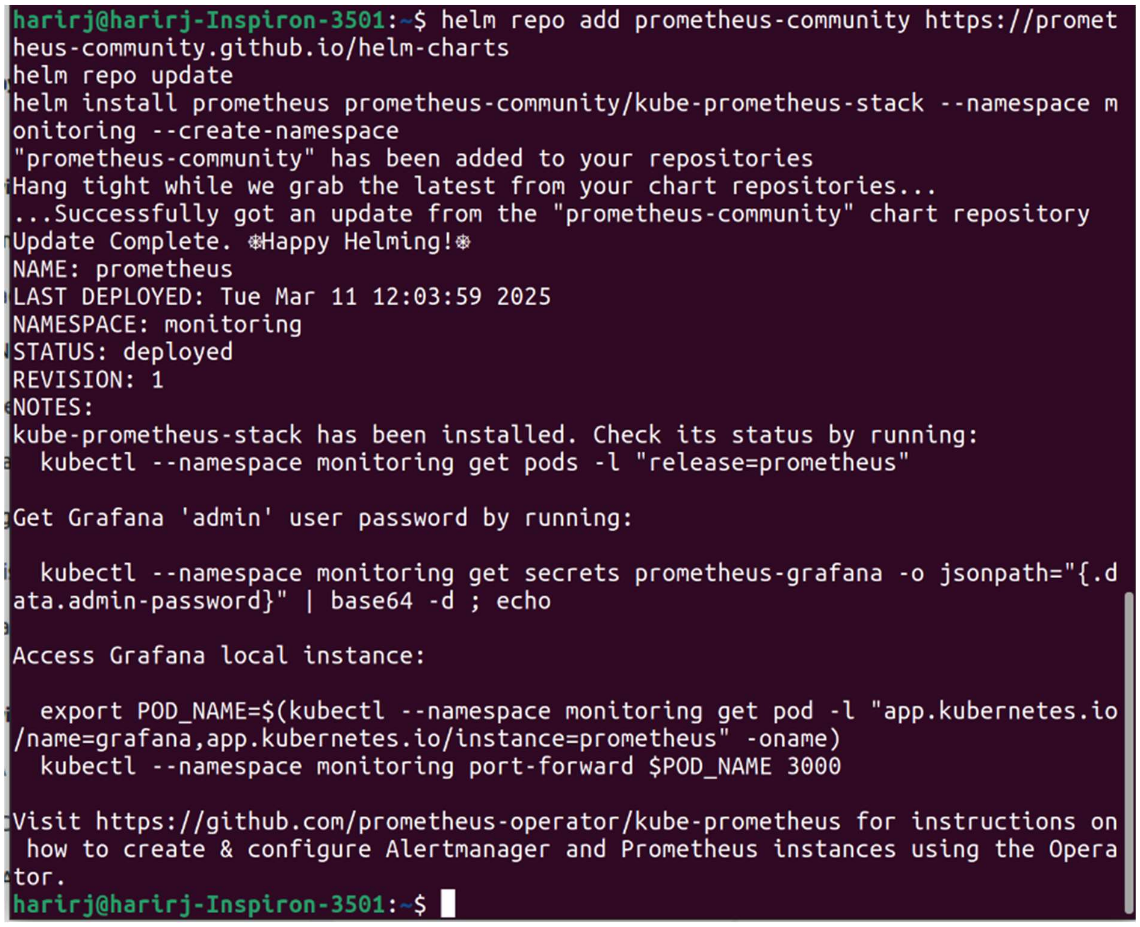
```
harirj@harirj-Inspiron-3501:~$ minikube start
😄  minikube v1.35.0 on Ubuntu 22.04
✨  Using the docker driver based on existing profile
👍  Starting "minikube" primary control-plane node in "minikube" cluster
🚜  Pulling base image v0.0.46 ...
🔄  Restarting existing docker container for "minikube" ...
❗  Failing to connect to https://registry.k8s.io/ from inside the minikube cont
ainer
💡  To pull new external images, you may need to configure a proxy: https://mini
kube.sigs.k8s.io/docs/reference/networking/proxy/
🐳  Preparing Kubernetes v1.32.0 on Docker 27.4.1 ...
🔎  Verifying Kubernetes components...
    ■ Using image gcr.io/k8s-minikube/storage-provisioner:v5
    ■ Using image registry.k8s.io/ingress-nginx/controller:v1.11.3
    ■ Using image registry.k8s.io/metrics-server/metrics-server:v0.7.2
    ■ Using image docker.io/kubernetesui/dashboard:v2.7.0
    ■ Using image registry.k8s.io/ingress-nginx/kube-webhook-certgen:v1.4.4
    ■ Using image docker.io/kubernetesui/metrics-scraper:v1.0.8
    ■ Using image registry.k8s.io/ingress-nginx/kube-webhook-certgen:v1.4.4
💡  Some dashboard features require the metrics-server addon. To enable all feat
ures please run:

        minikube addons enable metrics-server

🔎  Verifying ingress addon...
🌟  Enabled addons: storage-provisioner, default-storageclass, dashboard, metric
s-server, ingress
🏄  Done! kubectl is now configured to use "minikube" cluster and "default" name
space by default
harirj@harirj-Inspiron-3501:~$
```

Step 2: Install helm



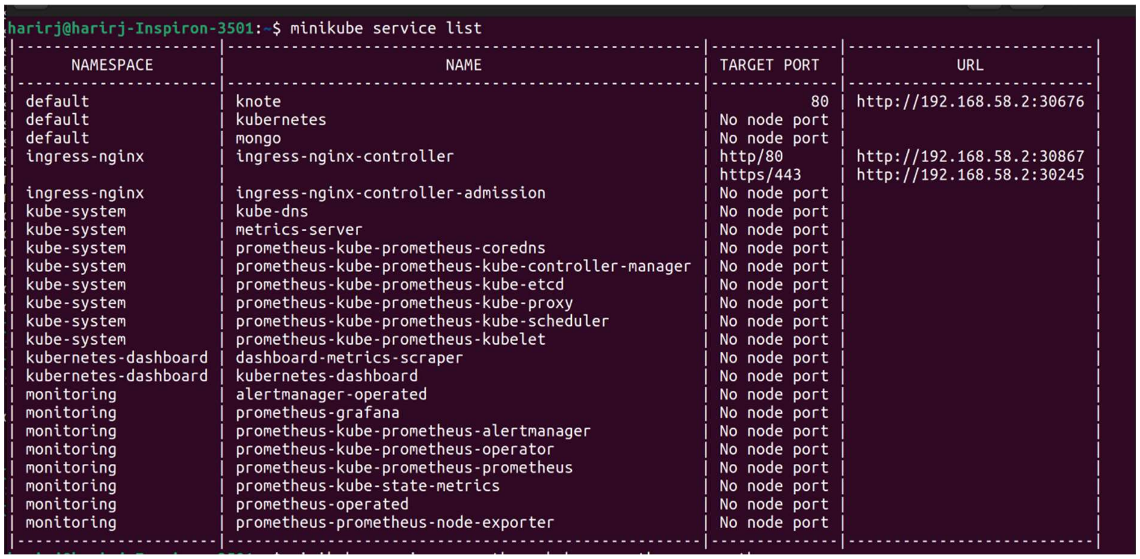
```
harirj@harirj-Inspiron-3501:~$ sudo snap install helm --classic
helm 3.17.1 from Snapcrafters* installed
harirj@harirj-Inspiron-3501:~$
```

Step 3:Enable Prometheus Monitoring



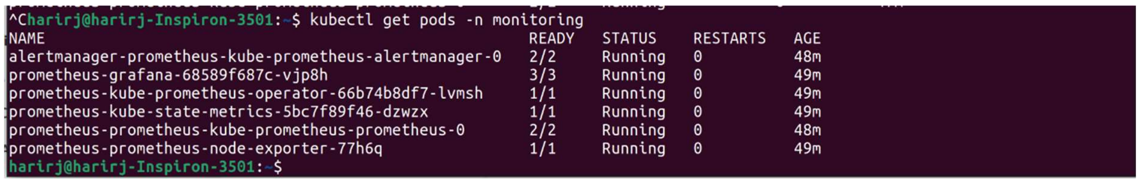
```
harirj@harirj-Inspiron-3501:~$ helm repo add prometheus-community https://promet
heus-community.github.io/helm-charts
helm repo update
helm install prometheus prometheus-community/kube-prometheus-stack --namespace m
onitoring --create-namespace
"prometheus-community" has been added to your repositories
Hang tight while we grab the latest from your chart repositories...
...Successfully got an update from the "prometheus-community" chart repository
Update Complete. ⎈Happy Helming!⎈
NAME: prometheus
LAST DEPLOYED: Tue Mar 11 12:03:59 2025
NAMESPACE: monitoring
STATUS: deployed
REVISION: 1
NOTES:
kube-prometheus-stack has been installed. Check its status by running:
  kubectl --namespace monitoring get pods -l "release=prometheus"

Get Grafana 'admin' user password by running:

  kubectl --namespace monitoring get secrets prometheus-grafana -o jsonpath="{.d
ata.admin-password}" | base64 -d ; echo

Access Grafana local instance:

  export POD_NAME=$(kubectl --namespace monitoring get pod -l "app.kubernetes.io
/name=grafana,app.kubernetes.io/instance=prometheus" -oname)
  kubectl --namespace monitoring port-forward $POD_NAME 3000

Visit https://github.com/prometheus-operator/kube-prometheus for instructions on
 how to create & configure Alertmanager and Prometheus instances using the Opera
tor.
harirj@harirj-Inspiron-3501:~$
```

Step 4 : Check Service list of minikube to check if Prometheus is running



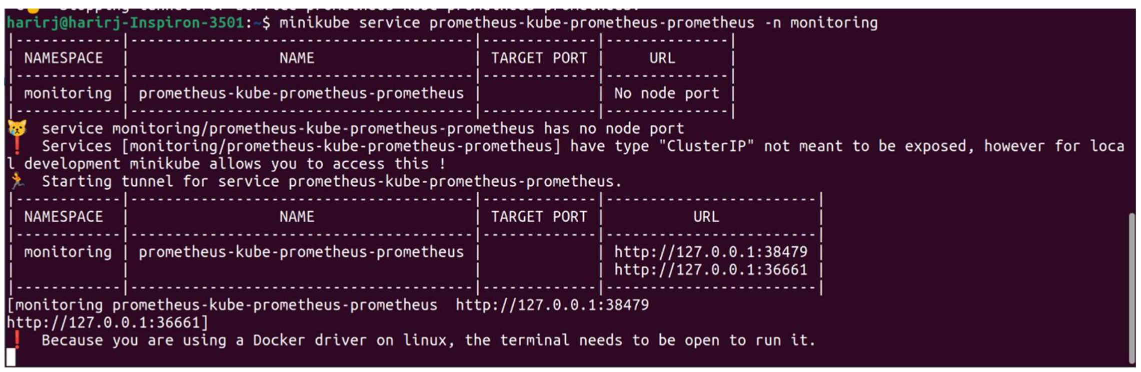
```
harirj@harirj-Inspiron-3501:~$ minikube service list
|----------------------|-----------------------------------------------------|--------------|---------------------------|
|      NAMESPACE       |                        NAME                         | TARGET PORT  |            URL            |
|----------------------|-----------------------------------------------------|--------------|---------------------------|
| default              | knote                                               |           80 | http://192.168.58.2:30676 |
| default              | kubernetes                                          | No node port |                           |
| default              | mongo                                               | No node port |                           |
| ingress-nginx        | ingress-nginx-controller                            | http/80      | http://192.168.58.2:30867 |
|                      |                                                     | https/443    | http://192.168.58.2:30245 |
| ingress-nginx        | ingress-nginx-controller-admission                  | No node port |                           |
| kube-system          | kube-dns                                            | No node port |                           |
| kube-system          | metrics-server                                      | No node port |                           |
| kube-system          | prometheus-kube-prometheus-coredns                  | No node port |                           |
| kube-system          | prometheus-kube-prometheus-kube-controller-manager  | No node port |                           |
| kube-system          | prometheus-kube-prometheus-kube-etcd                | No node port |                           |
| kube-system          | prometheus-kube-prometheus-kube-proxy               | No node port |                           |
| kube-system          | prometheus-kube-prometheus-kube-scheduler           | No node port |                           |
| kube-system          | prometheus-kube-prometheus-kubelet                  | No node port |                           |
| kubernetes-dashboard | dashboard-metrics-scraper                           | No node port |                           |
| kubernetes-dashboard | kubernetes-dashboard                                | No node port |                           |
| monitoring           | alertmanager-operated                               | No node port |                           |
| monitoring           | prometheus-grafana                                  | No node port |                           |
| monitoring           | prometheus-kube-prometheus-alertmanager             | No node port |                           |
| monitoring           | prometheus-kube-prometheus-operator                 | No node port |                           |
| monitoring           | prometheus-kube-prometheus-prometheus               | No node port |                           |
| monitoring           | prometheus-kube-state-metrics                       | No node port |                           |
| monitoring           | prometheus-operated                                 | No node port |                           |
| monitoring           | prometheus-prometheus-node-exporter                 | No node port |                           |
|----------------------|-----------------------------------------------------|--------------|---------------------------|
```

Step 5 : Check the pods running in namespace monitoring

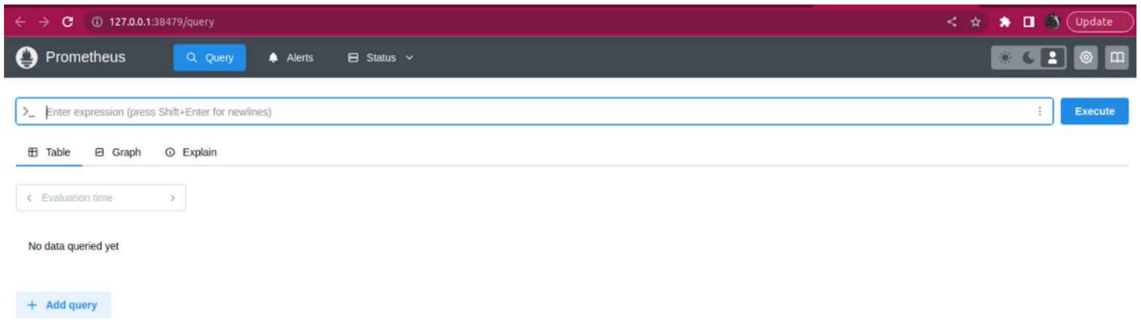


```
^Charirj@harirj-Inspiron-3501:~$ kubectl get pods -n monitoring
NAME                                                     READY   STATUS    RESTARTS   AGE
alertmanager-prometheus-kube-prometheus-alertmanager-0   2/2     Running   0          48m
prometheus-grafana-68589f687c-vjp8h                      3/3     Running   0          49m
prometheus-kube-prometheus-operator-66b74b8df7-lvmsh     1/1     Running   0          49m
prometheus-kube-state-metrics-5bc7f89f46-dzwzx           1/1     Running   0          49m
prometheus-prometheus-kube-prometheus-prometheus-0       2/2     Running   0          48m
prometheus-prometheus-node-exporter-77h6q                1/1     Running   0          49m
harirj@harirj-Inspiron-3501:~$
```

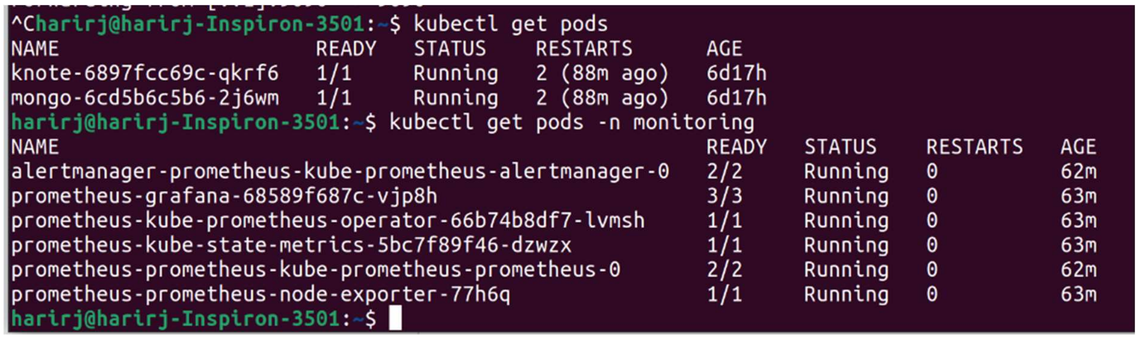
Step 6: Access Prometheus UI



```
harirj@harirj-Inspiron-3501:~$ minikube service prometheus-kube-prometheus-prometheus -n monitoring
|------------|---------------------------------------|-------------|--------------|
| NAMESPACE  |                 NAME                  | TARGET PORT |     URL      |
|------------|---------------------------------------|-------------|--------------|
| monitoring | prometheus-kube-prometheus-prometheus |             | No node port |
|------------|---------------------------------------|-------------|--------------|
😿  service monitoring/prometheus-kube-prometheus-prometheus has no node port
❗  Services [monitoring/prometheus-kube-prometheus-prometheus] have type "ClusterIP" not meant to be exposed, however for loca
l development minikube allows you to access this !
🏃  Starting tunnel for service prometheus-kube-prometheus-prometheus.
|------------|---------------------------------------|-------------|------------------------|
| NAMESPACE  |                 NAME                  | TARGET PORT |          URL           |
|------------|---------------------------------------|-------------|------------------------|
| monitoring | prometheus-kube-prometheus-prometheus |             | http://127.0.0.1:38479 |
|            |                                       |             | http://127.0.0.1:36661 |
|------------|---------------------------------------|-------------|------------------------|
[monitoring prometheus-kube-prometheus-prometheus  http://127.0.0.1:38479
http://127.0.0.1:36661]
❗  Because you are using a Docker driver on linux, the terminal needs to be open to run it.
```



Step 7 : Check the pods running

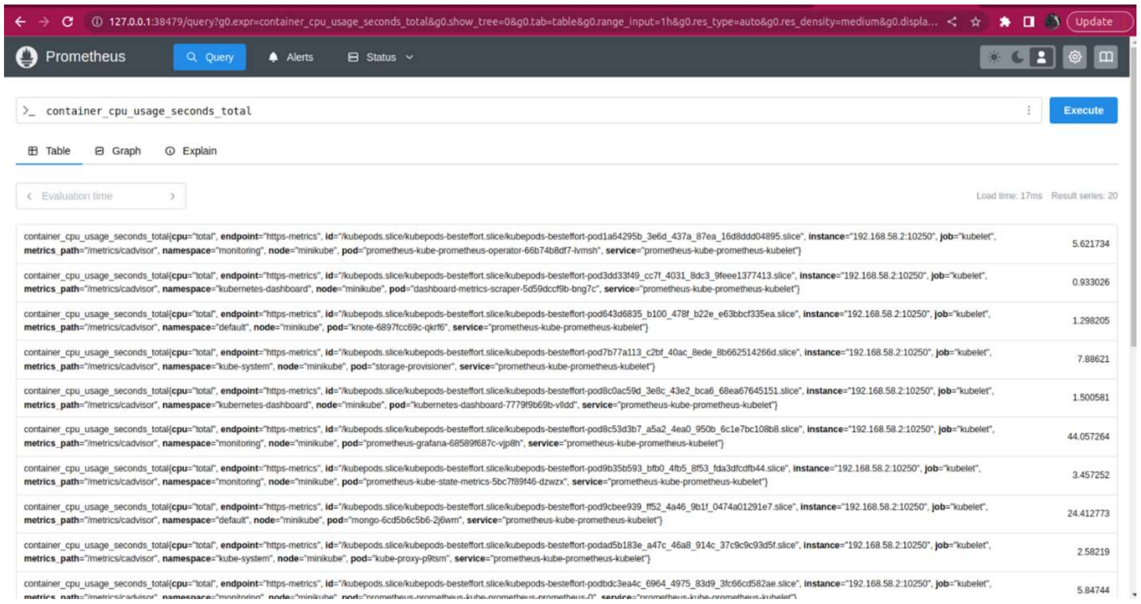


```
^Charirj@harirj-Inspiron-3501:~$ kubectl get pods
NAME                        READY   STATUS    RESTARTS      AGE
knote-6897fcc69c-qkrf6      1/1     Running   2 (88m ago)   6d17h
mongo-6cd5b6c5b6-2j6wm      1/1     Running   2 (88m ago)   6d17h
harirj@harirj-Inspiron-3501:~$ kubectl get pods -n monitoring
NAME                                                     READY   STATUS    RESTARTS   AGE
alertmanager-prometheus-kube-prometheus-alertmanager-0   2/2     Running   0          62m
prometheus-grafana-68589f687c-vjp8h                      3/3     Running   0          63m
prometheus-kube-prometheus-operator-66b74b8df7-lvmsh     1/1     Running   0          63m
prometheus-kube-state-metrics-5bc7f89f46-dzwzx           1/1     Running   0          63m
prometheus-prometheus-kube-prometheus-prometheus-0       2/2     Running   0          62m
prometheus-prometheus-node-exporter-77h6q                1/1     Running   0          63m
harirj@harirj-Inspiron-3501:~$
```

Step 8: Get Performance Metrics

1.CPU Usage

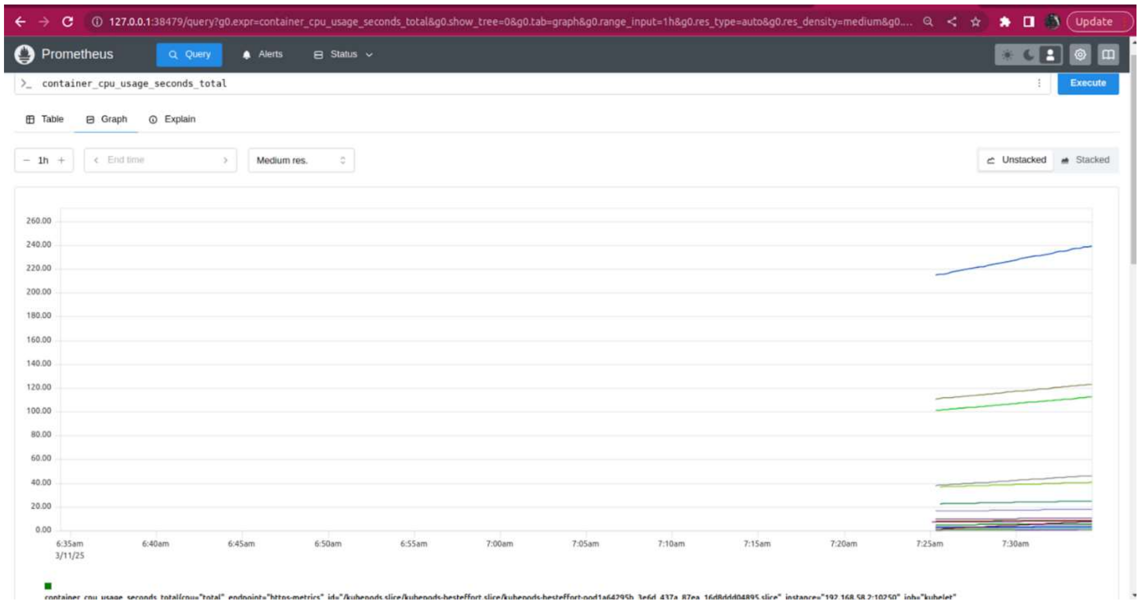
Tabular


127.0.0.1:38479/query?g0.expr=container_cpu_usage_seconds_total&g0.show_tree=0&g0.tab=table&g0.range_input=1h&g0.res_type=auto&g0.res_density=medium&g0.displa...
Update
Prometheus
Query
Alerts
Status
Execute
Table
Graph
Explain
Evaluation time
Load time: 17ms
Result series: 20

```
container_cpu_usage_seconds_total
```

```
container_cpu_usage_seconds_total{cpu="total", endpoint="https-metrics", id="/kubepods.slice/kubepods-besteffort.slice/kubepods-besteffort-pod1a64295b_3e6d_437a_87ea_16d8ddd04895.slice", instance="192.168.58.2:10250", job="kubelet", metrics_path="/metrics/cadvisor", namespace="monitoring", node="minikube", pod="prometheus-kube-prometheus-operator-66b74b8df7-lvmsh", service="prometheus-kube-prometheus-kubelet"}    5.621734
container_cpu_usage_seconds_total{cpu="total", endpoint="https-metrics", id="/kubepods.slice/kubepods-besteffort.slice/kubepods-besteffort-pod3dd33f49_cc7f_4031_8dc3_9feee1377413.slice", instance="192.168.58.2:10250", job="kubelet", metrics_path="/metrics/cadvisor", namespace="kubernetes-dashboard", node="minikube", pod="dashboard-metrics-scraper-5d59dccf9b-bng7c", service="prometheus-kube-prometheus-kubelet"}    0.933026
container_cpu_usage_seconds_total{cpu="total", endpoint="https-metrics", id="/kubepods.slice/kubepods-besteffort.slice/kubepods-besteffort-pod643d6835_b100_478f_b22e_e63bbcf335ea.slice", instance="192.168.58.2:10250", job="kubelet", metrics_path="/metrics/cadvisor", namespace="default", node="minikube", pod="knote-6897fcc69c-qkrf6", service="prometheus-kube-prometheus-kubelet"}    1.298205
container_cpu_usage_seconds_total{cpu="total", endpoint="https-metrics", id="/kubepods.slice/kubepods-besteffort.slice/kubepods-besteffort-pod7b77a113_c2bf_40ac_8ede_8b662514266d.slice", instance="192.168.58.2:10250", job="kubelet", metrics_path="/metrics/cadvisor", namespace="kube-system", node="minikube", pod="storage-provisioner", service="prometheus-kube-prometheus-kubelet"}    7.88621
container_cpu_usage_seconds_total{cpu="total", endpoint="https-metrics", id="/kubepods.slice/kubepods-besteffort.slice/kubepods-besteffort-pod8c0ac59d_3e8c_43e2_bca6_68ea67645151.slice", instance="192.168.58.2:10250", job="kubelet", metrics_path="/metrics/cadvisor", namespace="kubernetes-dashboard", node="minikube", pod="kubernetes-dashboard-7779f9b69b-vlldd", service="prometheus-kube-prometheus-kubelet"}    1.500581
container_cpu_usage_seconds_total{cpu="total", endpoint="https-metrics", id="/kubepods.slice/kubepods-besteffort.slice/kubepods-besteffort-pod8c53d3b7_a5a2_4ea0_950b_6c1e7bc108b8.slice", instance="192.168.58.2:10250", job="kubelet", metrics_path="/metrics/cadvisor", namespace="monitoring", node="minikube", pod="prometheus-grafana-68589f687c-vjp8h", service="prometheus-kube-prometheus-kubelet"}    44.057264
container_cpu_usage_seconds_total{cpu="total", endpoint="https-metrics", id="/kubepods.slice/kubepods-besteffort.slice/kubepods-besteffort-pod9b35b593_bfb0_4fb5_8f53_fda3dfcdfb44.slice", instance="192.168.58.2:10250", job="kubelet", metrics_path="/metrics/cadvisor", namespace="monitoring", node="minikube", pod="prometheus-kube-state-metrics-5bc7f89f46-dzwzx", service="prometheus-kube-prometheus-kubelet"}    3.457252
container_cpu_usage_seconds_total{cpu="total", endpoint="https-metrics", id="/kubepods.slice/kubepods-besteffort.slice/kubepods-besteffort-pod9cbee939_ff52_4a46_9b1f_0474a01291e7.slice", instance="192.168.58.2:10250", job="kubelet", metrics_path="/metrics/cadvisor", namespace="default", node="minikube", pod="mongo-6cd5b6c5b6-2j6wm", service="prometheus-kube-prometheus-kubelet"}    24.412773
container_cpu_usage_seconds_total{cpu="total", endpoint="https-metrics", id="/kubepods.slice/kubepods-besteffort.slice/kubepods-besteffort-podad5b183e_a47c_46a8_914c_37c9c9c93d5f.slice", instance="192.168.58.2:10250", job="kubelet", metrics_path="/metrics/cadvisor", namespace="kube-system", node="minikube", pod="kube-proxy-p9tsm", service="prometheus-kube-prometheus-kubelet"}    2.58219
container_cpu_usage_seconds_total{cpu="total", endpoint="https-metrics", id="/kubepods.slice/kubepods-besteffort.slice/kubepods-besteffort-podbdc3ea4c_6964_4975_83d9_3fc66cd582ae.slice", instance="192.168.58.2:10250", job="kubelet", metrics_path="/metrics/cadvisor", namespace="monitoring", node="minikube", pod="prometheus-prometheus-kube-prometheus-prometheus-0", service="prometheus-kube-prometheus-kubelet"}    5.84744
```

Graphical

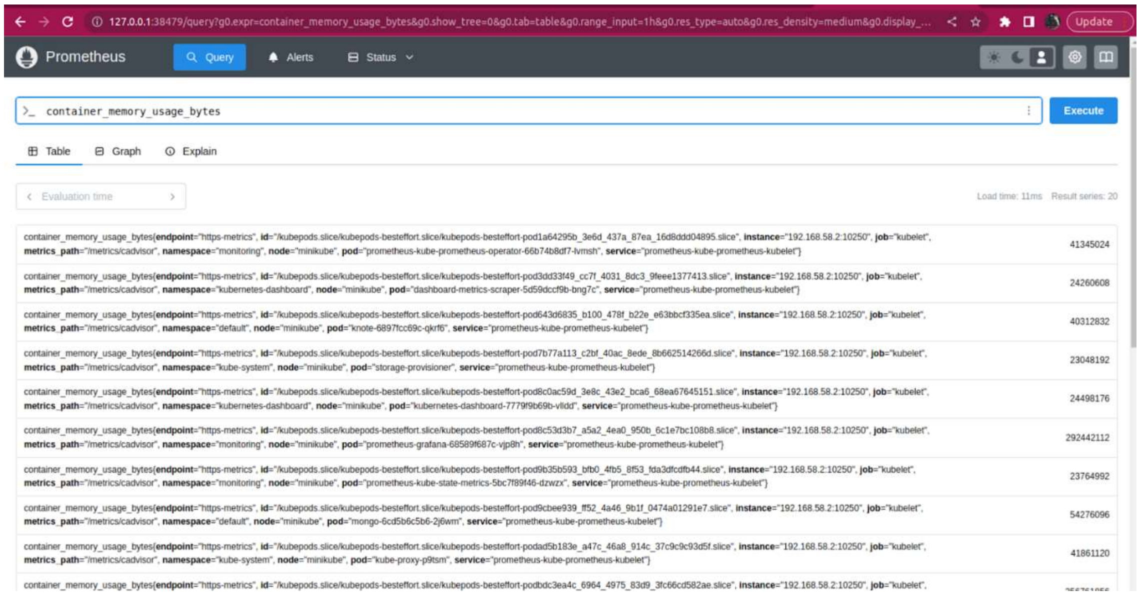


```
container_cpu_usage_seconds_total
```

```
🟩 container_cpu_usage_seconds_total{cpu="total", endpoint="https-metrics", id="/kubepods.slice/kubepods-besteffort.slice/kubepods-besteffort-pod1a64295b_3e6d_437a_87ea_16d8ddd04895.slice", instance="192.168.58.2:10250", job="kubelet",
```

2. Memory Usage

Tabular



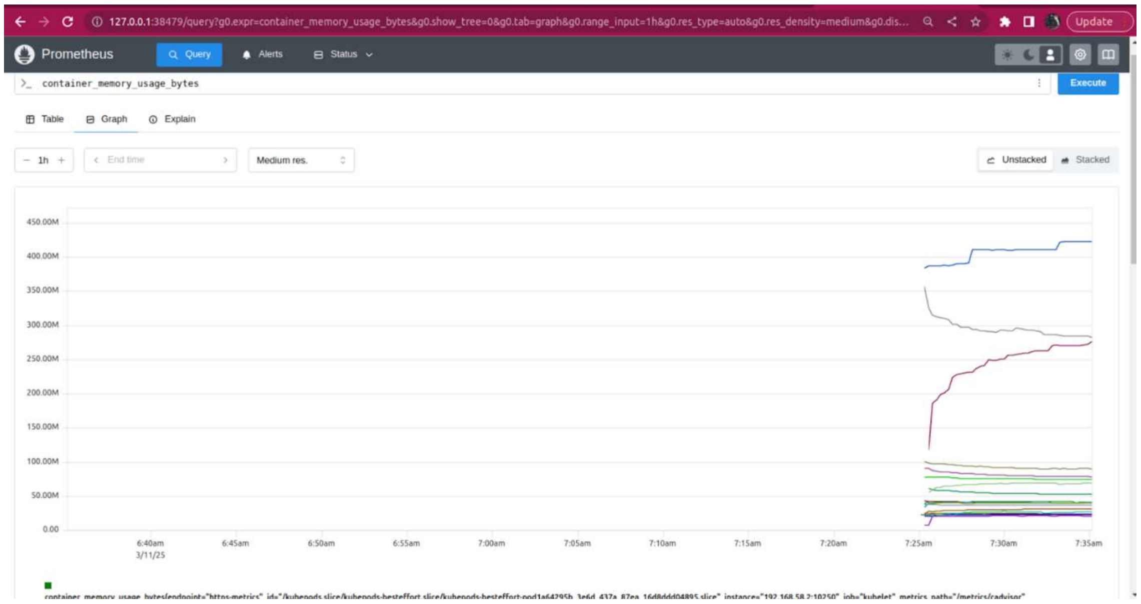
127.0.0.1:38479/query?g0.expr=container_memory_usage_bytes&g0.show_tree=0&g0.tab=table&g0.range_input=1h&g0.res_type=auto&g0.res_density=medium&g0.display_...

```
container_memory_usage_bytes
```

Load time: 11ms   Result series: 20

```
container_memory_usage_bytes{endpoint="https-metrics", id="/kubepods.slice/kubepods-besteffort.slice/kubepods-besteffort-pod1a64295b_3e6d_437a_87ea_16d8ddd04895.slice", instance="192.168.58.2:10250", job="kubelet",
metrics_path="/metrics/cadvisor", namespace="monitoring", node="minikube", pod="prometheus-kube-prometheus-operator-66b74b8df7-lvmsh", service="prometheus-kube-prometheus-kubelet"}    41345024
container_memory_usage_bytes{endpoint="https-metrics", id="/kubepods.slice/kubepods-besteffort.slice/kubepods-besteffort-pod3dd33f49_cc7f_4031_8dc3_9feee1377413.slice", instance="192.168.58.2:10250", job="kubelet",
metrics_path="/metrics/cadvisor", namespace="kubernetes-dashboard", node="minikube", pod="dashboard-metrics-scraper-5d59dccf9b-bng7c", service="prometheus-kube-prometheus-kubelet"}    24260608
container_memory_usage_bytes{endpoint="https-metrics", id="/kubepods.slice/kubepods-besteffort.slice/kubepods-besteffort-pod643d6835_b100_478f_b22e_e63bbcf335ea.slice", instance="192.168.58.2:10250", job="kubelet",
metrics_path="/metrics/cadvisor", namespace="default", node="minikube", pod="knote-6897fcc69c-qkrf6", service="prometheus-kube-prometheus-kubelet"}    40312832
container_memory_usage_bytes{endpoint="https-metrics", id="/kubepods.slice/kubepods-besteffort.slice/kubepods-besteffort-pod7b77a113_c2bf_40ac_8ede_8b662514266d.slice", instance="192.168.58.2:10250", job="kubelet",
metrics_path="/metrics/cadvisor", namespace="kube-system", node="minikube", pod="storage-provisioner", service="prometheus-kube-prometheus-kubelet"}    23048192
container_memory_usage_bytes{endpoint="https-metrics", id="/kubepods.slice/kubepods-besteffort.slice/kubepods-besteffort-pod8c0ac59d_3e8c_43e2_bca6_68ea67645151.slice", instance="192.168.58.2:10250", job="kubelet",
metrics_path="/metrics/cadvisor", namespace="kubernetes-dashboard", node="minikube", pod="kubernetes-dashboard-7779f9b69b-vlldd", service="prometheus-kube-prometheus-kubelet"}    24498176
container_memory_usage_bytes{endpoint="https-metrics", id="/kubepods.slice/kubepods-besteffort.slice/kubepods-besteffort-pod8c53d3b7_a5a2_4ea0_950b_6c1e7bc108b8.slice", instance="192.168.58.2:10250", job="kubelet",
metrics_path="/metrics/cadvisor", namespace="monitoring", node="minikube", pod="prometheus-grafana-68589f687c-vjp8h", service="prometheus-kube-prometheus-kubelet"}    292442112
container_memory_usage_bytes{endpoint="https-metrics", id="/kubepods.slice/kubepods-besteffort.slice/kubepods-besteffort-pod9b35b593_bfb0_4fb5_8f53_fda3dfcdfb44.slice", instance="192.168.58.2:10250", job="kubelet",
metrics_path="/metrics/cadvisor", namespace="monitoring", node="minikube", pod="prometheus-kube-state-metrics-5bc7f89f46-dzwzx", service="prometheus-kube-prometheus-kubelet"}    23764992
container_memory_usage_bytes{endpoint="https-metrics", id="/kubepods.slice/kubepods-besteffort.slice/kubepods-besteffort-pod9cbee939_ff52_4a46_9b1f_0474a01291e7.slice", instance="192.168.58.2:10250", job="kubelet",
metrics_path="/metrics/cadvisor", namespace="default", node="minikube", pod="mongo-6cd5b6c5b6-2j6wm", service="prometheus-kube-prometheus-kubelet"}    54276096
container_memory_usage_bytes{endpoint="https-metrics", id="/kubepods.slice/kubepods-besteffort.slice/kubepods-besteffort-podad5b183e_a47c_46a8_914c_37c9c9c93d5f.slice", instance="192.168.58.2:10250", job="kubelet",
metrics_path="/metrics/cadvisor", namespace="kube-system", node="minikube", pod="kube-proxy-p9tsm", service="prometheus-kube-prometheus-kubelet"}    41861120
container_memory_usage_bytes{endpoint="https-metrics", id="/kubepods.slice/kubepods-besteffort.slice/kubepods-besteffort-podbdc3ea4c_6964_4975_83d9_3fc66cd582ae.slice", instance="192.168.58.2:10250", job="kubelet",
```

Graphical



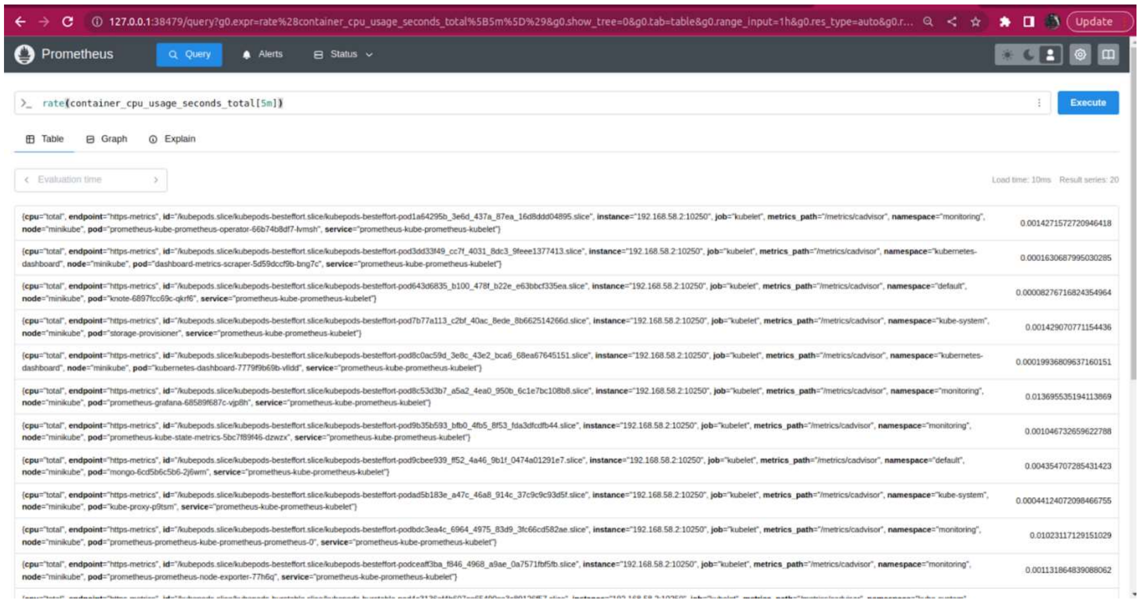
127.0.0.1:38479/query?g0.expr=container_memory_usage_bytes&g0.show_tree=0&g0.tab=graph&g0.range_input=1h&g0.res_type=auto&g0.res_density=medium&g0.dis...

```
container_memory_usage_bytes
```

🟩 container_memory_usage_bytes{endpoint="https-metrics", id="/kubepods.slice/kubepods-besteffort.slice/kubepods-besteffort-pod1a64295b_3e6d_437a_87ea_16d8ddd04895.slice", instance="192.168.58.2:10250", job="kubelet", metrics_path="/metrics/cadvisor",

3.Rate of CPU Usage

Tabular



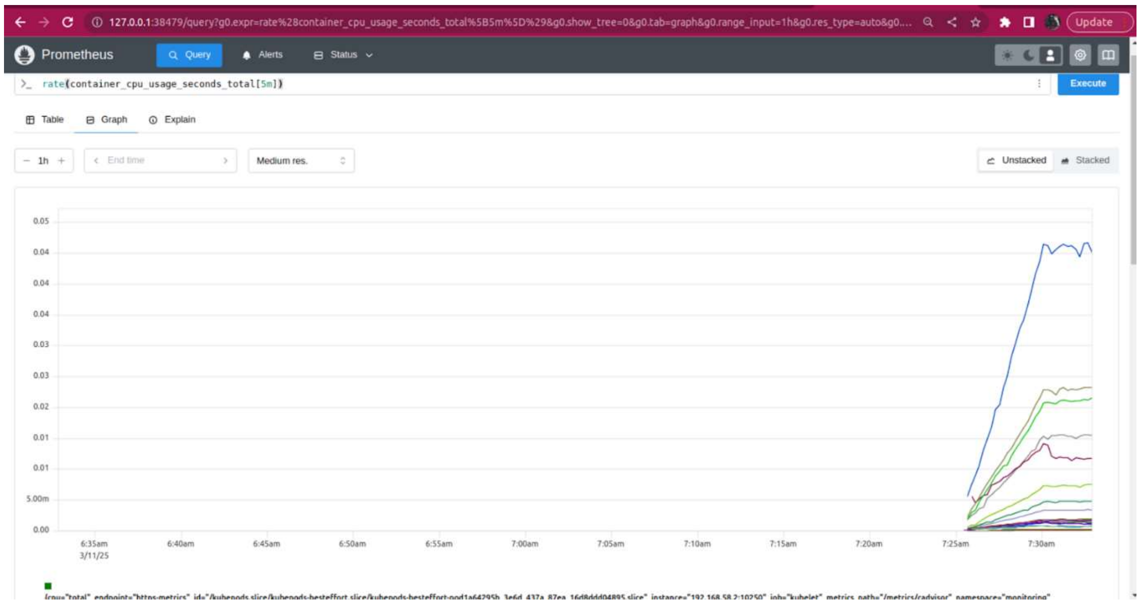
```
127.0.0.1:38479/query?g0.expr=rate%28container_cpu_usage_seconds_total%5B5m%5D%29&g0.show_tree=0&g0.tab=table&g0.range_input=1h&g0.res_type=auto&g0.r...
```

```
rate(container_cpu_usage_seconds_total[5m])
```

Load time: 10ms Result series: 20

```
{cpu="total", endpoint="https-metrics", id="/kubepods.slice/kubepods-besteffort.slice/kubepods-besteffort-pod1a64295b_3e6d_437a_87ea_16d8ddd04895.slice", instance="192.168.58.2:10250", job="kubelet", metrics_path="/metrics/cadvisor", namespace="monitoring",
node="minikube", pod="prometheus-kube-prometheus-operator-66b74b8df7-lvmsh", service="prometheus-kube-prometheus-kubelet"}    0.0014271572720946418
{cpu="total", endpoint="https-metrics", id="/kubepods.slice/kubepods-besteffort.slice/kubepods-besteffort-pod3dd33f49_cc7f_4031_8dc3_9feee1377413.slice", instance="192.168.58.2:10250", job="kubelet", metrics_path="/metrics/cadvisor", namespace="kubernetes-
dashboard", node="minikube", pod="dashboard-metrics-scraper-5d59dccf9b-bng7c", service="prometheus-kube-prometheus-kubelet"}    0.0001630687995030285
{cpu="total", endpoint="https-metrics", id="/kubepods.slice/kubepods-besteffort.slice/kubepods-besteffort-pod643d6835_b100_478f_b22e_e63bbcf335ea.slice", instance="192.168.58.2:10250", job="kubelet", metrics_path="/metrics/cadvisor", namespace="default",
node="minikube", pod="knote-6897fcc69c-qkrf6", service="prometheus-kube-prometheus-kubelet"}    0.00008276716824354964
{cpu="total", endpoint="https-metrics", id="/kubepods.slice/kubepods-besteffort.slice/kubepods-besteffort-pod7b77a113_c2bf_40ac_8ede_8b662514266d.slice", instance="192.168.58.2:10250", job="kubelet", metrics_path="/metrics/cadvisor", namespace="kube-system",
node="minikube", pod="storage-provisioner", service="prometheus-kube-prometheus-kubelet"}    0.001429070771154436
{cpu="total", endpoint="https-metrics", id="/kubepods.slice/kubepods-besteffort.slice/kubepods-besteffort-pod8c0ac59d_3e8c_43e2_bca6_68ea67645151.slice", instance="192.168.58.2:10250", job="kubelet", metrics_path="/metrics/cadvisor", namespace="kubernetes-
dashboard", node="minikube", pod="kubernetes-dashboard-7779f9b69b-vlldd", service="prometheus-kube-prometheus-kubelet"}    0.00019936809637160151
{cpu="total", endpoint="https-metrics", id="/kubepods.slice/kubepods-besteffort.slice/kubepods-besteffort-pod8c53d3b7_a5a2_4ea0_950b_6c1e7bc108b8.slice", instance="192.168.58.2:10250", job="kubelet", metrics_path="/metrics/cadvisor", namespace="monitoring",
node="minikube", pod="prometheus-grafana-68589f687c-vjp8h", service="prometheus-kube-prometheus-kubelet"}    0.013695535194113869
{cpu="total", endpoint="https-metrics", id="/kubepods.slice/kubepods-besteffort.slice/kubepods-besteffort-pod9b35b593_bfb0_4fb5_8f53_fda3dfcdfb44.slice", instance="192.168.58.2:10250", job="kubelet", metrics_path="/metrics/cadvisor", namespace="monitoring",
node="minikube", pod="prometheus-kube-state-metrics-5bc7f89f46-dzwzx", service="prometheus-kube-prometheus-kubelet"}    0.001046732659622788
{cpu="total", endpoint="https-metrics", id="/kubepods.slice/kubepods-besteffort.slice/kubepods-besteffort-pod9cbee939_ff52_4a46_9b1f_0474a01291e7.slice", instance="192.168.58.2:10250", job="kubelet", metrics_path="/metrics/cadvisor", namespace="default",
node="minikube", pod="mongo-6cd5b6c5b6-2j6wm", service="prometheus-kube-prometheus-kubelet"}    0.004354707285431423
{cpu="total", endpoint="https-metrics", id="/kubepods.slice/kubepods-besteffort.slice/kubepods-besteffort-podad5b183e_a47c_46a8_914c_37c9c9c93d5f.slice", instance="192.168.58.2:10250", job="kubelet", metrics_path="/metrics/cadvisor", namespace="kube-system",
node="minikube", pod="kube-proxy-p9tsm", service="prometheus-kube-prometheus-kubelet"}    0.00044124072098466755
{cpu="total", endpoint="https-metrics", id="/kubepods.slice/kubepods-besteffort.slice/kubepods-besteffort-podbdc3ea4c_6964_4975_83d9_3fc66cd582ae.slice", instance="192.168.58.2:10250", job="kubelet", metrics_path="/metrics/cadvisor", namespace="monitoring",
node="minikube", pod="prometheus-prometheus-kube-prometheus-prometheus-0", service="prometheus-kube-prometheus-kubelet"}    0.01023117129151029
{cpu="total", endpoint="https-metrics", id="/kubepods.slice/kubepods-besteffort.slice/kubepods-besteffort-podceaff3ba_f846_4968_a9ae_0a7571fbf5fb.slice", instance="192.168.58.2:10250", job="kubelet", metrics_path="/metrics/cadvisor", namespace="monitoring",
node="minikube", pod="prometheus-prometheus-node-exporter-77h6q", service="prometheus-kube-prometheus-kubelet"}    0.001131864839088062
```

Graphical

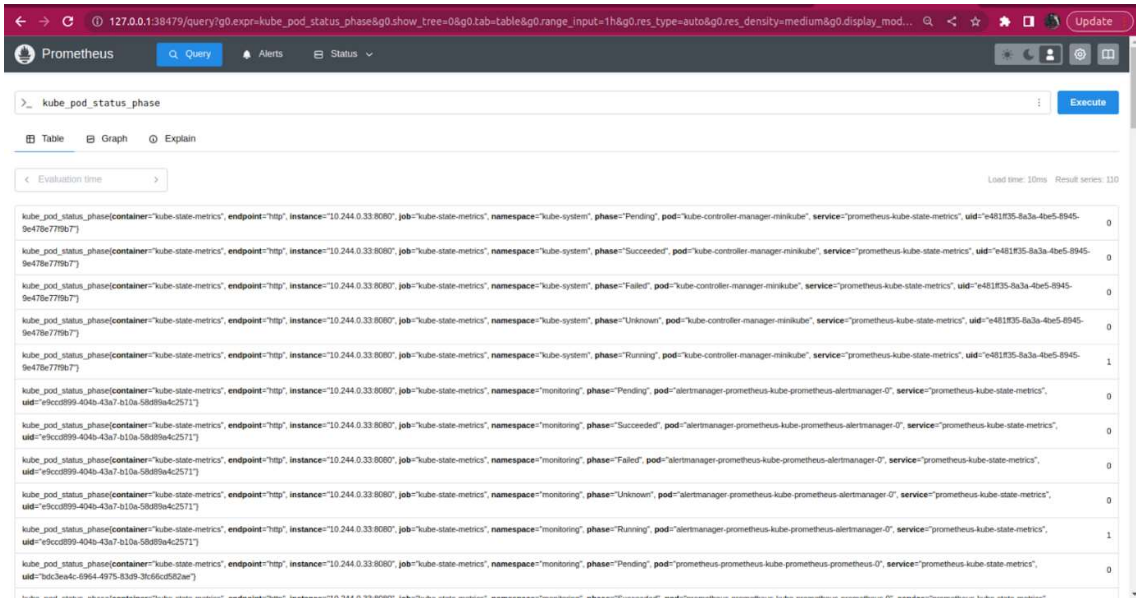


```
127.0.0.1:38479/query?g0.expr=rate%28container_cpu_usage_seconds_total%5B5m%5D%29&g0.show_tree=0&g0.tab=graph&g0.range_input=1h&g0.res_type=auto&g0....
```

```
rate(container_cpu_usage_seconds_total[5m])
```

4.Pod Status

Tabular



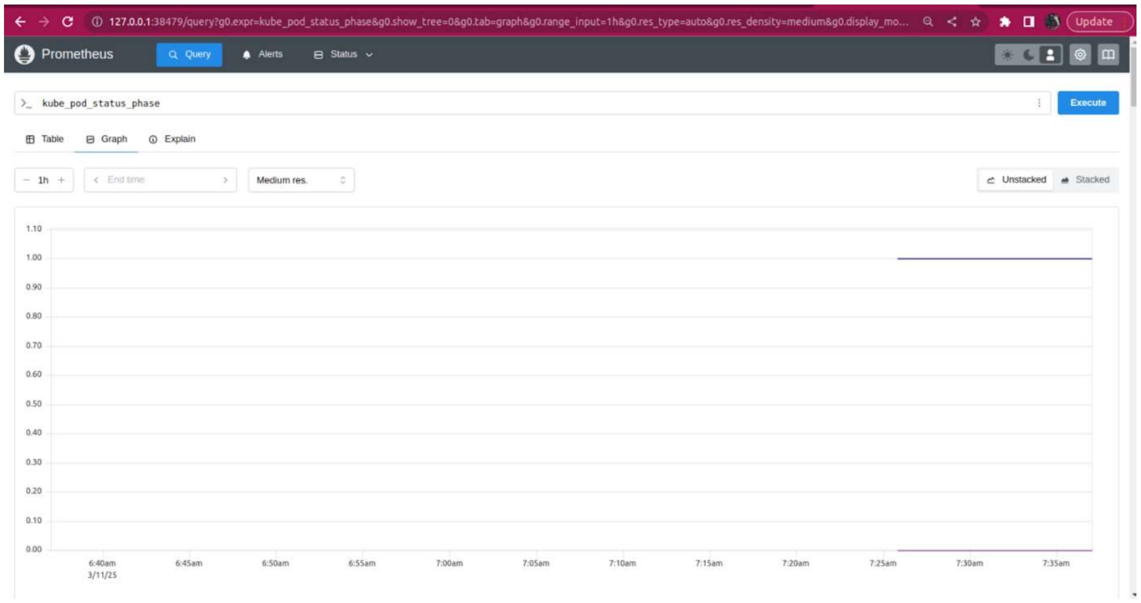
127.0.0.1:38479/query?g0.expr=kube_pod_status_phase&g0.show_tree=0&g0.tab=table&g0.range_input=1h&g0.res_type=auto&g0.res_density=medium&g0.display_mod...

```
kube_pod_status_phase
```

Load time: 10ms   Result series: 110

```
kube_pod_status_phase{container="kube-state-metrics", endpoint="http", instance="10.244.0.33:8080", job="kube-state-metrics", namespace="kube-system", phase="Pending", pod="kube-controller-manager-minikube", service="prometheus-kube-state-metrics", uid="e481ff35-8a3a-4be5-8945-9e478e77f9b7"}    0
kube_pod_status_phase{container="kube-state-metrics", endpoint="http", instance="10.244.0.33:8080", job="kube-state-metrics", namespace="kube-system", phase="Succeeded", pod="kube-controller-manager-minikube", service="prometheus-kube-state-metrics", uid="e481ff35-8a3a-4be5-8945-9e478e77f9b7"}    0
kube_pod_status_phase{container="kube-state-metrics", endpoint="http", instance="10.244.0.33:8080", job="kube-state-metrics", namespace="kube-system", phase="Failed", pod="kube-controller-manager-minikube", service="prometheus-kube-state-metrics", uid="e481ff35-8a3a-4be5-8945-9e478e77f9b7"}    0
kube_pod_status_phase{container="kube-state-metrics", endpoint="http", instance="10.244.0.33:8080", job="kube-state-metrics", namespace="kube-system", phase="Unknown", pod="kube-controller-manager-minikube", service="prometheus-kube-state-metrics", uid="e481ff35-8a3a-4be5-8945-9e478e77f9b7"}    0
kube_pod_status_phase{container="kube-state-metrics", endpoint="http", instance="10.244.0.33:8080", job="kube-state-metrics", namespace="kube-system", phase="Running", pod="kube-controller-manager-minikube", service="prometheus-kube-state-metrics", uid="e481ff35-8a3a-4be5-8945-9e478e77f9b7"}    1
kube_pod_status_phase{container="kube-state-metrics", endpoint="http", instance="10.244.0.33:8080", job="kube-state-metrics", namespace="monitoring", phase="Pending", pod="alertmanager-prometheus-kube-prometheus-alertmanager-0", service="prometheus-kube-state-metrics", uid="e9ccd899-404b-43a7-b10a-58d89a4c2571"}    0
kube_pod_status_phase{container="kube-state-metrics", endpoint="http", instance="10.244.0.33:8080", job="kube-state-metrics", namespace="monitoring", phase="Succeeded", pod="alertmanager-prometheus-kube-prometheus-alertmanager-0", service="prometheus-kube-state-metrics", uid="e9ccd899-404b-43a7-b10a-58d89a4c2571"}    0
kube_pod_status_phase{container="kube-state-metrics", endpoint="http", instance="10.244.0.33:8080", job="kube-state-metrics", namespace="monitoring", phase="Failed", pod="alertmanager-prometheus-kube-prometheus-alertmanager-0", service="prometheus-kube-state-metrics", uid="e9ccd899-404b-43a7-b10a-58d89a4c2571"}    0
kube_pod_status_phase{container="kube-state-metrics", endpoint="http", instance="10.244.0.33:8080", job="kube-state-metrics", namespace="monitoring", phase="Unknown", pod="alertmanager-prometheus-kube-prometheus-alertmanager-0", service="prometheus-kube-state-metrics", uid="e9ccd899-404b-43a7-b10a-58d89a4c2571"}    0
kube_pod_status_phase{container="kube-state-metrics", endpoint="http", instance="10.244.0.33:8080", job="kube-state-metrics", namespace="monitoring", phase="Running", pod="alertmanager-prometheus-kube-prometheus-alertmanager-0", service="prometheus-kube-state-metrics", uid="e9ccd899-404b-43a7-b10a-58d89a4c2571"}    1
kube_pod_status_phase{container="kube-state-metrics", endpoint="http", instance="10.244.0.33:8080", job="kube-state-metrics", namespace="monitoring", phase="Pending", pod="prometheus-prometheus-kube-prometheus-prometheus-0", service="prometheus-kube-state-metrics", uid="bdc3ea4c-6964-4975-83d9-3fc66cd582ae"}    0
```

Graphical



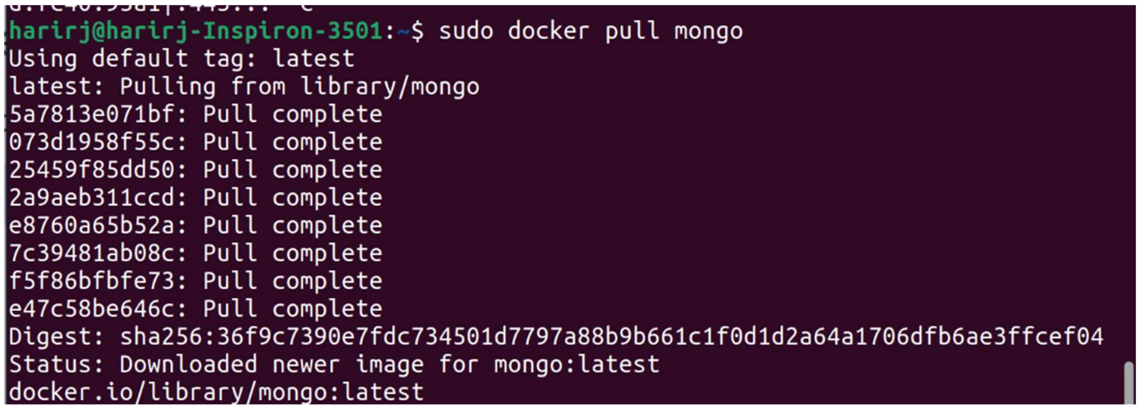
127.0.0.1:38479/query?g0.expr=kube_pod_status_phase&g0.show_tree=0&g0.tab=graph&g0.range_input=1h&g0.res_type=auto&g0.res_density=medium&g0.display_mo...

```
kube_pod_status_phase
```

Task 2: Install MongoDB & Write a Service in Go or Node.js

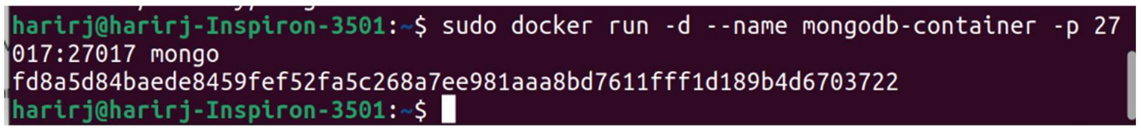
Install MongoDB

Step 1 :Pull the MongoDB Image



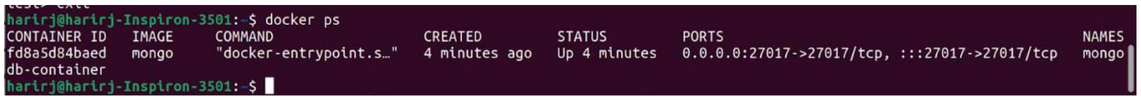
```
harirj@harirj-Inspiron-3501:~$ sudo docker pull mongo
Using default tag: latest
latest: Pulling from library/mongo
5a7813e071bf: Pull complete
073d1958f55c: Pull complete
25459f85dd50: Pull complete
2a9aeb311ccd: Pull complete
e8760a65b52a: Pull complete
7c39481ab08c: Pull complete
f5f86bfbfe73: Pull complete
e47c58be646c: Pull complete
Digest: sha256:36f9c7390e7fdc734501d7797a88b9b661c1f0d1d2a64a1706dfb6ae3ffcef04
Status: Downloaded newer image for mongo:latest
docker.io/library/mongo:latest
```

Step 2 : Run MongoDB Container



```
harirj@harirj-Inspiron-3501:~$ sudo docker run -d --name mongodb-container -p 27017:27017 mongo
fd8a5d84baede8459fef52fa5c268a7ee981aaa8bd7611fff1d189b4d6703722
harirj@harirj-Inspiron-3501:~$
```

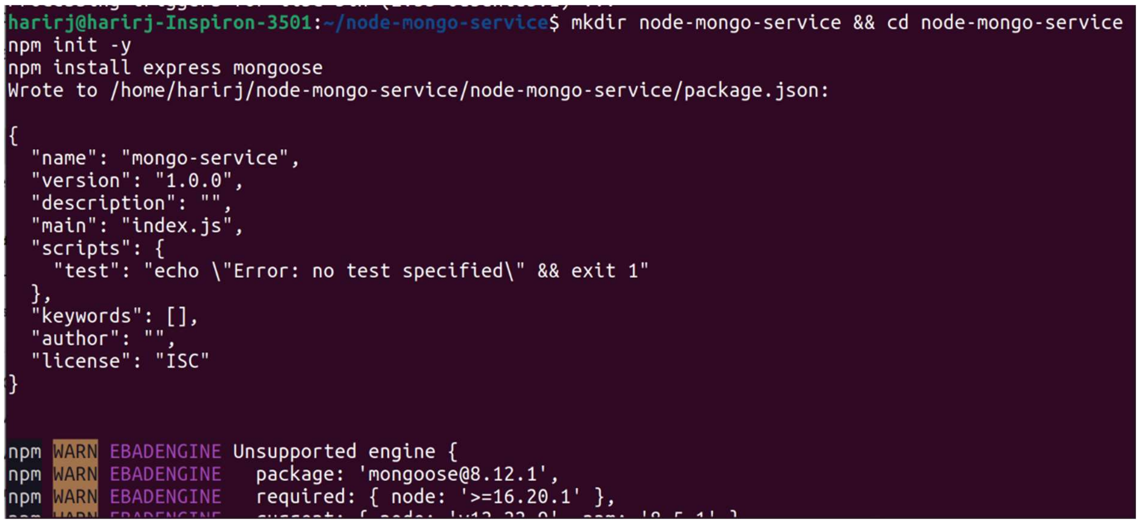
Step 3 : Verify if its running



```
harirj@harirj-Inspiron-3501:~$ docker ps
CONTAINER ID   IMAGE     COMMAND                  CREATED         STATUS         PORTS                                           NAMES
fd8a5d84baed   mongo     "docker-entrypoint.s…"   4 minutes ago   Up 4 minutes   0.0.0.0:27017->27017/tcp, :::27017->27017/tcp   mongo
db-container
harirj@harirj-Inspiron-3501:~$
```

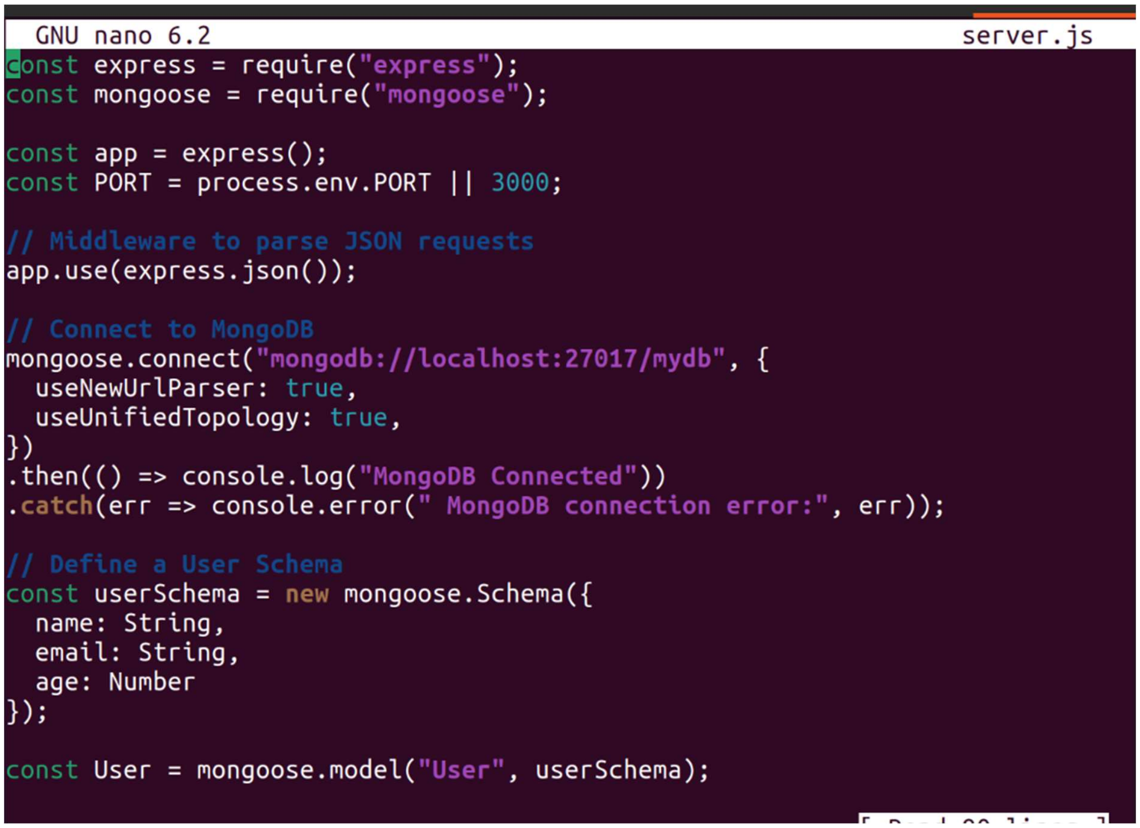
Writing Service

Step 1 :Create a New Project

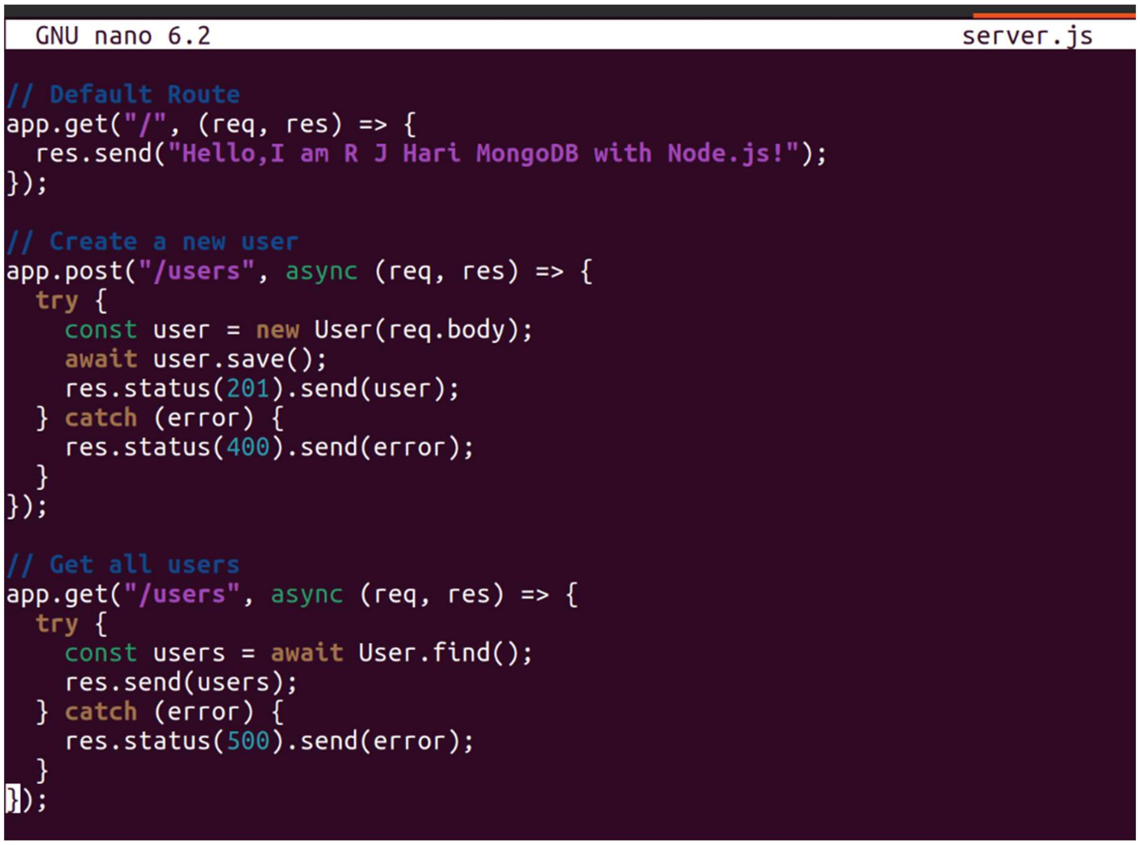


```
harirj@harirj-Inspiron-3501:~/node-mongo-service$ mkdir node-mongo-service && cd node-mongo-service
npm init -y
npm install express mongoose
Wrote to /home/harirj/node-mongo-service/node-mongo-service/package.json:

{
  "name": "mongo-service",
  "version": "1.0.0",
  "description": "",
  "main": "index.js",
  "scripts": {
    "test": "echo \"Error: no test specified\" && exit 1"
  },
  "keywords": [],
  "author": "",
  "license": "ISC"
}


npm WARN EBADENGINE Unsupported engine {
npm WARN EBADENGINE   package: 'mongoose@8.12.1',
npm WARN EBADENGINE   required: { node: '>=16.20.1' },
```

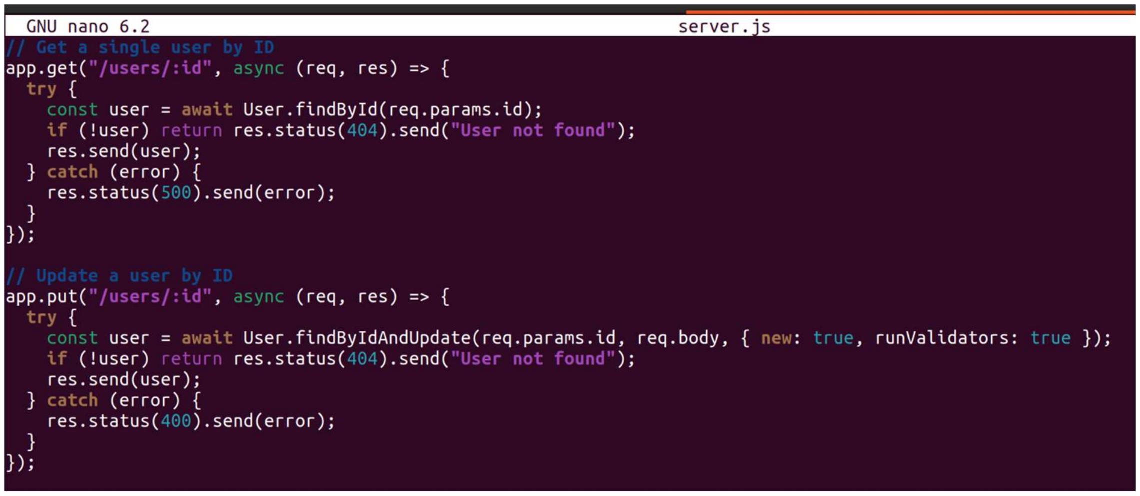
Step 2 : Create server.js



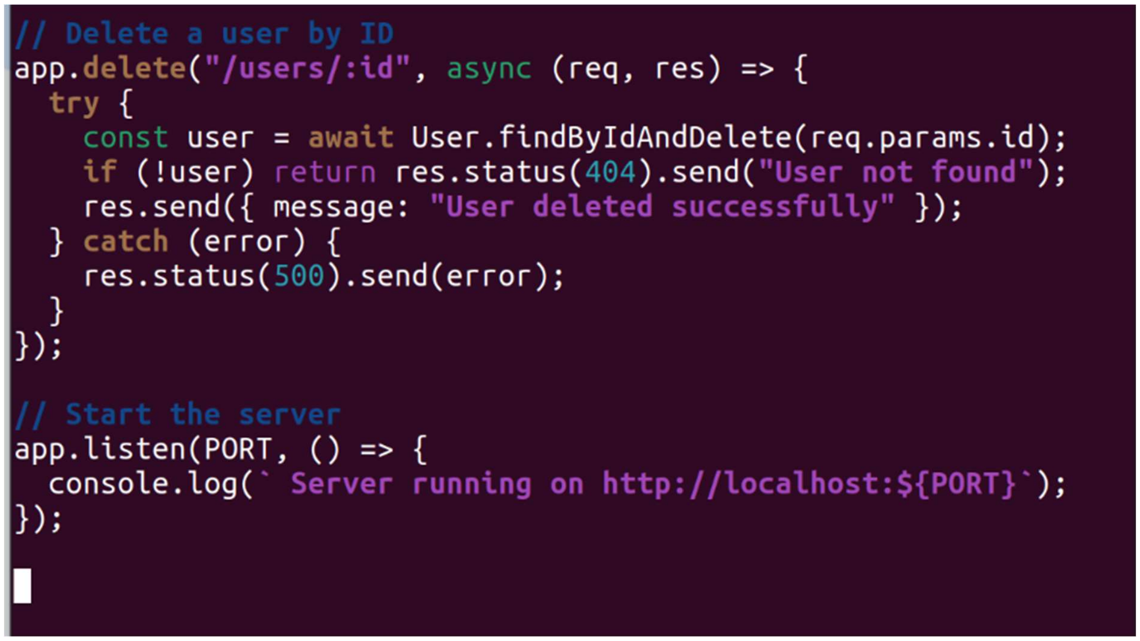
```
  GNU nano 6.2                                                    server.js
const express = require("express");
const mongoose = require("mongoose");

const app = express();
const PORT = process.env.PORT || 3000;

// Middleware to parse JSON requests
app.use(express.json());

// Connect to MongoDB
mongoose.connect("mongodb://localhost:27017/mydb", {
  useNewUrlParser: true,
  useUnifiedTopology: true,
})
.then(() => console.log("MongoDB Connected"))
.catch(err => console.error(" MongoDB connection error:", err));

// Define a User Schema
const userSchema = new mongoose.Schema({
  name: String,
  email: String,
  age: Number
});

const User = mongoose.model("User", userSchema);
```



```
  GNU nano 6.2                                                    server.js

// Default Route
app.get("/", (req, res) => {
  res.send("Hello,I am R J Hari MongoDB with Node.js!");
});

// Create a new user
app.post("/users", async (req, res) => {
  try {
    const user = new User(req.body);
    await user.save();
    res.status(201).send(user);
  } catch (error) {
    res.status(400).send(error);
  }
});

// Get all users
app.get("/users", async (req, res) => {
  try {
    const users = await User.find();
    res.send(users);
  } catch (error) {
    res.status(500).send(error);
  }
});
```

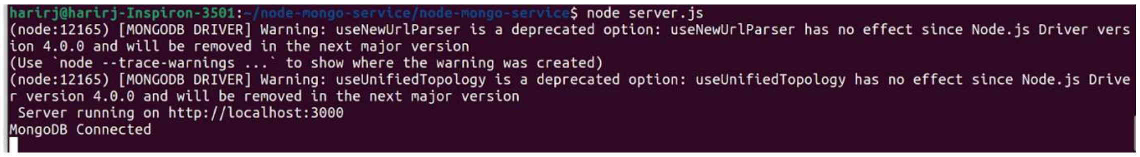


```
  GNU nano 6.2                                              server.js
// Get a single user by ID
app.get("/users/:id", async (req, res) => {
  try {
    const user = await User.findById(req.params.id);
    if (!user) return res.status(404).send("User not found");
    res.send(user);
  } catch (error) {
    res.status(500).send(error);
  }
});

// Update a user by ID
app.put("/users/:id", async (req, res) => {
  try {
    const user = await User.findByIdAndUpdate(req.params.id, req.body, { new: true, runValidators: true });
    if (!user) return res.status(404).send("User not found");
    res.send(user);
  } catch (error) {
    res.status(400).send(error);
  }
});
```



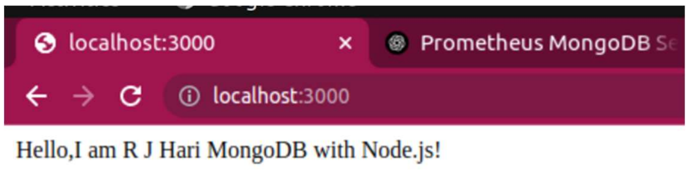
```
// Delete a user by ID
app.delete("/users/:id", async (req, res) => {
  try {
    const user = await User.findByIdAndDelete(req.params.id);
    if (!user) return res.status(404).send("User not found");
    res.send({ message: "User deleted successfully" });
  } catch (error) {
    res.status(500).send(error);
  }
});

// Start the server
app.listen(PORT, () => {
  console.log(` Server running on http://localhost:${PORT}`);
});
```

Step 3 : Run the Service



```
harirj@harirj-Inspiron-3501:~/node-mongo-service/node-mongo-service$ node server.js
(node:12165) [MONGODB DRIVER] Warning: useNewUrlParser is a deprecated option: useNewUrlParser has no effect since Node.js Driver vers
ion 4.0.0 and will be removed in the next major version
(Use `node --trace-warnings ...` to show where the warning was created)
(node:12165) [MONGODB DRIVER] Warning: useUnifiedTopology is a deprecated option: useUnifiedTopology has no effect since Node.js Drive
r version 4.0.0 and will be removed in the next major version
 Server running on http://localhost:3000
MongoDB Connected
```

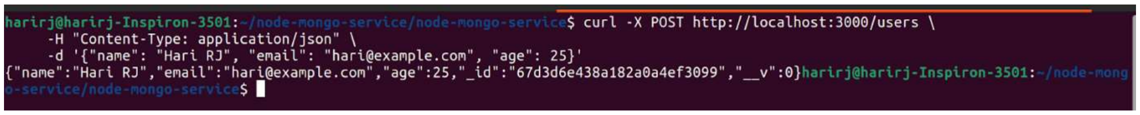
In Browser :



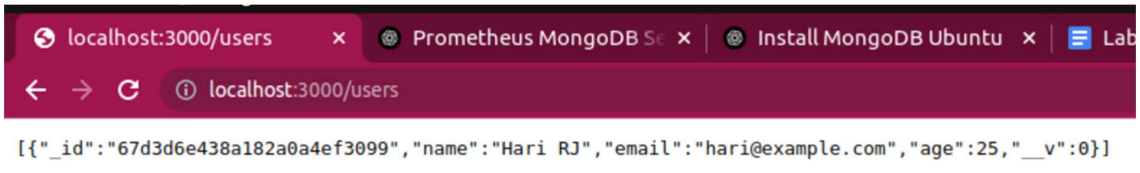
Hello,I am R J Hari MongoDB with Node.js!

Step 4 : Performing CRUD Operations

1.POST (Create a User)

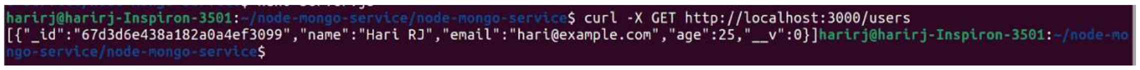


```
harirj@harirj-Inspiron-3501:~/node-mongo-service/node-mongo-service$ curl -X POST http://localhost:3000/users \
     -H "Content-Type: application/json" \
     -d '{"name": "Hari RJ", "email": "hari@example.com", "age": 25}'
{"name":"Hari RJ","email":"hari@example.com","age":25,"_id":"67d3d6e438a182a0a4ef3099","__v":0}harirj@harirj-Inspiron-3501:~/node-mong
o-service/node-mongo-service$ 
```



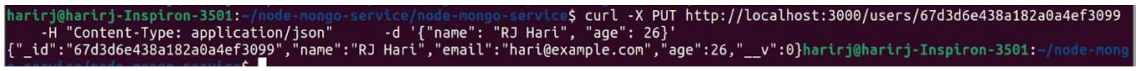
```
[{"_id":"67d3d6e438a182a0a4ef3099","name":"Hari RJ","email":"hari@example.com","age":25,"__v":0}]
```

2.GET Request (Fetch All Users)

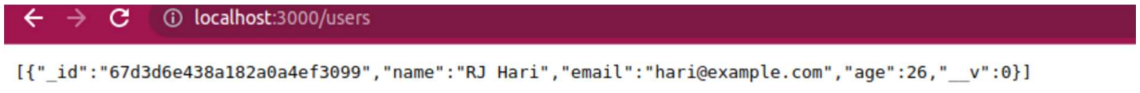


```
harirj@harirj-Inspiron-3501:~/node-mongo-service/node-mongo-service$ curl -X GET http://localhost:3000/users
[{"_id":"67d3d6e438a182a0a4ef3099","name":"Hari RJ","email":"hari@example.com","age":25,"__v":0}]harirj@harirj-Inspiron-3501:~/node-mo
ngo-service/node-mongo-service$
```

3.PUT (Update a User by ID)

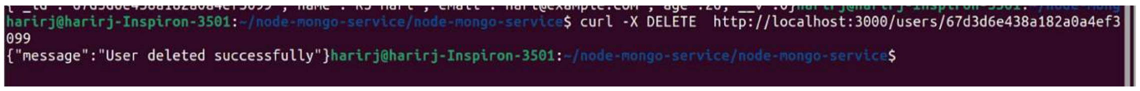


```
harirj@harirj-Inspiron-3501:~/node-mongo-service/node-mongo-service$ curl -X PUT http://localhost:3000/users/67d3d6e438a182a0a4ef3099
    -H "Content-Type: application/json"      -d '{"name": "RJ Hari", "age": 26}'
{"_id":"67d3d6e438a182a0a4ef3099","name":"RJ Hari","email":"hari@example.com","age":26,"__v":0}harirj@harirj-Inspiron-3501:~/node-mong
```

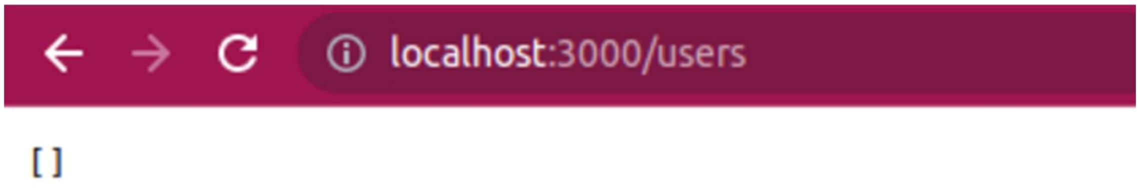


```
[{"_id":"67d3d6e438a182a0a4ef3099","name":"RJ Hari","email":"hari@example.com","age":26,"__v":0}]
```

4.DELETE (Remove a User by ID)



```
harirj@harirj-Inspiron-3501:~/node-mongo-service/node-mongo-service$ curl -X DELETE  http://localhost:3000/users/67d3d6e438a182a0a4ef3
099
{"message":"User deleted successfully"}harirj@harirj-Inspiron-3501:~/node-mongo-service/node-mongo-service$
```



```
[]
```