How To Setup Prometheus Monitoring On Kubernetes Cluster

Prometheus is an open source monitoring framework. Explaining Prometheus is out of the scope of this article. In this article, I will guide you to setup Prometheus on a Kubernetes cluster and collect node, pods and services metrics automatically using Kubernetes service discovery configurations. If you want to know more about Prometheus, You can watch all the Prometheus related videos from here.

Prometheus Monitoring On Kubernetes

I assume that you have a kubernetes cluster up and running with kubectl setup on your workstation. If you don't have a kubernetes setup, you can set up a cluster on google cloud by following this article.

Latest Prometheus is available as a docker image in its official docker hub account. We will use that image for the setup.

Let's get started with the setup.

All the configuration files I mentioned in this guide is hosted on Github. You can clone the repo using the following command. Thanks to James for contributing to this repo. Please don't hesitate to contribute to the repo for adding features.

Create A Namespace:-

First, we will create a Kubernetes namespace for all our monitoring components. Execute the following command to create a new namespace called monitoring.

```
kubectl create namespace monitoring
```

You need to assign cluster reader permission to this namespace so that Prometheus can fetch the metrics from kubernetes API's.

1. Create a file named clusterRole.yaml and copy the content of this file –> ClusterRole Config

2. Create the role using the following command

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

Create A Config Map:-

We should create a config map with all the prometheus scrape config and alerting rules, which will be mounted to the Prometheus container in `/etc/prometheus` as `prometheus.yaml` and `prometheus.rules` files. The prometheus.yaml contains all the configuration to dynamically discover pods and services running in the kubernetes cluster. prometheus.rules will contain all the alert rules for sending alerts to alert manager.

1. Create a file called config-map.yaml and copy the contents of this file –> Prometheus Config File

2. Execute the following command to create the config map in kubernetes.

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

Create A Prometheus Deployment

1. Create a file named `prometheus-deployment.yaml` and copy the following contents onto the file. In this configuration, we are mounting the Prometheus config map as a file inside /etc/prometheus. It uses the official Prometheus image from docker hub.

```yaml
apiVersion: extensions/v1beta1
kind: Deployment
metadata:
  name: prometheus-deployment
  namespace: monitoring
spec:
  replicas: 1
  template:
    metadata:
      labels:
        app: prometheus-server
    spec:
      containers:
        - name: prometheus
          image: prom/prometheus:v2.1.0
          args:
            - "--config.file=/etc/prometheus/prometheus.yml"
            - "--storage.tsdb.path=/prometheus/"
          ports:
            - containerPort: 9090
          volumeMounts:
            - name: prometheus-config-volume
              mountPath: /etc/prometheus/
            - name: prometheus-storage-volume
              mountPath: /prometheus/
      volumes:
        - name: prometheus-config-volume
          configMap:
            defaultMode: 420
            name: prometheus-server-conf

        - name: prometheus-storage-volume
          emptyDir: {}
```

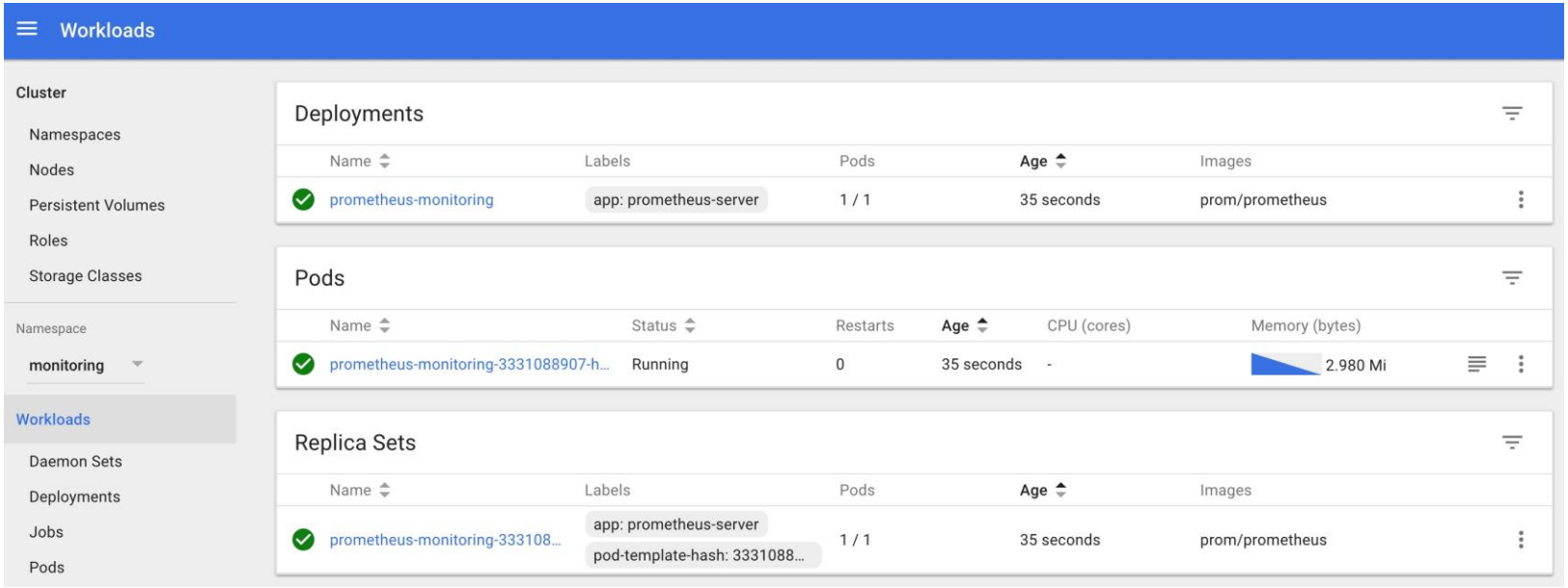
4. Create a deployment on monitoring namespace using the above file.

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

5. You can check the created deployment using the following command.

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

You can also get details from the kubernetes dashboard like shown below.



Connecting To Prometheus

You can connect to the deployed Prometheus in two ways.

1. Using Kubectl port forwarding
2. Exposing the Prometheus deployment as a service with NodePort or a Load Balancer.

We will look at both the options.

Using Kubectl Port Forwarding

Using kubectl port forwarding, you can access the pod from your workstation using a selected port on your localhost.

1. First, get the Prometheus pod name.

```
# kubectl get pods --namespace=monitoring
```

The output will look like the following.

```
# kubectl get pods --namespace=monitoring
NAME                                          READY     STATUS    RESTARTS   AGE
prometheus-monitoring-3331088907-hm5n1   1/1       Running   0
```

2. Execute the following command with your pod name to access Prometheus from localhost port 8080.

Note: Replace prometheus-monitoring-3331088907-hm5n1 with your pod name.

```
# kubectl port-forward prometheus-monitoring-3331088907-hm5n1 8080:9090 -n monitoring
```

3. Now, if you access http://localhost:8080 on your browser, you will get the Prometheus home page.

Exposing Prometheus As A Service

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

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.

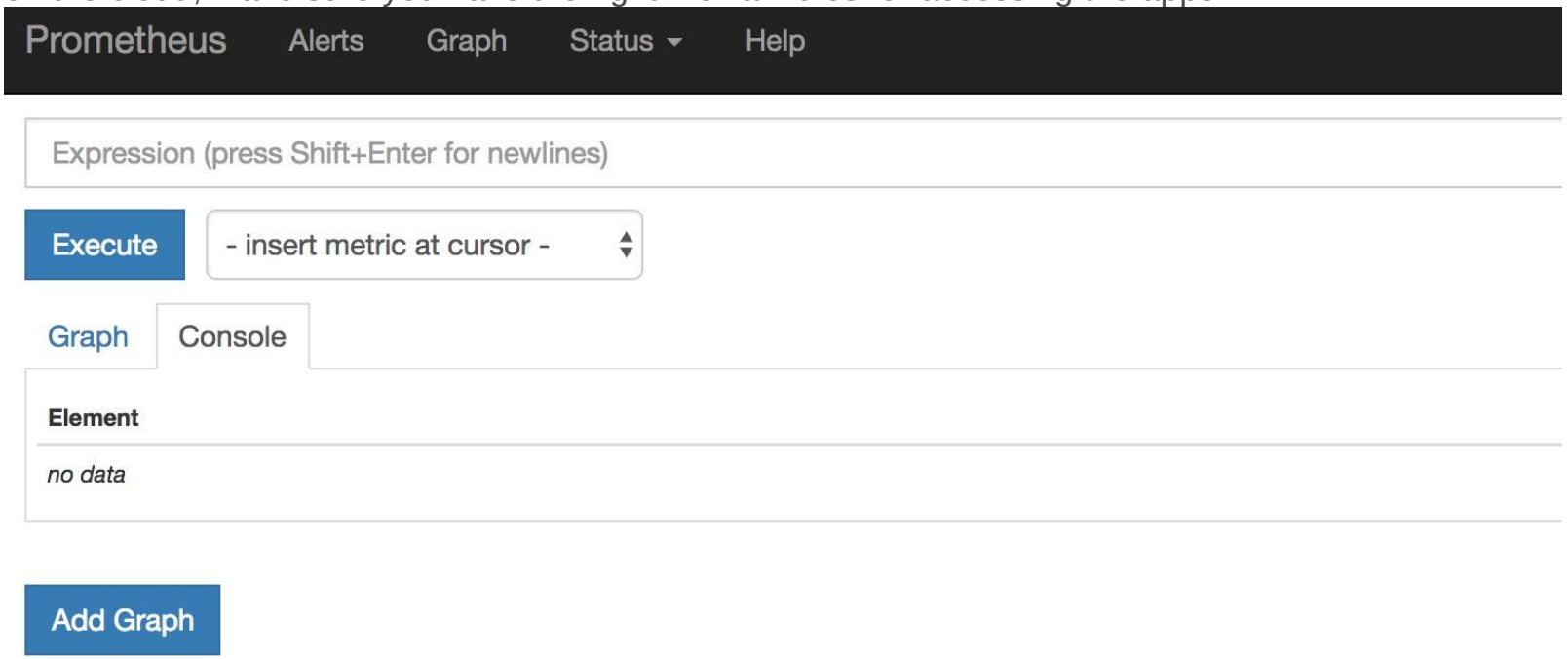
```yaml
apiVersion: v1
kind: Service
metadata:
  name: prometheus-service
spec:
  selector:
    app: prometheus-server
  type: NodePort
  ports:
    - port: 8080
      targetPort: 9090
      nodePort: 30000
```

Note: If you are on AWS or Google Cloud, You can use Loadbalancer type, which will create a load balancer and points it to the service.

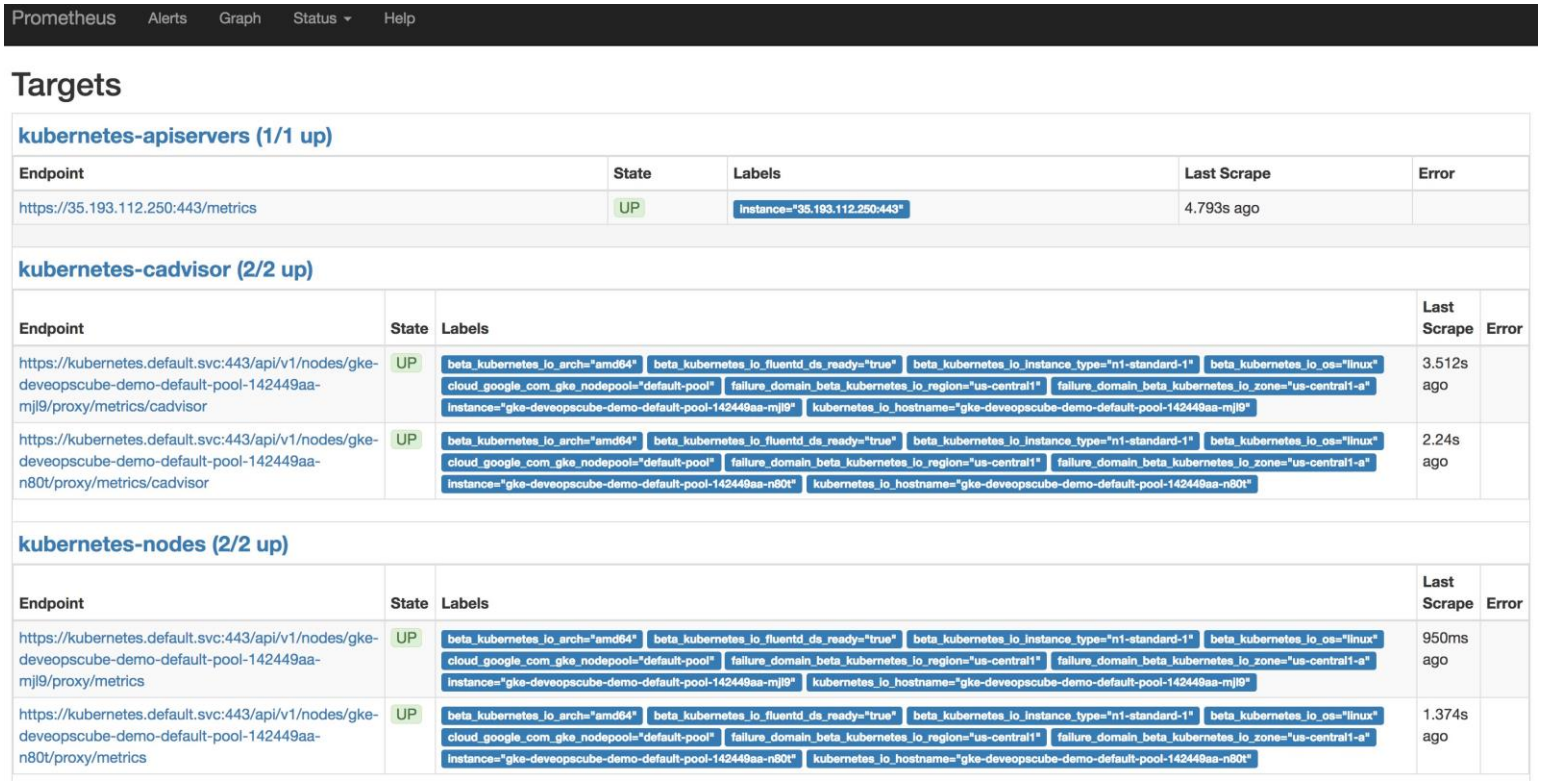
2. Create the service using the following command.

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

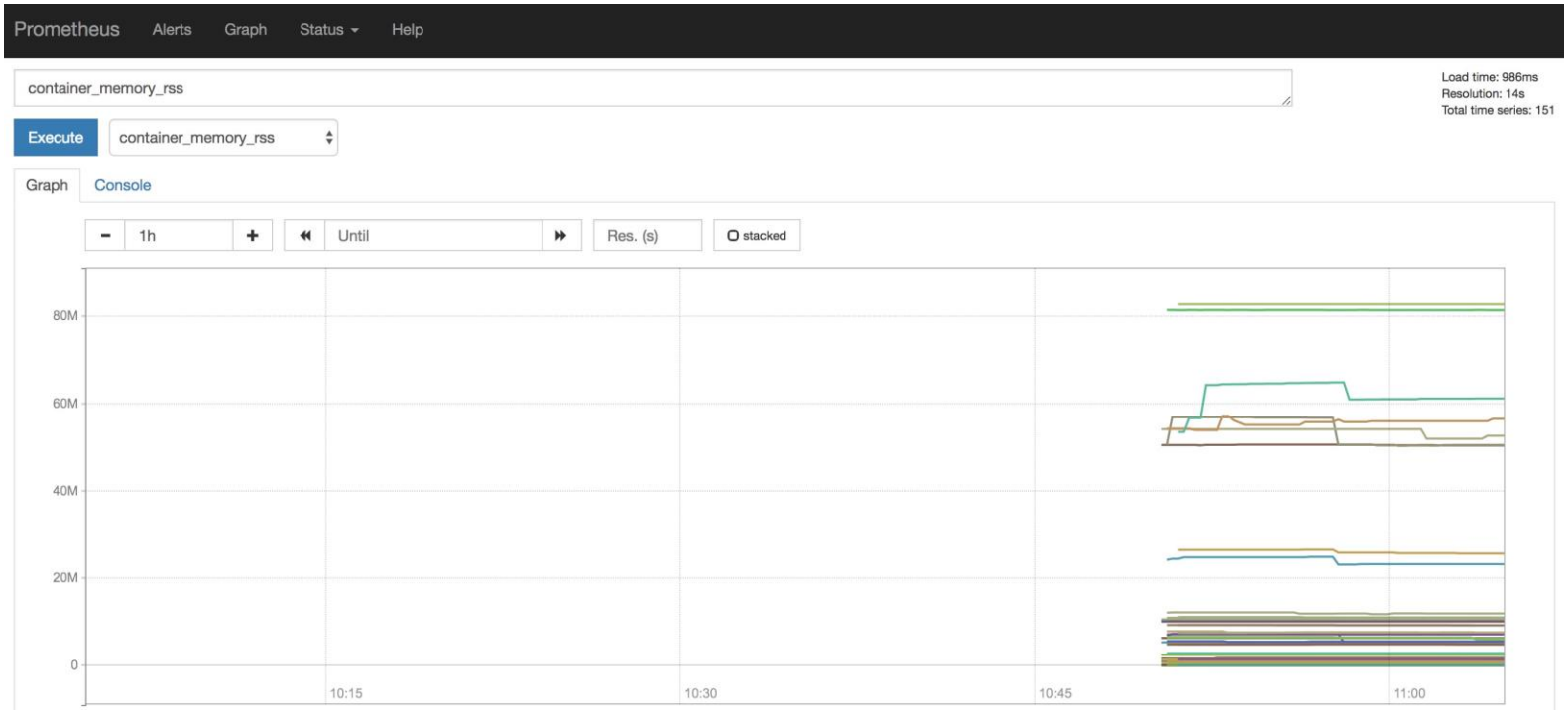
3. Once created, you can access the Prometheus dashboard using any Kubernetes node IP on port 30000. If you are on the cloud, make sure you have the right firewall rules for accessing the apps.



3. Now if you go to status –> Targets, you will see all the Kubernetes endpoints connected to Prometheus automatically using service discovery as shown below. So you will get all kubernetes container and node metrics in Prometheus.



4. You can head over the homepage and select the metrics you need from the drop-down and get the graph for the time range you mention. An example graph for container memory utilization is shown below.

5. 
Prometheus
Alerts
Graph
Status
Help
container_memory_rss
Load time: 986ms
Resolution: 14s
Total time series: 151
Execute
container_memory_rss
Graph
Console
1h
Until
Res. (s)
stacked
80M
60M
40M
20M
0
10:15
10:30
10:45
11:00