Lab: Kubernetes Metrics Pipeline

Goal: Deploy `metrics-server` → Scrape with `Prometheus` → Visualize in `Grafana`

Prerequisites

- A running Kubernetes cluster (Minikube, Kind, or similar)
- `kubectl` and optionally `helm` installed

Overview

```
+------------------+
| metrics-server   |   <-- collects resource metrics (CPU/mem) from nodes and
pods
+------------------+
        ↓
+------------------+
| Prometheus       |   <-- scrapes metrics-server via HTTP
+------------------+
        ↓
+------------------+
| Grafana          |   <-- visualizes Prometheus metrics
+------------------+
```

Step-by-Step Instructions

Deploy `metrics-server`

```
kubectl apply -f https://github.com/kubernetes-sigs/metrics-
server/releases/latest/download/components.yaml
```

> ⚠️ If you're using Minikube, patch the deployment:

```
kubectl patch deployment metrics-server -n kube-system \
  --type=json -p='[{"op":"add","path":"/spec/template/spec/containers/0/args/-
","value":"--kubelet-insecure-tls"}]'
```

Confirm it's working:

```
kubectl get --raw "/apis/metrics.k8s.io/v1beta1/nodes"
```

Install Prometheus using Helm

```
helm repo add prometheus-community https://prometheus-community.github.io/helm-
charts
helm repo update

helm install prometheus prometheus-community/prometheus \
  --namespace monitoring --create-namespace
```

Verify installation:

```
kubectl get pods -n monitoring
kubectl port-forward svc/prometheus-server -n monitoring 9090:80
```

Visit: http://localhost:9090

Configure Prometheus to Scrape Metrics Server

Add a new scrape config

Create a configmap to add custom scrape configs:

```yaml
# metrics-scrape-config.yaml
apiVersion: v1
kind: ConfigMap
metadata:
  name: additional-scrape-configs
  namespace: monitoring
data:
  scrape-configs.yaml: |
    - job_name: 'metrics-server'
      metrics_path: /metrics
      scheme: https
      static_configs:
        - targets: ['metrics-server.kube-system.svc:443']
      tls_config:
        insecure_skip_verify: true
```

Apply it:

```
kubectl apply -f metrics-scrape-config.yaml
```

Now update the Prometheus release to use it:

```
helm upgrade prometheus prometheus-community/prometheus \
  --namespace monitoring \
  --set server.extraScrapeConfigsSecret.enabled=true \
  --set server.extraScrapeConfigsSecret.name=additional-scrape-configs \
  --set-file server.extraScrapeConfigsSecret.data.scrape-configs.yaml=metrics-
scrape-config.yaml
```

Install Grafana with Helm

```
helm install grafana grafana/grafana \
  --namespace monitoring \
  --set adminPassword='admin' \
  --set service.type=NodePort \
  --create-namespace
```

Forward port:

```
kubectl port-forward svc/grafana -n monitoring 3000:80
```

Visit: http://localhost:3000 Login with: `admin / admin`

Configure Grafana

- Add Prometheus as a data source:
- URL: `http://prometheus-server.monitoring.svc.cluster.local`
- Import dashboard (ID: **6417** for Kubernetes resource metrics)

Done

Now you're visualizing real-time Kubernetes metrics via metrics-server → Prometheus → Grafana.

Cleanup

```
helm uninstall prometheus -n monitoring
helm uninstall grafana -n monitoring
kubectl delete ns monitoring
kubectl delete -f https://github.com/kubernetes-sigs/metrics-
server/releases/latest/download/components.yaml
```

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