

Assignment and Exam Content

Kubernetes Engine

Always Delete your Cloud Resources to Avoid \$\$ Charges.

Kubernetes lab

Kubernetes Lab Contains – Three major areas below to say complete Lab 😊

A

Launch Kubernetes Cluster

Choose different configurations to Launch Cluster.

B

Deploy Application

Once the cluster is ready , you can deploy Sample Application Bundle. Available to deploy.

3

Manage Application on Kubernetes Cluster.

Monitor Cluster , Log , Add Node Pool etc.

Kubernetes Engine Creations – Steps in Summary

1

Cluster Creation Choose Options or define your own configuration

Cluster templates

Select a template with preconfigured setting, or customize a template to suit your needs

- ☐ Clone an existing cluster
Select one of your existing clusters to populate fields
- ☒ Standard cluster
Continuous integration, web serving, backends. Best choice for further customization or if you are not sure what to choose.
- ☐ Your first cluster
Experimenting with Kubernetes Engine, deploying your first application. Affordable choice to get started.
- ☐ CPU intensive applications
Web crawling or anything else that requires more CPU.
- ☐ Memory intensive applications
Databases, analytics, things like Hadoop, Spark, ETL or anything else that requires more memory.
- ☐ GPU Accelerated Computing
Machine learning, video transcoding, scientific computations or anything else that is compute-intensive and can utilize GPUs.
- ☐ Highly available
Most demanding availability requirements.

2

Cluster location and Master Node

'Your first cluster' template

Experimenting with Kubernetes Engine, deploying your first application. Affordable choice to get started.

Some fields can't be changed after the cluster is created. Hover over the help icons to learn more. [Dismiss](#)

Name [?]
your-first-cluster-1

Location type [?]
☒ Zonal
☐ Regional

Zone [?]
us-central1-a

Master version
1.13.6-gke.6

3

Define Node Pool

Node pools

Node pools are separate instance groups running Kubernetes in a cluster. You may add node pools in different zones for higher availability, or add node pools of different type machines. To add a node pool, click Edit. [Learn more](#)

pool-1

Number of nodes
1

Machine type [?]
Customize to select cores, memory and GPUs
small (1 shared ... 1.7 GB memory [Customize](#)

Boot disk: Standard, 30 GB Auto-upgrade: On

[More options](#)

[+ Add node pool](#)

3.1

Availability Networking

Availability

Additional node locations
New nodes will be deployed above.

☐ us-central1-b
☐ us-central1-c
☐ us-central1-f

Maintenance window (beta) [?]
Any Time

Hours shown in your local time zone (UTC-7)

Networking

VPC-native
☐ Enable VPC-native (using alias IP) [?]

VPC-native will soon become enabled by default

Network [?]
default

28.0.0/20

3.2

Security & Logging

Security

☐ Enable basic authentication [?]

☐ Issue a client certificate [?]

Starting with version 1.12, clusters will have basic authentication and client certificate issuance disabled by default.

☐ Enable legacy authorization [?]

☒ Enable Binary Authorization (beta) [?]

☐ Enable Application-layer Secrets Encryption (beta) [?]

☐ Enable Workload Identity (beta) [?]

Metadata

Description (Optional) [?]

Labels (Optional)
To organize your project, add arbitrary labels as key/value pairs to your resources. Use labels to indicate different environments, services, teams, and so on. [Learn more](#)

[+ Add label](#)

Stackdriver

☐ Enable Stackdriver Kubernetes Engine Monitoring [?]

Stackdriver legacy features

☐ Enable legacy Stackdriver Logging service [?]

☐ Enable legacy Stackdriver Monitoring service [?]

Additional features

☒ Enable Cloud TPU [?]

☐ Enable Kubernetes alpha features in this cluster [?]

☐ Enable Kubernetes Dashboard (deprecated) [?]

1

Choose from predefined template

- Google Provides Multiple template for you to use /reconfigure it while using it.
- You can define your own configuration.
- Or you can clone existing cluster.

2

Cluster Location and Master Node

- Configuration – regional /zonal cluster location for it.
- Provide Master Node Configuration.

3

Define Node Pool and other configurations

1. Node Pool (Group of nodes can be managed separately)
2. Availability and Networking
3. Security and Logging

1 Cluster Selection

Choose from predefined template

- Google Provides Multiple template for you to use /reconfigure it while using it.
- You can define your own configuration.
- Or you can clone existing cluster.

Cluster Location and Master Node

- Configuration – regional /zonal cluster location for it.
- Provide Master Node Configuration.

Define Node Pool and other configurations

1. Node Pool (Group of nodes can be managed separately)
2. Availability and Networking
3. Security and Logging

1 Go To -> COMPUTE -> Kubernetes Engine-> Cluster

2 There are multiple Templates available to choose.

e.g. CPU Intensive, Memory Intensive, GPU Accelerations or Generic High Availability

The only change between configurations are

1. Node Configurations – CPU, Memory size
2. No of Nodes
3. HTTP Load Balancer
4. Logging and Monitoring

You can change/adjust all configurations in all options.

For Current lab

Choose Standard or Your first Cluster and make sure that you have only one node in node pool

Cluster templates
Select a template with preconfigured setting, or customize a template to suit your needs

☐ Clone an existing cluster
Select one of your existing clusters to populate fields

☒ **Standard cluster**
Continuous integration, web serving, backends. Best choice for further customization or if you are not sure what to choose.

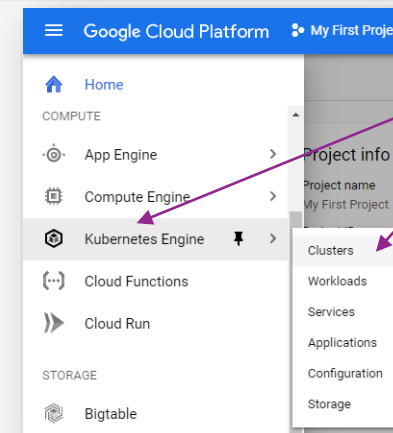
☐ Your first cluster
Experimenting with Kubernetes Engine, deploying your first application. Affordable choice to get started.

☐ CPU intensive applications
Web crawling or anything else that requires more CPU.

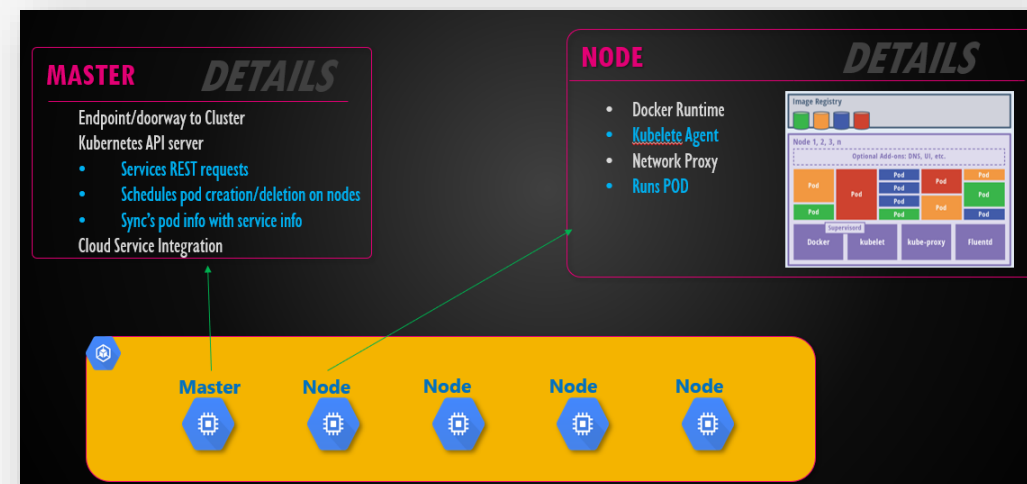
☐ Memory intensive applications
Databases, analytics, things like Hadoop, Spark, ETL or anything else that requires more memory.

☐ GPU Accelerated Computing
Machine learning, video transcoding, scientific computations or anything else that is compute-intensive and can utilize GPUs.

☐ Highly available
Most demanding availability requirements.



Kubernetes Clusters



2 Cluster and Master Configuration

Choose from predefined template

- Google Provides Multiple template for you to use /reconfigure it while using it.
- You can define your own configuration.
- Or you can clone existing cluster.

Cluster Location and Master Node

- Configuration – regional /zonal cluster location for it.
- Provide Master Node Configuration.

Define Node Pool and other configurations

1. Node Pool (Group of nodes can be managed separately)
2. Availability and Networking
3. Security and Logging

2

Cluster and Master Configurations

Name - : Choose Any name

Locations : You can say Zonal

Zone : Choose Your preferred Zone.

Master Version : You can choose different Available Kubernetes versions. You can leave default.

'Your first cluster' template (edited)

Experimenting with Kubernetes Engine, deploying your first application. Affordable choice to get started.

Info Some fields can't be changed after the cluster is created. Hover over the help icons to learn more. Dismiss

Name ?
your-first-cluster-1

Location type ?
☒ Zonal
☐ Regional

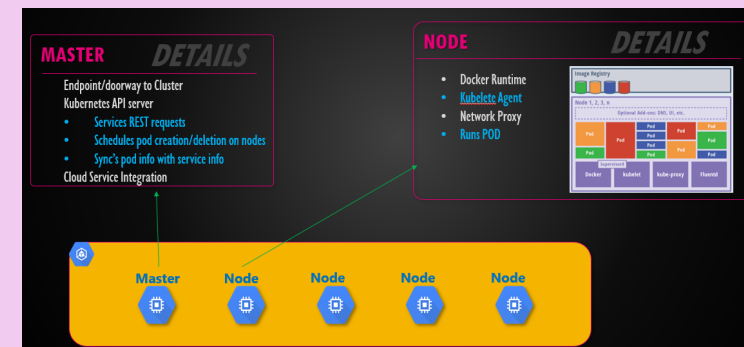
Zone ?
us-central1-a

Master version
1.13.6-gke.6

Node pools
Node pools are separate instance groups running Kubernetes in a cluster. You

Things to remember

1. Kubernetes works in Master and Slave mode.
2. You can have Master Configuration as well as Nodes configurations
3. You need to have one Master and at least one Slave Node.
4. Cluster Master is endpoint to cluster.



2 Node Pool and Availability

2

Node pools are separate instance groups running Kubernetes in a cluster. You may add node pools in different zones for higher availability, or add node pools of different type machines.

For Current lab

Enter Number of Node : 1

Go to Availability : Additional Node Locations

Click checkbox for Multiple Zone

observe Label Changes and Total Nodes numbers

\$\$\$ Impacting

Do not choose any Zone (in Additional Node Locations) , GCP Charges based on number of nodes.

Choose from predefined template

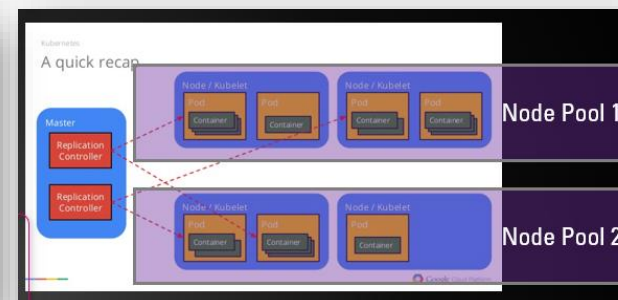
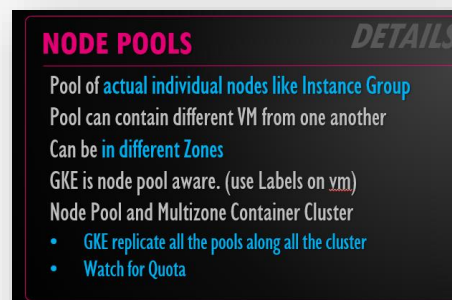
- Google Provides Multiple template for you to use /reconfigure it while using it.
- You can define your own configuration.
- Or you can clone existing cluster.

Cluster Location and Master Node

- Configuration – regional /zonal cluster location for it.
- Provide Master Node Configuration.

Define Node Pool and other configurations

1. Node Pool (Group of nodes can be managed separately)
2. Availability and Networking
3. Security and Logging



Node pools

Node pools are separate instance groups running Kubernetes in a cluster. You may add node pools in different zones for higher availability, or add node pools of different type machines. To add a node pool, click Edit. [Learn more](#)

pool-1

Number of nodes
1

Machine type ?
Customize to select cores, memory and GPUs
small (1 shared ... 1.7 GB memory [Customize](#)

Boot disk: Standard, 30 GB Auto-upgrade: On
[More options](#)

[+ Add node pool](#)

Availability

Additional node locations ?
New nodes will be deployed for each zone selected based upon the node pools settings above.

☐ us-central1-b
☐ us-central1-c
☐ us-central1-f

pool-1

Number of nodes (per zone)
1 **Total (in all zones): 2**

Machine type ?
Customize to select cores, memory and GPUs
small (1 shared ... 1.7 GB memory [Customize](#)

Boot disk: Standard, 30 GB Auto-upgrade: On
[More options](#)

[+ Add node pool](#)

Availability

Additional node locations ?
New nodes will be deployed for each zone selected based upon the node pools settings above.

☒ us-central1-b
☐ us-central1-c
☐ us-central1-f

2 Networking, Security, Logging

Choose from predefined template

- Google Provides Multiple template for you to use /reconfigure it while using it.
- You can define your own configuration.
- Or you can clone existing cluster.

Cluster Location and Master Node

- Configuration – regional /zonal cluster location for it.
- Provide Master Node Configuration.

Define Node Pool and other configurations

1. Node Pool (Group of nodes can be managed separately)
2. Availability and Networking
3. Security and Logging


Networking

- You can choose default network or you can choose your custom Network.
- If you want you can have POD ip Address range
- Internode Visibility will provide internode communications logs.. _ You don't need that for this demo.
- You can enable Load Balancing.
- **KEEP DEFAULT**

Networking

VPC-native

☐ Enable VPC-native (using alias IP) ?

 VPC-native will soon become enabled by default

Network ?

default

Subnet ?

default (10.128.0.0/20)

Pod address range (Optional) ?

Example: 10.96.0.0/14

☐ Enable Intranode visibility (beta) ?
Reveals your intranode traffic to Google's networking fabric. To get logs, you need to enable VPC flow logs in the [selected subnet](#).

Load balancing

☒ Enable HTTP load balancing ?

Network security

☐ Private cluster ?

☐ Enable master authorized networks ?

☐ Enable network policy ?

Security

- You have option to choose Basic authentication (User and Password) Not recommended.
- You can have Client Certificate
- You can have legacy (old school) or choose RBAC (RBAC recommended)
- You can have Application level secrets stored in etcd
- **KEEP DEFAULT**

Network security

☐ Private cluster ?


☐ Enable master authorized networks ?

☐ Enable network policy ?

Security

☐ Enable basic authentication ?

☐ Issue a client certificate ?

 Starting with version 1.12, clusters will have basic authentication and client certificate issuance disabled by default.

☐ Enable legacy authorization ?

☐ Enable Binary Authorization (beta) ?

☐ Enable Application-layer Secrets Encryption (beta) ?

☐ Enable Workload Identity (beta) ?

Metadata

Description (Optional) ?

Labels (Optional)
To organize your project, add arbitrary labels as key/value pairs to your resources. Use labels to indicate different environments, services, teams, and so on. [Learn more](#)

[+ Add label](#)

Logging

- You can enable Stackdriver logging for Kubernetes Cluster
- You can also optionally have Istio and Other beta features .
- **KEEP DEFAULT**

Stackdriver

☐ Enable Stackdriver Kubernetes Engine Monitoring ?

Stackdriver legacy features

☐ Enable legacy Stackdriver Logging service ?

☐ Enable legacy Stackdriver Monitoring service ?

Additional features

☐ Enable Cloud TPU ?

☐ Enable Kubernetes alpha features in this cluster ?

☐ Enable Kubernetes Dashboard (deprecated) ?

☐ Enable Istio (beta) ?

☐ Enable Cloud Run on GKE (beta) ?

☐ Enable node auto-provisioning (beta) ?

☐ Enable Vertical Pod Autoscaling (beta) ?

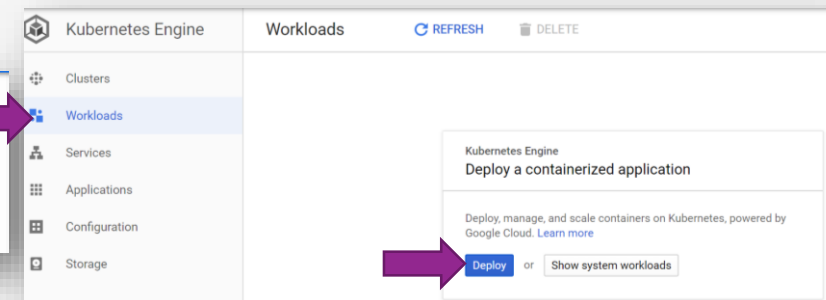
☐ Enable GKE usage metering (beta) ?

[Less](#)

Deploy Application

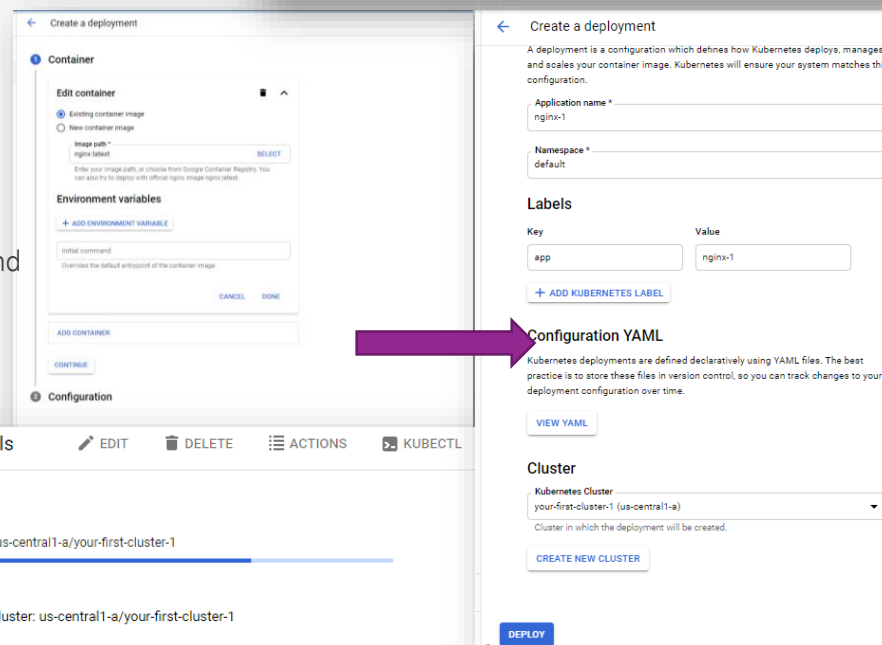
1

Use Sample Application to deploy. There are two ways to start deployment process shows in below snippets 1. Cluster Home page or Workloads.



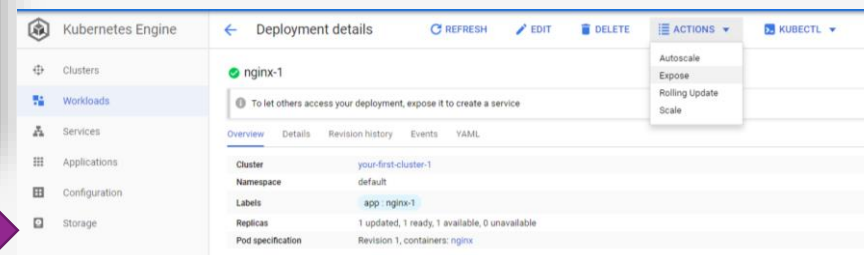
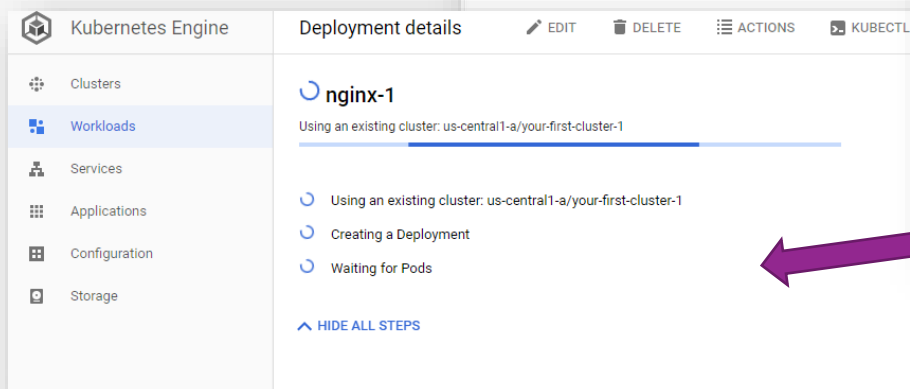
2

1. Use Existing Image
2. Click Continue
3. Choose Application Name
4. Expose Service -> go to Workloads, Click on Service and go to actions Expose.



2

Alternatively – You can get sample Image from <https://cloud.google.com/kubernetes-engine/docs/quickstart>
Using Command Line
See next Page



Create Cluster and Deploy Application – CLI (gcloud)

1

Set default Configurations

Set Project

```
$ gcloud config set project [project-id]
```

Set Zone

```
$ gcloud config set compute/zone [Your Default Zone]
```

Set Region

```
$ gcloud config set compute/region [Your default Region]
```



Sample output

```
$ gcloud config set project tokyo-data-243419
```

```
Updated property [core/project].
```

```
$ gcloud config set compute/zone us-central1
```

```
Updated property [compute/zone].
```

```
$ gcloud config set compute/region us-central1-a
```

```
Updated property [compute/region].
```

2

Create Cluster

```
$ gcloud container clusters create gcptraince--num-nodes=1
```

Alternatively you can choose different options to create cluster. E.g.

```
$ gcloud container clusters create [CLUSTER_NAME] --image-type ubuntu
```

```
$ gcloud container clusters upgrade --image-type cos [CLUSTER_NAME] \
  [--node-pool [POOL_NAME]]
```



Sample output

```
$ gcloud container clusters create gcptraince --num-nodes=1
```

```
Creating cluster gcptraince in us-central1-a... Cluster is being health-checked (master is healthy)...done.
```

```
Created [https://container.googleapis.com/v1/projects/tokyo-data-243419/zones/us-central1-a/clusters/gcptraince].
```

```
To inspect the contents of your cluster, go to: https://console.cloud.google.com/kubernetes/workload_/gcloud/us-central1-a/gcptraince?project=tokyo-data-243419
```

```
kubeconfig entry generated for gcptraince.
```

NAME	LOCATION	MASTER_VERSION	MASTER_IP	MACHINE_TYPE	NODE_VERSION	NUM_NODES	STATUS
gcptraince	us-central1-a	1.12.8-gke.6	35.202.63.71	n1-standard-1	1.12.8-gke.6	1	RUNNING

Auto Scaling

```
$ gcloud container clusters create [CLUSTER_NAME] --num-nodes 1 \
  --enable-autoscaling --min-nodes 1 --max-nodes 3
```

You can enable autoscaling for existing cluster

```
$ gcloud container clusters update [CLUSTER_NAME] --enable-autoscaling \
  --min-nodes 1 --max-nodes 10 --zone [COMPUTE_ZONE] --node-pool default-pool
```

Create Cluster and Deploy Application – CLI (gcloud)

1

Get Authentications to connect to Cluster using kubectl.

```
$ gcloud container clusters get-credentials [Your Cluster]
```



Sample output

```
$ gcloud container clusters get-credentials gcptraince
Fetching cluster endpoint and auth data.
kubeconfig entry generated for gcptraince.
```

2

Deploy and run application

```
$ kubectl run hello-server --image gcr.io/google-samples/hello-app:1.0 --port 8080
```



Sample output

```
$ kubectl run hello-server --image gcr.io/google-samples/hello-app:1.0 --port 8080
kubectl run --generator=deployment/apps.v1 is DEPRECATED and will be removed in a future version. Use kubectl run --generator=run-pod/v1 or kubectl create instead.
deployment.apps/hello-server created
```

Export Service

```
$ kubectl expose deployment hello-server --type LoadBalancer
```

```
$ kubectl expose deployment hello-server --type LoadBalancer \
> --port 80 --target-port 8080
service/hello-server exposed
```

View Application

Go To Service

COMPUTE -> KUBERNETES ENGINE -> SERVICES

Click on Endpoint

- You should see

Kubernetes Engine

Clusters

Workloads

Services

Applications

Configuration

Storage

Services

REFRESHDELETE

Kubernetes services

Brokered services

BETA

Services are sets of Pods with a network endpoint that can be used for discovery and load balancing. Ingresses are collections of rules for routing external HTTP(S) traffic to Services.

Is system object : False

Filter resources

Name ^	Status	Type	Endpoints	Pods	Namespace	Cluster
hello-server	Ok	Load balancer	146.148.98.216:80	1 / 1	default	your-first-cluster-1

← → ↻ ⓘ Not secure | 146.148.98.216

Hello, world!
Version: 1.0.0
Hostname: hello-server-6d89bbd574-x9mc8

Now Browse Different Screens on Console and Try different CLIS

Delete Your Cluster after work

Google Cloud PlatformMy First Project

Kubernetes Engine

Clusters

EDITDELETEDEPLOYCONNECT

Clusters

Workloads

Services

Applications

Configuration

Storage

Cluster Details

DetailsStorageNodes

Cluster

Endpoint35.202.63.71Show cluster certificate

Client certificateDisabled

Binary AuthorizationDisabled

Kubernetes alpha featuresDisabled

Total size1

Google Cloud PlatformMy First Project

Kubernetes Engine

Clusters

EDITDELETEDEPLOYCONNECT

Clusters

Workloads

Services

Applications

Configuration

Storage

gcptraince

DetailsStorageNodes

Nodes

Filter nodes

Columns

Name	Status	CPU requested	CPU allocatable	Memory requested	Memory allocatable	Storage requested	Storage allocatable
gke-gcptraince-default-pool-3e112703-b8tw	Ready	602 mCPU	0.40 mCPU	709.3 MB	3.77 GB	0 B	0 B

See All Nodes in Cluster

Kubernetes Engine

Node details

REFRESHEDITCORDONKUBECTL

Clusters

Workloads

Services

Applications

Configuration

Storage

gke-gcptraince-default-pool-3e112703-b8tw

SummaryDetailsYAMLEvents

CPU

Memory

Disk

1h6h1d7d30d

Pods

Filter pods

Columns

Name	Status	CPU requested	Memory requested	Storage requested	Namespace	Restarts	Created on
17-default-backend-6f8697844f-b56vh	Running	10 mCPU	20.97 MB	0 B	kube-system	0	Jun 11, 2019, 1:55:07 PM
kube-dns-948cc9485-gfrfk	Running	260 mCPU	115.34 MB	0 B	kube-system	0	Jun 11, 2019, 1:55:07 PM
event-exporter-v0.2.4-5f7d5d7d44-7nir7	Running	0 CPU	0 B	0 B	kube-system	0	Jun 11, 2019, 1:55:07 PM
fluentd-gcp-scaler-7d895cb89-4zdv2	Running	0 CPU	0 B	0 B	kube-system	0	Jun 11, 2019, 1:55:18 PM
kube-dns-autoscaler-76fdcf658-4dvt	Running	20 mCPU	10.49 MB	0 B	kube-system	0	Jun 11, 2019, 1:55:18 PM
prometheus-to-ad-2fbd4	Running	1 mCPU	20.97 MB	0 B	kube-system	0	Jun 11, 2019, 1:55:22 PM

Node Details

See Utilizations , Deployment or containers running

Google Cloud PlatformMy First Project

Kubernetes Engine

Clusters

EDITDELETEDEPLOYCONNECT

Clusters

Workloads

Services

Applications

Configuration

Storage

your-first-cluster-1

Cluster

Master version1.13.6-gke.6

Endpoint35.202.206.254Show cluster certificate

Client certificateDisabled

Kubernetes alpha featuresDisabled

Total size1

Networkdefault

Subnetdefault

VPC-native (alias IP)Disabled

Pod address range10.4.0.0/14

Private clusterDisabled

Cloud RunDisabled

EncryptionDisabled

Basic Authentication

Binary Authorization (beta)Disabled

Intranode visibility (beta)Disabled

Stackdriver Kubernetes Engine MonitoringDisabled

Legacy Stackdriver LoggingDisabled

Legacy Stackdriver MonitoringDisabled

Master authorized networks

Cluster Edit and Save

See What different Parameters You can edit , Change

Details Also Available <https://cloud.google.com/kubernetes-engine/docs/tutorials/hello-app>

Deploy : Docker Container Application - Important for Exam

1. Config base setup

Your earlier default setup can be used -> project, Region , Zone

2. Sample App

Use Google Sample Code

```
$ git clone https://github.com/GoogleCloudPlatform/kubernetes-engine-samples cd kubernetes-engine-samples/hello-app
```

3. Build Docker Image

```
$ docker build -t gcr.io/${PROJECT_ID}/hello-app:v1 .
```

```
$ docker images
```

4. Get Authorization for Docker and Push Image to Container Registry

```
$ gcloud auth configure-docker
```

```
$ docker push gcr.io/${PROJECT_ID}/hello-app:v1
```

5. Create Cluster

Your earlier default setup can be used -> project, Region , Zone

6. Get Cluster Credentials for kubectl Command

```
$ gcloud container clusters get-credentials [your Cluster]
```

7. Deploy Application

```
$ kubectl run hello-web --image=gcr.io/${PROJECT_ID}/hello-app:v1 --port 8080
```

8. Get the information on Deployed Pods

```
$ kubectl get pods
```

9. Expose Service

```
$ kubectl expose deployment hello-web --type=LoadBalancer --port 80 --target-port 8080
```

Get IP address of service (http://External IP) to access application - Output of following command
\$ kubectl get service

10. Adjust Different Parameters

Scale Your Application (Not Cluster – For Cluster you have to use gcloud command)

```
$ kubectl scale deployment hello-web --replicas=3
```

Check – if application has now 3 pods running

```
$ kubectl get deployment hello-web
```

```
$ kubectl get pods
```

New Version Deployment

```
$ docker build -t gcr.io/${PROJECT_ID}/hello-app:v2 .
```

Delete Your Cluster after work

Important For Exam

- How to Get Current Configurations of Cluster
- Node pool and Configurations
- Availability & Autoscaling Configurations
- Deployment, Service, POD Monitoring
- Secrets Management (remember etcd)
- How to get Cluster to latest version of Kubernetes
- Kubectl vs gcloud Commands. – Purposes. -> Example all Cluster Management is done by gcloud , And Application deployment and management like scaling , exposing, Versioning etc is done by kubectl.

Delete Your Cluster after work

KUBERNETES Engine

End of KUBERNETES ENGINE lab

Always Delete your Cloud Resources to Avoid \$\$ Charges.