Contents

Monitoring HPE GreenLake Servers running GPU using Grafana and Prometheus

Overview

HPE GreenLake provides a cloud-native platform for managing and monitoring infrastructure with built-in tools and dashboards. While GreenLake offers comprehensive native monitoring capabilities, organizations can also leverage the GreenLake API to integrate with popular open-source tools like Grafana and Prometheus. This approach enables teams to consolidate monitoring data across hybrid environments, utilize existing observability workflows, and create customized dashboards tailored to specific operational needs.

Kubernetes and Helm Setup

Kubernetes cluster setup

This demonstration environment utilizes a high-availability Kubernetes cluster consisting of three control plane nodes and two worker nodes,

```
wsl=> k get node -o wide
NAME                                STATUS   ROLES           AGE   VERSION   INTERNAL-IP
    EXTERNAL-IP   OS-IMAGE             KERNEL-VERSION         CONTAINER-RUNTIME
c2-cp-01.hst.enablement.local       Ready    control-plane   80d   v1.32.5   10.16.160.51   <
    none>         Ubuntu 22.04.5 LTS   5.15.0-144-generic   containerd://2.0.5
c2-cp-02.hst.enablement.local       Ready    control-plane   80d   v1.32.5   10.16.160.52   <
    none>         Ubuntu 22.04.5 LTS   5.15.0-144-generic   containerd://2.0.5
c2-cp-03.hst.enablement.local       Ready    control-plane   80d   v1.32.5   10.16.160.53   <
    none>         Ubuntu 22.04.5 LTS   5.15.0-144-generic   containerd://2.0.5
c2-worker-01.hst.enablement.local   Ready    <none>          80d   v1.32.5   10.16.160.54   <
    none>         Ubuntu 22.04.5 LTS   5.15.0-144-generic   containerd://2.0.5
c2-worker-02.hst.enablement.local   Ready    <none>          80d   v1.32.5   10.16.160.55   <
    none>         Ubuntu 22.04.5 LTS   5.15.0-144-generic   containerd://2.0.5
```

Kubernetes namespace setup

The cluster is equipped with the `gpu-operator` namespace for NVIDIA GPU management and the `monitoring` namespace hosting the Prometheus stack, with external access enabled via NodePort services.

```
wsl=> kubectl get ns | grep -vE '^(kube-|default)'
NAME                 STATUS   AGE
gpu-operator         Active   80d
monitoring           Active   56d

wsl=> k get svc -n gpu-operator
NAME                        TYPE          CLUSTER-IP      EXTERNAL-IP   PORT(S)    AGE
```

```
gpu-operator            ClusterIP   10.233.44.80   <none>        8080/TCP   78d
nvidia-dcgm-exporter    ClusterIP   10.233.15.59   <none>        9400/TCP   78d

wsl=> k get svc --field-selector spec.type=NodePort -n monitoring
NAME                                   TYPE        CLUSTER-IP      EXTERNAL-IP   PORT(S)
                              AGE
kube-prometheus-stack-grafana          NodePort    10.233.22.241   <none>        80:30080/TCP
                        56d
kube-prometheus-stack-prometheus       NodePort    10.233.8.106    <none>        9090:30090/TCP
    ,8080:30398/TCP   56d
```

Helm chart installation

The environment uses Helm to manage two key components: the NVIDIA GPU Operator for GPU resource management and the Kube Prometheus Stack for monitoring and observability.

```
wsl=> helm list -A
NAME                    NAMESPACE       REVISION        UPDATED
                                    STATUS          CHART                              APP
    VERSION
gpu-operator-1753140595 gpu-operator    4               2025-08-14 19:20:42.329819669 -0700
    MST deployed        gpu-operator-v25.3.2            v25.3.2
kube-prometheus-stack   monitoring      5               2025-08-15 13:06:31.169338089 -0700
    MST deployed        kube-prometheus-stack-76.3.
0    v0.84.1
```

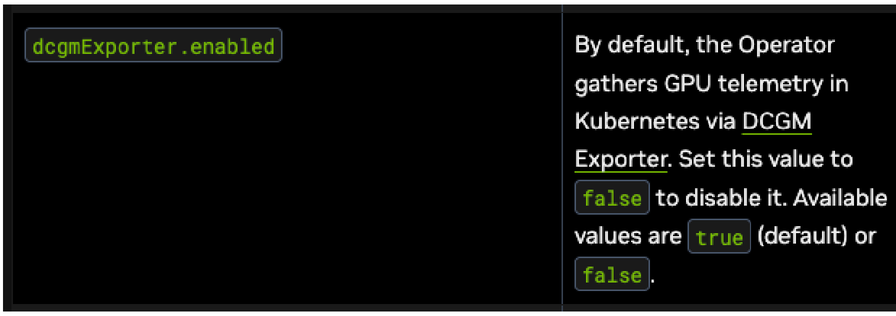
GPU Operator chart customization

The NVIDIA GPU Operator Helm chart deploys a DCGM (Data Center GPU Manager) exporter by default, but there are important nuances:

- The DCGM exporter Pod will be created automatically when the operator detects a node with an NVIDIA GPU and the dcgm-exporter component is enabled in its values.

```
wsl=> k -n gpu-operator get pods -o wide | grep dcgm
nvidia-dcgm-exporter-gkg6d                                        1/1     Running     0
             56d   10.233.117.209   c2-worker-01.hst.enablement.local   <none>           <
    none>
nvidia-dcgm-exporter-r2np6                                        1/1     Running     0
             56d   10.233.114.15    c2-worker-02.hst.enablement.local   <none>           <
    none>
```

- In the stock gpu-operator Helm chart from NVIDIA's repo, the DCGM exporter is enabled by default (`dcgmExporter.enabled: true`). This is from Nvidia GPU Operator Documentation. https://docs.nvidia.com/datacenter/cloud-native/gpu-operator/latest/gettingstarted.html#operator-install-guide



However:

1. ServiceMonitor is not enabled by default.

- This means Prometheus won't automatically scrape the DCGM exporter unless you either:
  - Enable the ServiceMonitor (`dcgmExporter.serviceMonitor.enabled: true`), or
  - Manually define a scrape config in Prometheus.

The gpu-operator is configured with custom values to enable Prometheus integration. The DCGM exporter runs as a ClusterIP service with ServiceMonitor enabled for automatic metrics discovery by Prometheus.

```
wsl=> helm get values gpu-operator-1753140595 -n gpu-operator
USER-SUPPLIED VALUES:
dcgmExporter:
  service:
    type: ClusterIP
  serviceMonitor:
    enabled: true
```

GPU utilization simulation

To simulate GPU load and verify monitoring functionality, we deployed a test pod running the gpu-burn utility. This tool performs intensive GPU computations, allowing us to observe GPU utilization metrics in our monitoring dashboards.

The following YAML manifest creates a pod that clones the gpu-burn repository, compiles it, and runs continuous GPU stress testing:

```
apiVersion: v1
kind: Pod
metadata:
    name: gpu-burn
spec:
    containers:
        - name: gpu-burn
          image: nvidia/cuda:12.2.0-devel-ubuntu22.04
```

```
          command: ["/bin/bash", "-c"]
          args:
              - |
                  apt update && apt install -y git build-essential && \
                  git clone https://github.com/wilicc/gpu-burn.git && \
                  cd gpu-burn && make && ./gpu_burn 999999
          resources:
              limits:
                  nvidia.com/gpu: 1
  restartPolicy: Never
```

Key configuration details: - **Base image**: `nvidia/cuda:12.2.0-devel-ubuntu22.04` provides the CUDA development environment
- **GPU allocation**: `nvidia.com/gpu: 1` requests a single GPU from the cluster
- **Runtime**: `gpu_burn 999999` runs for approximately 277 hours (effectively continuous)
- **Restart policy**: `Never` ensures the pod completes its run without automatic restarts

Deploy the pod using:

```
kubectl apply -f gpu-burn.yaml
```