

Create a Namespace & ClusterRole

First we need to create namespace for our monitoring using the following command, after we start the minikube

```
minikube start
```

create new namespace using

```
kubectl create namespace monitoring
```

To start the dashboard for kubernetes cluster run **minikube dashboard** and navigate to **Cluster / Namespaces** and we can see that the namespace that we create.

The screenshot shows the Kubernetes dashboard interface. On the left is a sidebar menu with categories: Service, Config and Storage, Cluster, and Settings. The 'Namespaces' option under the 'Cluster' category is selected and highlighted in blue. The main content area displays details for the 'monitoring' namespace. It includes a 'Metadata' section with a table showing the namespace's name, creation time (May 4, 2023), age (55 minutes ago), and UID. Below this is a 'Resource information' section showing the status as 'Active'. Further down are sections for 'Resource Quotas' and 'Resource Limits', both of which display 'There is nothing to display here' with the note 'No resources found.' At the bottom, the 'Events' section shows 'Items: 0'.

Name	Created	Age	UID
monitoring	May 4, 2023	55 minutes ago	61bd398b-4be1-4db1-a9f3-7e0b017832f6

Labels: kubernetes.io/metadata.name: monitoring

Status: Active

Resource Quotas: There is nothing to display here. No resources found.

Resource Limits: There is nothing to display here. No resources found.

Events: Items: 0

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To verify that namespace **monitoring** is created in command line type:

```
kubectl get namespaces
```

```
Terminal
ds@ds-HP-ProBook-440-G6:~$ kubectl get namespaces
NAME                STATUS    AGE
default             Active   18m
kube-node-lease     Active   18m
kube-public         Active   18m
kube-system         Active   18m
kubernetes-dashboard Active   16m
monitoring          Active   5m43s
ds@ds-HP-ProBook-440-G6:~$
```

Now lets create new file caled **clusterRole.yaml**

Note: In the role, given below, you can see that we have added ***get, list, and watch*** permissions to nodes, services endpoints, pods, and ingresses. The role binding is bound to the monitoring namespace. If you have any use case to retrieve metrics from any other object, you need to add that in this cluster role.

clusterRole.yaml

```
! clusterRole.yaml x
monitoring > ! clusterRole.yaml > [ ] subjects > {} 0 > namespace
io.k8s.api.rbac.v1.ClusterRoleBinding (v1@clusterrolebinding.json) | io.k8s.api.rbac.v1.ClusterRole (v1@clusterrole.json)
1  apiVersion: rbac.authorization.k8s.io/v1
2  kind: ClusterRole
3  metadata:
4    name: prometheus
5  rules:
6  - apiGroups: ["" ]
7    resources:
8      - nodes
9      - nodes/proxy
10     - services
11     - endpoints
12     - pods
13     verbs: ["get", "list", "watch"]
14  - apiGroups:
15     - extensions
16     resources:
17       - ingresses
18     verbs: ["get", "list", "watch"]
19  - nonResourceURLs: ["/metrics"]
20     verbs: ["get"]
21  ---
22  apiVersion: rbac.authorization.k8s.io/v1
23  kind: ClusterRoleBinding
24  metadata:
25    name: prometheus
26  roleRef:
27    apiGroup: rbac.authorization.k8s.io
28    kind: ClusterRole
29    name: prometheus
30  subjects:
31  - kind: ServiceAccount
32    name: default
33    namespace: monitoring
```

run the following command to create the role

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```
kubectl create -f clusterRole.yaml
```

```
Terminal
ds@ds-HP-ProBook-440-G6:~/Documents/monitoring$ kubectl create -f clusterRole.yaml
clusterrole.rbac.authorization.k8s.io/prometheus created
clusterrolebinding.rbac.authorization.k8s.io/prometheus created
ds@ds-HP-ProBook-440-G6:~/Documents/monitoring$
```

Create a Config Map To Externalize Prometheus Configurations

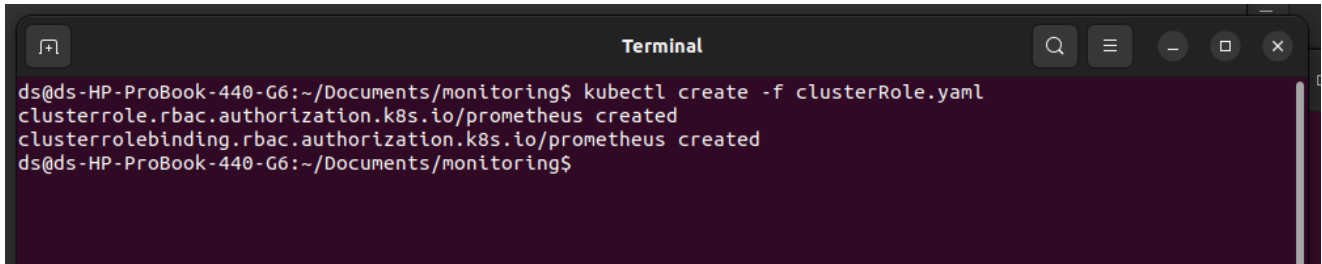
All configurations for Prometheus are part of prometheus.yaml file and all the alert rules for Alertmanager are configured in prometheus.rules.

prometheus.yaml: This is the main Prometheus configuration which holds all the scrape configs, service discovery details, storage locations, data retention configs, etc)

prometheus.rules: This file contains all the Prometheus alerting rules

Lets create new file **config-map.yaml** with the following content [config-map.yaml](#) and excute **kubectl create -f config-map.yaml** this command will create two new file ***prometheus.yaml***: and ***prometheus.rules***:

```
kubectl create -f config-map.yaml
```

A terminal window titled "Terminal" with a dark background. The prompt is "ds@ds-HP-ProBook-440-G6:~/Documents/monitoring\$". The command entered is "kubectl create -f clusterRole.yaml". The output shows three lines: "clusterrole.rbac.authorization.k8s.io/prometheus created", "clusterrolebinding.rbac.authorization.k8s.io/prometheus created", and the prompt "ds@ds-HP-ProBook-440-G6:~/Documents/monitoring\$".

```
ds@ds-HP-ProBook-440-G6:~/Documents/monitoring$ kubectl create -f clusterRole.yaml
clusterrole.rbac.authorization.k8s.io/prometheus created
clusterrolebinding.rbac.authorization.k8s.io/prometheus created
ds@ds-HP-ProBook-440-G6:~/Documents/monitoring$
```

The prometheus.yaml contains all the configurations to discover pods and services running in the Kubernetes cluster dynamically. We have the following scrape jobs in our Prometheus scrape configuration.

- **kubernetes-apiservers**: It gets all the metrics from the API servers.
- **kubernetes-nodes**: It collects all the kubernetes node metrics.
- **kubernetes-pods**: All the pod metrics get discovered if the pod metadata is annotated with prometheus.io/scrape and prometheus.io/port annotations.
- **kubernetes-cadvisor**: Collects all cAdvisor metrics.
- **kubernetes-service-endpoints**: All the Service endpoints are scrapped if the service metadata is annotated with prometheus.io/scrape and prometheus.io/port annotations. It can be used for black-box monitoring.

Create a Prometheus Deployment

Let`s create new file called **prometheus-deployment.yaml** with the following content.

```

! prometheus-deployment.yaml 1 x
! prometheus-deployment.yaml > {} spec > {} template > {} spec > [ ] containers > {} 0 > [ ] volumeMounts > {} 1 > name
io.k8s.api.apps.v1.Deployment (v1@deployment.json)
1  apiVersion: apps/v1
2  kind: Deployment
3  metadata:
4    name: prometheus-deployment
5    namespace: monitoring
6    labels:
7      app: prometheus-server
8  spec:
9    replicas: 1
10   selector:
11     matchLabels:
12       app: prometheus-server
13   template:
14     metadata:
15       labels:
16         app: prometheus-server
17     spec:
18       containers:
19         - name: prometheus
20           image: prom/prometheus
21           args:
22             - "--storage.tsdb.retention.time=12h"
23             - "--config.file=/etc/prometheus/prometheus.yml"
24             - "--storage.tsdb.path=/prometheus/"
25           ports:
26             - containerPort: 9090
27           resources:
28             requests:
29               cpu: 500m
30               memory: 500M
31             limits:
32               cpu: 1
33               memory: 1Gi
34           volumeMounts:
35             - name: prometheus-config-volume
36               mountPath: /etc/prometheus/
37             - name: prometheus-storage-volume
38               mountPath: /prometheus/
39       volumes:
40         - name: prometheus-config-volume
41           configMap:
42             defaultMode: 420
43             name: prometheus-server-conf
44         - name: prometheus-storage-volume
45           emptyDir: {}

```

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Run the command ***kubectl create -f prometheus-deployment.yaml*** to create the deployment

```
kubectl create -f prometheus-deployment.yaml
```

```

ds@ds-HP-ProBook-440-G6:~/Documents/monitoring$ kubectl create -f prometheus-deployment.yaml
deployment.apps/prometheus-deployment created
ds@ds-HP-ProBook-440-G6:~/Documents/monitoring$

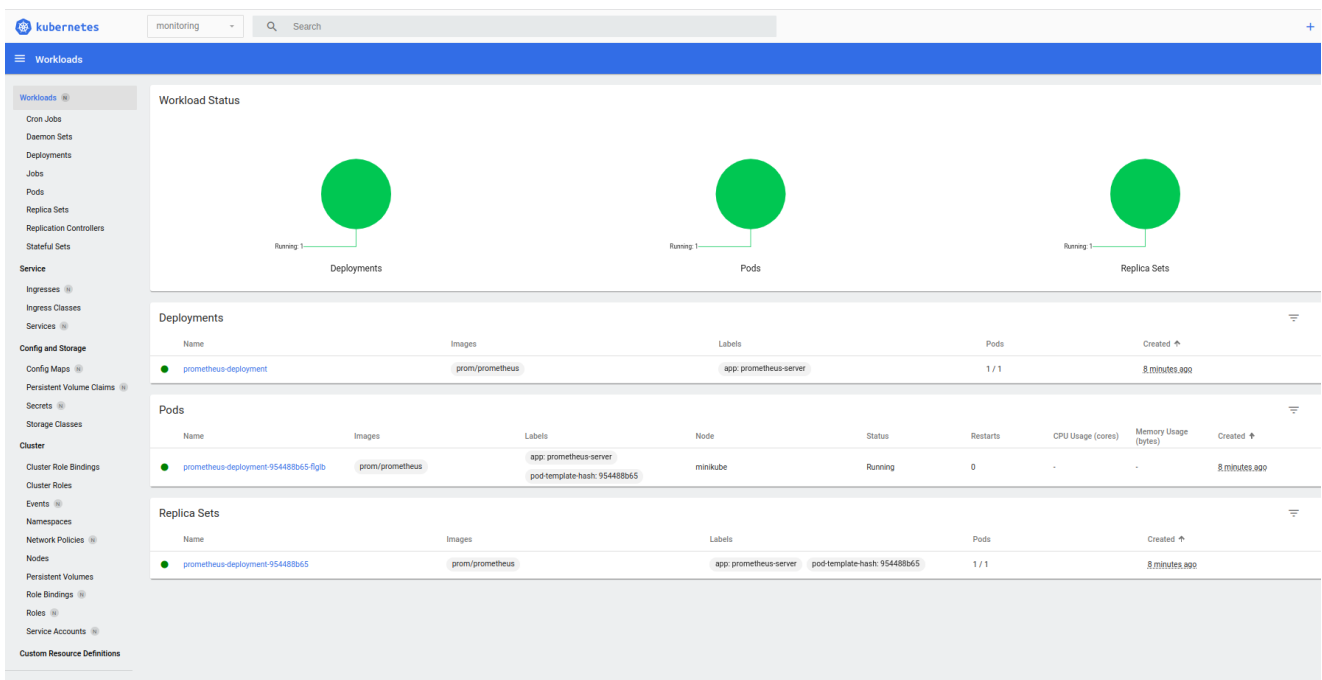
```

You can check the created deployment using the following command or you can check also ***from minikube dashboard***.

```
kubectl get deployments --namespace=monitoring
```

```
deployment.apps/prometheus-deployment created
ds@ds-HP-ProBook-440-G6:~/Documents/monitoring$ kubectl get deployments --namespace=monitoring
NAME                READY   UP-TO-DATE   AVAILABLE   AGE
prometheus-deployment 1/1     1            1           3m27s
ds@ds-HP-ProBook-440-G6:~/Documents/monitoring$
```

Minikube dashboard



Connecting To Prometheus Dashboard

1. First get the pods name

kubectl get pods --namespace=monitoring

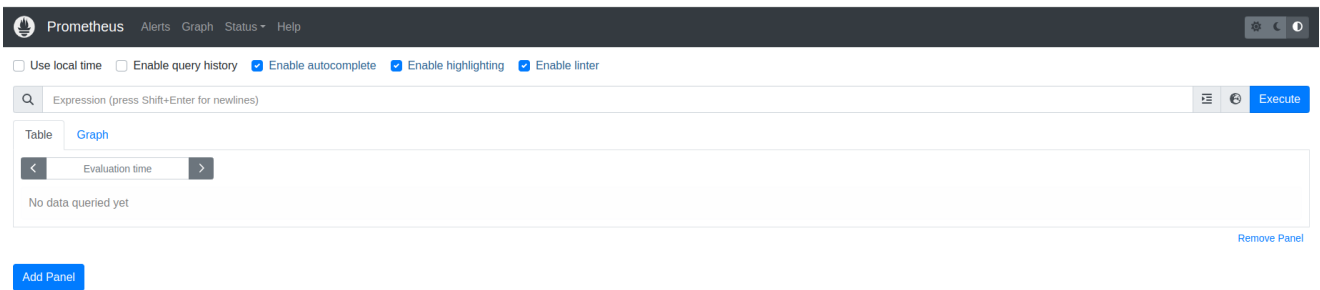
```
ds@ds-HP-ProBook-440-G6:/media/ds/New Volume/sfa-homework/Prometheus Monitoring$ kubectl get pods --namespace=monitoring
NAME                READY   STATUS    RESTARTS   AGE
prometheus-deployment-954488b65-flglb 1/1     Running   0           10m
ds@ds-HP-ProBook-440-G6:/media/ds/New Volume/sfa-homework/Prometheus Monitoring$
```

2. execute the following command to start monitoring dashboard

kubectl port-forward prometheus-deployment-954488b65-flglb 8080:9090 -n monitoring

```
ds@ds-HP-ProBook-440-G6:/media/ds/New Volume/sfa-homework/Prometheus Monitoring$ kubectl port-forward prometheus-deployment-954488b65-flglb 8080:9090 -n monitoring
Forwarding from 127.0.0.1:8080 -> 9090
Forwarding from [::1]:8080 -> 9090
Handling connection for 8080
Handling connection for 8080
Handling connection for 8080
```

You can open you browser to **http://localhost:8080** and view the dashboard



Method 2: Exposing Prometheus as a Service [NodePort & LoadBalancer]

To access the Prometheus dashboard over a IP or a DNS name, you need to expose it as a Kubernetes service.

Step 1: Create a file named `prometheus-service.yaml` and copy the following contents. We will expose Prometheus on all kubernetes node IP's on port 30000.

```
apiVersion: v1
kind: Service
metadata:
  name: prometheus-service
  namespace: monitoring
  annotations:
    prometheus.io/scrape: 'true'
    prometheus.io/port: '9090'
spec:
  selector:
    app: prometheus-server
  type: NodePort
  ports:
    - port: 8080
      targetPort: 9090
      nodePort: 30000
```

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Step 2: Create the service using the following command.

```
kubectl create -f prometheus-service.yaml --namespace=monitoring
```

```
ds@ds-HP-ProBook-440-G6:~/Documents/monitoring$ kubectl create -f prometheus-service.yaml --namespace=monitoring
service/prometheus-service created
ds@ds-HP-ProBook-440-G6:~/Documents/monitoring$
```

