Kubernetes 5 notes

Helm charts

Promethues

Grafana

EFK Stack

To install in Amazon Linux VM -->

sudo yum install git

sudo yum install java

sudo yum install maven

Ubuntu Linux VM

sudo apt install git

sudo apt install maven

HELM

HELM is a package manager, which is used to install required softwares in Kubernetes cluster. With metrics-server, it is very complex and time-consuming. Similar to yum/apt package manager in Linux distribution, Helm allows us to install applications on Kubernetes cluster. Helm uses charts in order to achieve this. Charts refer to collection of configuration files (manifest yml)

Chart repository

K8s API server

Helm client

Kubernetes cluster

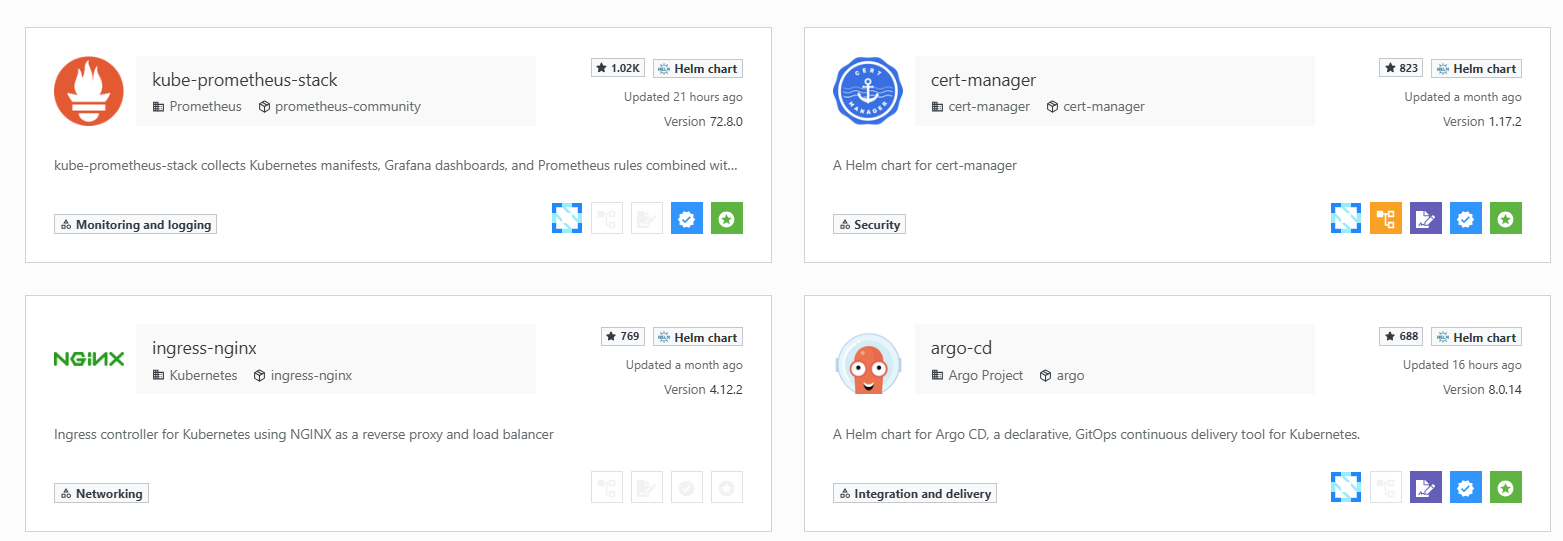
Helm talks to Kubernetes API server in order to install packages in the cluster

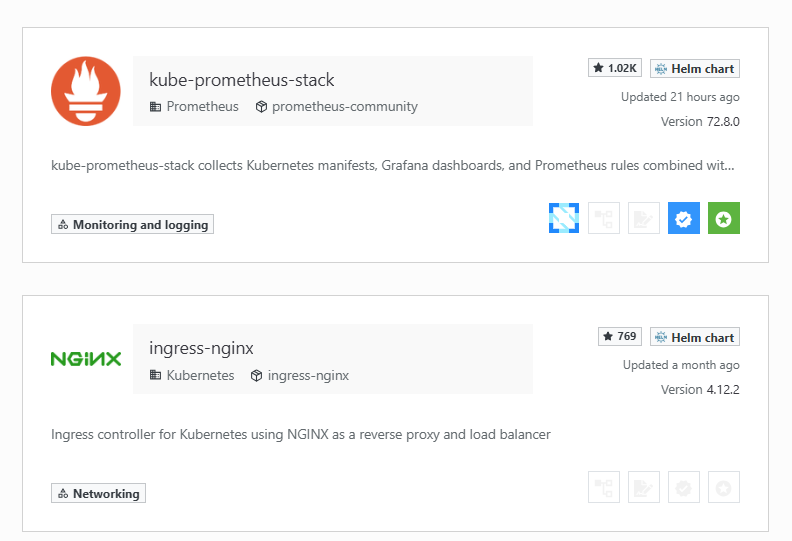
Chart repository is the collection of required configuration files (yaml files required to install specific software). With the help of Chart repository, Helm client will go and talk to K8s API server and install all required software specified in charts in Chart repository

Helm is the best way to find, share and use softwares built for Kubernetes

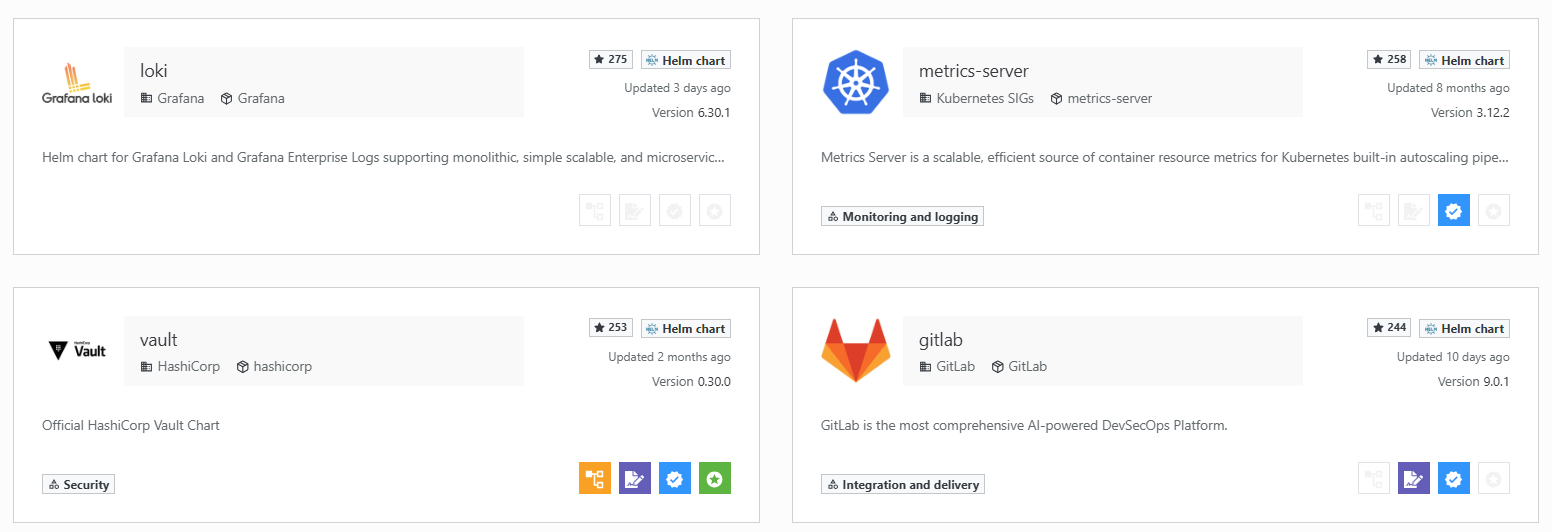
<https://artifacthub.io/>

<https://artifacthub.io/packages/search>

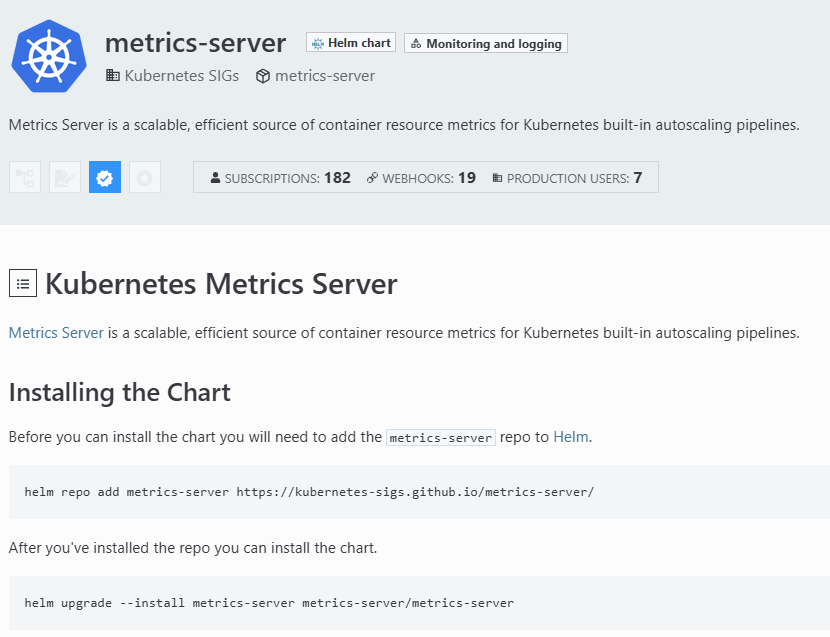




If you want ‘metrics-server’



<https://artifacthub.io/packages/helm/metrics-server/metrics-server>



If youo run this one command, it will take care of all metrics-server installation

helm repo add metrics-server https://kubernetes-sigs.github.io/metrics-server/

Helm charts --> Using Helm charts, we can install Prometheus server, Grafana server, Metrics server, Gitlab etc

What’s Prometheus or Grafana server?

Monitoring tools

Prometheus is an open-source monitoring tool, which is used for altering purpose, it collects and stores metrics of the entire cluster. Grafana shows that visually. Grafana gives interactive visualization of what’s happening. If you want to monitor specific application in this entire cluster, then EFK comes into picture. Actual tool that will monitor your entire cluster is Prometheus. Grafana will talk to Prometheus and Promotheus will talk to metrics-server and get the information. Grafana will again talk to Prometheus and visually show you how your entire Kubernetes cluster is behaving.

Prometheus -> it is an open-source system monitoring and alerting toolkit

It collects and stores its metrics as a time-series data

It provides out-of-box monitoring capabilities for k8s

Grafana

It is an analysis and monitoring tool, which provides visualization for monitoring of your k8s cluster

It provides graphs, charts and alerts for web when connected to supported data sources

Grafana connects with Prometheus for data source

Which is the easiest way to install servers into Kubernetes cluster?

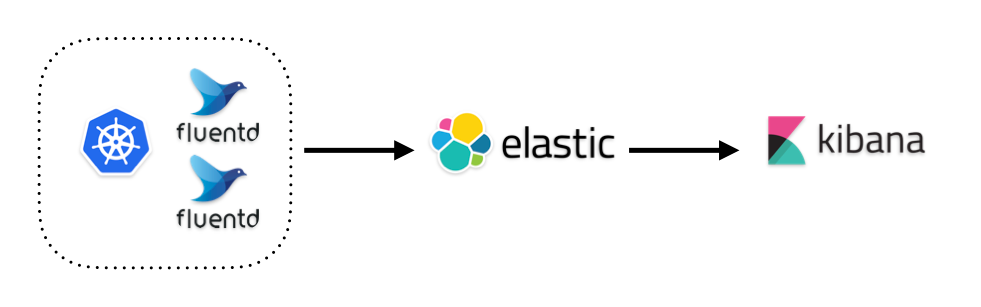
Helm

EFK refers to Elastic search, FluentD, Kibana --> all these are different products.

By using kubectl logs, could you get to know what’s happening in a particular pod?

Splunk is an alternative for EFK. Splunk has upper edge without a doubt but it is paid

EFK stack provides centralized logging in order to identify problems with servers or applications. It will help us to search all the logs in a single place. Using FluentD, it will read all the logs and those logs will be stored within the Elastic search. Then if you want to see those logs, then we have something called as Kibana. Kibana provides UI for this Elastic search. We need to understand daemonset, statefulset, deployment.



Stores logs

Kibana

Elastic search

FluentD

Logs

Microservice1

End user

Logs

Microservice2

Logs

Microservice3

FluentD will read logs and index into Elastic search, stores logs in Elastic search.How do we know these logs are stored here. What component is there to know the logs stored here? Kibana, it provides UI for clients

It will take all the logs and index those logs.

If you want to install or update these servers in the Kubernetes cluster, which component is used? HELM

If you want to monitor the entire Kubernetes cluster, which tool is used? Prometheus

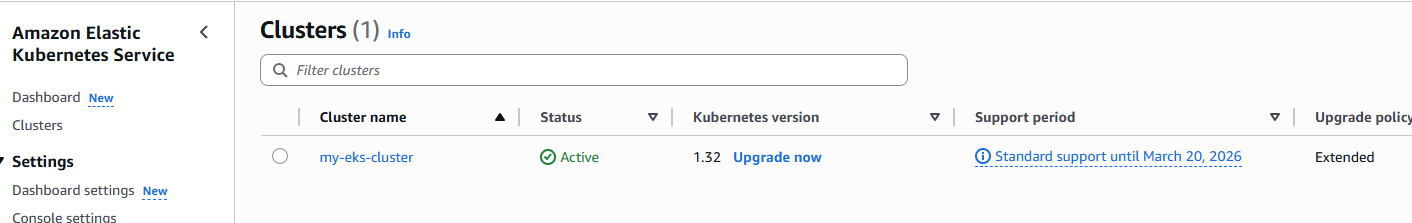
In order to display, cluster monitoring in graphical format? Grafana

If you want to monitor your application which are there, then EFK comes into picture

Create K8s cluster

eksctl create cluster --name my-eks-cluster --region ca-central-1 --node-type t2.medium --zones ca-central-1a,ca-central-1b

Go to EKS



Go into EKS host VM

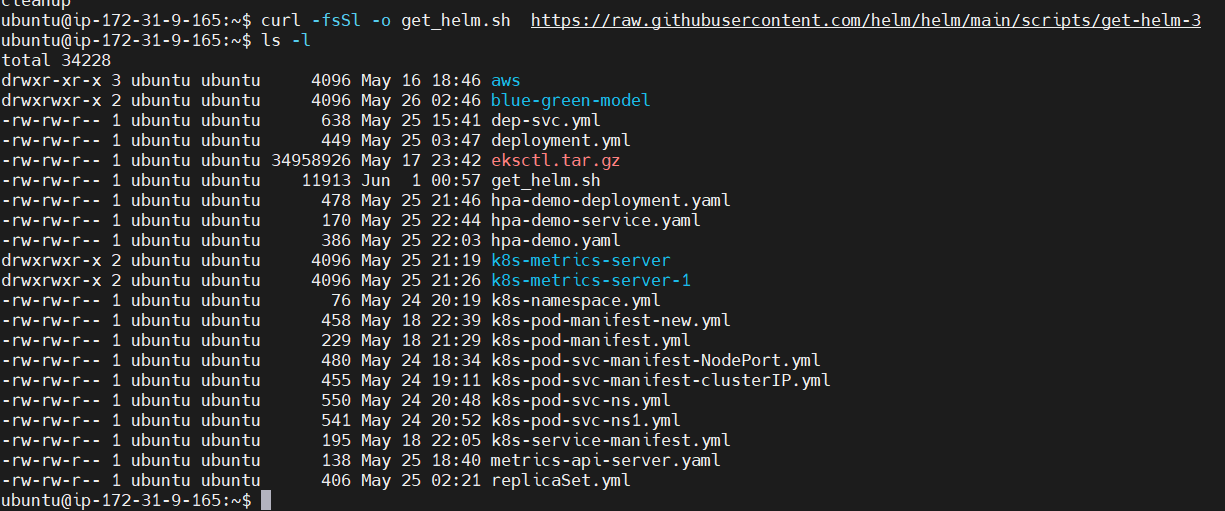
HELM installation:

$ curl https://raw.githubusercontent.com/helm/helm/main/scripts/get-helm-3 | bash

Run this without bash

ubuntu@ip-172-31-9-165:~$ curl https://raw.githubusercontent.com/helm/helm/main/scripts/get-helm-3

ubuntu@ip-172-31-9-165:~$ curl -fsSl -o get\_helm.sh https://raw.githubusercontent.com/helm/helm/main/scripts/get-helm-3



-rw-rw-r-- 1 ubuntu ubuntu 11913 Jun 1 00:57 get\_helm.sh

We have read and write permission but not execute. So ‘chmod 700 get\_helm.sh’ to give execute permission. To check it is is installed ‘helm’

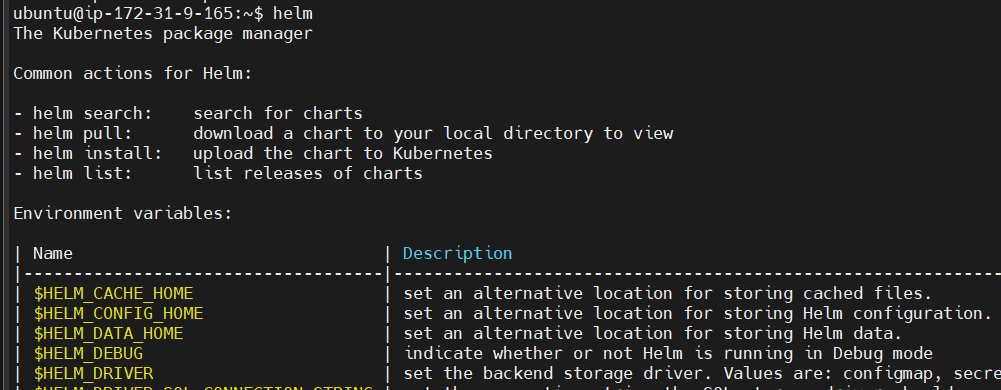
ubuntu@ip-172-31-9-165:~$ chmod 700 get\_helm.sh

-rwx------ 1 ubuntu ubuntu 11913 Jun 1 00:57 get\_helm.sh

ubuntu@ip-172-31-9-165:~$ ./get\_helm.sh

Helm v3.18.1 is already latest

Helm is successfully installed



ubuntu@ip-172-31-9-165:~$ kubectl top pods

No resources found in default namespace.

ubuntu@ip-172-31-9-165:~$ kubectl top nodes

NAME CPU(cores) CPU(%) MEMORY(bytes) MEMORY(%)

ip-192-168-1-194.ca-central-1.compute.internal 30m 1% 535Mi 15%

ip-192-168-37-54.ca-central-1.compute.internal 31m 1% 533Mi 15%

If you want to install the metrics-server,

-> Execute manifest yml files

-> Use Helm charts

ubuntu@ip-172-31-9-165:~$ helm repo ls

Error: no repositories to show

ubuntu@ip-172-31-9-165:~$ helm repo add metrics-server https://kubernetes-sigs.github.com/metrics-server

ubuntu@ip-172-31-9-165:~$ helm repo add metrics-server https://kubernetes-sigs.github.io/metrics-server

"metrics-server" has been added to your repositories

ubuntu@ip-172-31-9-165:~$

ubuntu@ip-172-31-9-165:~$ helm repo update

Hang tight while we grab the latest from your chart repositories...

...Successfully got an update from the "metrics-server" chart repository

Update Complete. ⎈Happy Helming!⎈

ubuntu@ip-172-31-9-165:~$ helm repo ls

NAME URL

metrics-server https://kubernetes-sigs.github.io/metrics-server

ubuntu@ip-172-31-9-165:~$ helm upgrade --install metrics-server metrics-server/metrics-server

ubuntu@ip-172-31-9-165:~$ helm upgrade --install metrics-server metrics-server/metrics-server

Release "metrics-server" does not exist. Installing it now.

Error: Unable to continue with install: ClusterRole "system:metrics-server-aggregated-reader" in namespace "" exists and cannot be imported into the current release: invalid ownership metadata; label validation error: key "app.kubernetes.io/managed-by" must equal "Helm": current value is "EKS"; annotation validation error: missing key "meta.helm.sh/release-name": must be set to "metrics-server"; annotation validation error: missing key "meta.helm.sh/release-namespace": must be set to "default"

These things are already there in the system so we delete one by one

ubuntu@ip-172-31-9-165:~$ kubectl delete deployment metrics-server -n kube-system

deployment.apps "metrics-server" deleted

ubuntu@ip-172-31-9-165:~$ kubectl delete clusterrole system:metrics-server-aggregated-reader

clusterrole.rbac.authorization.k8s.io "system:metrics-server-aggregated-reader" deleted

ubuntu@ip-172-31-9-165:~$ kubectl delete clusterrolebinding metrics-server:system:auth-delegator

clusterrolebinding.rbac.authorization.k8s.io "metrics-server:system:auth-delegator" deleted

ubuntu@ip-172-31-9-165:~$ kubectl delete apiservice v1beta1.metrics.k8s.io

apiservice.apiregistration.k8s.io "v1beta1.metrics.k8s.io" deleted

ubuntu@ip-172-31-9-165:~$ kubectl delete service metrics-server -n kube-system

service "metrics-server" deleted

ubuntu@ip-172-31-9-165:~$ kubectl delete serviceaccount metrics-server -n kube-systen

Error from server (NotFound): serviceaccounts "metrics-server" not found

ubuntu@ip-172-31-9-165:~$ kubectl delete serviceaccount metrics-server -n kube-system

serviceaccount "metrics-server" deleted

ubuntu@ip-172-31-9-165:~$ helm upgrade --install metrics-server metrics-server/metrics-server

Release "metrics-server" does not exist. Installing it now.

Error: Unable to continue with install: ClusterRole "system:metrics-server" in namespace "" exists and cannot be imported into the current release: invalid ownership metadata; label validation error: key "app.kubernetes.io/managed-by" must equal "Helm": current value is "EKS"; annotation validation error: missing key "meta.helm.sh/release-name": must be set to "metrics-server"; annotation validation error: missing key "meta.helm.sh/release-namespace": must be set to "default"

ubuntu@ip-172-31-9-165:~$ kubectl get clusterrole system:metrics-server -o yaml

apiVersion: rbac.authorization.k8s.io/v1

kind: ClusterRole

metadata:

creationTimestamp: "2025-05-31T23:51:10Z"

labels:

app.kubernetes.io/instance: metrics-server

app.kubernetes.io/managed-by: EKS

app.kubernetes.io/name: metrics-server

app.kubernetes.io/version: 0.7.2

name: system:metrics-server

resourceVersion: "970"

uid: 41670649-cfa2-404c-aa5a-32eea7cd85b3

rules:

- apiGroups:

- ""

resources:

- nodes/metrics

verbs:

- get

- apiGroups:

- ""

resources:

- pods

- nodes

- namespaces

- configmaps

verbs:

- get

- list

- watch

apiVersion: rbac.authorization.k8s.io/v1

kind: ClusterRole

metadata:

creationTimestamp: "2025-05-31T23:51:10Z"

labels:

app.kubernetes.io/instance: metrics-server

app.kubernetes.io/managed-by: EKS

app.kubernetes.io/name: metrics-server

app.kubernetes.io/version: 0.7.2

name: system:metrics-server

resourceVersion: "970"

uid: 41670649-cfa2-404c-aa5a-32eea7cd85b3

rules:

- apiGroups:

- ""

resources:

- nodes/metrics

verbs:

- get

- apiGroups:

- ""

resources:

- pods

- nodes

- namespaces

- configmaps

verbs:

- get

- list

- watch

Change EKS to Helm

apiVersion: rbac.authorization.k8s.io/v1

kind: ClusterRole

metadata:

creationTimestamp: "2025-05-31T23:51:10Z"

labels:

app.kubernetes.io/instance: metrics-server

app.kubernetes.io/managed-by: Helm

app.kubernetes.io/name: metrics-server

app.kubernetes.io/version: 0.7.2

name: system:metrics-server

resourceVersion: "32569"

uid: 41670649-cfa2-404c-aa5a-32eea7cd85b3

rules:

- apiGroups:

- ""

resources:

- nodes/metrics

verbs:

- get

- apiGroups:

- ""

resources:

- pods

- nodes

- namespaces

- configmaps

verbs:

- get

- list

- watch

ubuntu@ip-172-31-9-165:~$ helm upgrade --install metrics-server metrics-server/metrics-server

Release "metrics-server" does not exist. Installing it now.

Error: Unable to continue with install: ClusterRole "system:metrics-server" in namespace "" exists and cannot be imported into the current release: invalid ownership metadata; annotation validation error: missing key "meta.helm.sh/release-name": must be set to "metrics-server"; annotation validation error: missing key "meta.helm.sh/release-namespace": must be set to "default"

kubectl patch clusterrole system:metrics-server --type='merge' -p '{

"metadata": {

“annotations”: {

“meta.helm.sh/release-namespace”: “kube-system”

}

}

}’

kubectl patch clusterrolebinding system:metrics-server --type=’merge’ -p {

“metadata”: {

“annotations”: {

“meta.helm.sh/release-namespace”: “kube-system”

}

}

}’

ubuntu@ip-172-31-9-165:~$ kubectl patch clusterrole system:metrics-server --type='merge' -p '{

"metadata": {

"annotations": {

"meta.helm.sh/release-namespace": "kube-system"

}

}

}'

kubectl patch clusterrolebinding system:metrics-server --type='merge' -p '{

"metadata": {

"annotations": {

"meta.helm.sh/release-namespace": "kube-system"

}

}

}'

clusterrole.rbac.authorization.k8s.io/system:metrics-server patched (no change)

clusterrolebinding.rbac.authorization.k8s.io/system:metrics-server patched

apiVersion: rbac.authorization.k8s.io/v1

kind: ClusterRole

metadata:

annotations:

meta.helm.sh/release-name: metrics-server

meta.helm.sh/release-namespace: kube-system

creationTimestamp: "2025-05-31T23:51:10Z"

labels:

app.kubernetes.io/instance: metrics-server

app.kubernetes.io/managed-by: Helm

app.kubernetes.io/name: metrics-server

app.kubernetes.io/version: 0.7.2

name: system:metrics-server

resourceVersion: "35453"

uid: 41670649-cfa2-404c-aa5a-32eea7cd85b3

rules:

- apiGroups:

- ""

resources:

- nodes/metrics

verbs:

- get

- apiGroups:

- ""

resources:

- pods

- nodes

- namespaces

- configmaps

verbs:

- get

- list

- watch

Run this in case of error

eksctl delete addon --name metrics-server --cluster my-eks-cluster --region ca-central-1

eksctl create addon --name metrics-server --cluster my-eks-cluster --region ca-central-1 --force

ubuntu@ip-172-31-9-165:~$ helm upgrade --install metrics-server metrics-server/metrics-server --namespace kube-system

Release "metrics-server" does not exist. Installing it now.

NAME: metrics-server

LAST DEPLOYED: Sun Jun 1 03:32:18 2025

NAMESPACE: kube-system

STATUS: deployed

REVISION: 1

TEST SUITE: None

NOTES:

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\* Metrics Server \*

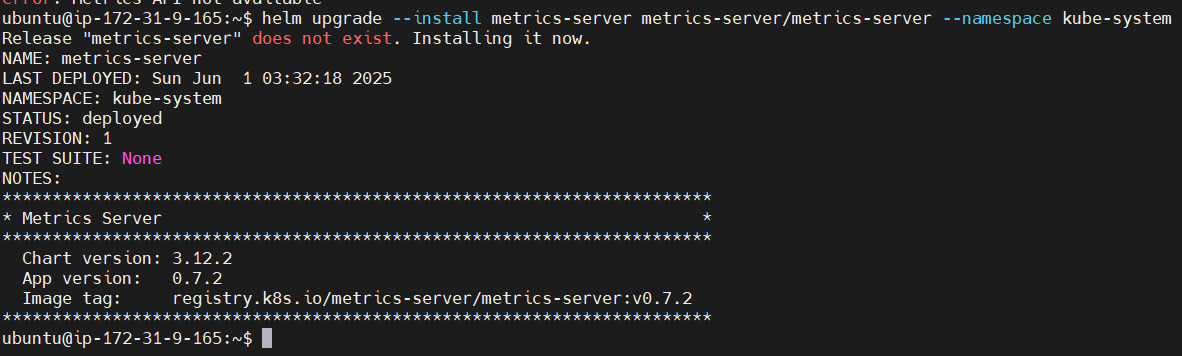
\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*

Chart version: 3.12.2

App version: 0.7.2

Image tag: registry.k8s.io/metrics-server/metrics-server:v0.7.2

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ubuntu@ip-172-31-9-165:~$ kubectl get pods -n kube-system

NAME READY STATUS RESTARTS AGE

aws-node-p8twr 2/2 Running 0 3h44m

aws-node-rjz8f 2/2 Running 0 3h44m

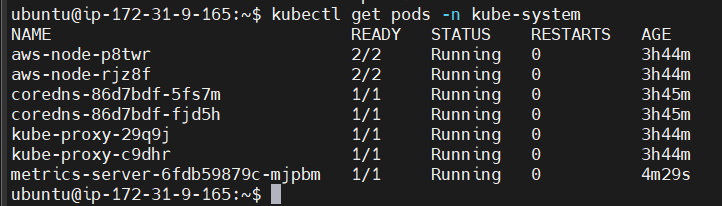
coredns-86d7bdf-5fs7m 1/1 Running 0 3h45m

coredns-86d7bdf-fjd5h 1/1 Running 0 3h45m

kube-proxy-29q9j 1/1 Running 0 3h44m

kube-proxy-c9dhr 1/1 Running 0 3h44m

metrics-server-6fdb59879c-mjpbm 1/1 Running 0 4m29s



metrics-server is running

If required:

kubectl patch rolebinding metrics-server-auth-reader -n kube-system --type=’merge’ -p ‘{

“metadata”: {

“labels”: {

“app.kubernetes.io/managed-by”: “Helm”

},

“annotations” : {

“meta.helm.sh/release-name”: “metrics-server”,

“meta.helm.sh/release-namespace”: “kube-system”

}

}

}’

ubuntu@ip-172-31-9-165:~$ kubectl get nodes

NAME STATUS ROLES AGE VERSION

ip-192-168-1-194.ca-central-1.compute.internal Ready <none> 4h v1.32.3-eks-473151a

ip-192-168-37-54.ca-central-1.compute.internal Ready <none> 4h v1.32.3-eks-473151a

ubuntu@ip-172-31-9-165:~$

ubuntu@ip-172-31-9-165:~$

ubuntu@ip-172-31-9-165:~$ kubectl get pods -n kube-system

NAME READY STATUS RESTARTS AGE

aws-node-p8twr 2/2 Running 0 4h

aws-node-rjz8f 2/2 Running 0 4h

coredns-86d7bdf-5fs7m 1/1 Running 0 4h2m

coredns-86d7bdf-fjd5h 1/1 Running 0 4h2m

kube-proxy-29q9j 1/1 Running 0 4h

kube-proxy-c9dhr 1/1 Running 0 4h

metrics-server-6fdb59879c-mjpbm 1/1 Running 0 21m

Deploy Grafana and Prometheus in K8s: --> Using Helm charts