

# IBM Cloud Kubernetes Service overview

## Unit objectives

- Create a Kubernetes cluster by using the IBM Cloud Kubernetes Service.
- Create containers and build on the IBM Cloud Container Registry.
- Work with helm charts.
- Deploy an application to IBM Kubernetes Service.

# IBM Cloud Kubernetes Service

## Topics

- ▶ IBM Cloud Kubernetes Service
  - Deploying an application
  - Summary and further reading

## IBM Cloud Kubernetes Service

A certified, managed Kubernetes service that provides an intuitive user experience with on-going cluster management. It has built-in security and isolation to enable rapid delivery of apps while using IBM Cloud Services.

Features:

- Secure.
- Automated lifecycle management.
- Fully integrated with IBM Cloud and third-party services.
- Fully integrated with cognitive solutions with various Watson APIs.
- Different worker node types.
- Supports community-certified Kubernetes and Red Hat OpenShift (RHOS) Kubernetes.



# IBM Cloud Kubernetes Service demonstration

Access the IBM Service catalog and select **Kubernetes Service**.



IBM Cloud

Search resources and offerings...

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Catalog

Search the catalog...

Filter

All Categories >

- Compute
- Containers
- Networking
- Storage
- AI
- Analytics
- Databases
- Developer Tools
- Integration
- Internet of Things
- Security and Identity
- Starter Kits
- Web and Mobile
- Web and Application

### Featured Offerings

**Kubernetes Service**  
IBM • IAM-enabled  
Deploy secure, highly available apps in a native Kubernetes experience.

**IBM Log Analysis with LogDNA**  
Third Party • IAM-enabled  
LogDNA provides log collection and log search for IBM Log Analysis. Define alerts and design custom views to monitor application and system logs.

### Compute

#### Infrastructure

**Bare Metal Server**  
IBM  
Bare metal servers provide the raw horsepower you demand for your processor-intensive and disk I/O-intensive workloads. These servers come wit...

**Cloud Foundry Enterprise Environment**  
IBM • IAM-enabled  
An isolated environment for hosting your Cloud Foundry apps with full admin control over configuration, capacity and access.

**HPC Cluster**  
IBM • IAM-enabled  
Provides the capability to configure, deploy and manage powerful HPC clusters to add new or expand existing HPC footprint.

# Creating a free cluster




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 Create a new cluster

### Select a plan

#### Free

New to Kubernetes? Create a cluster with 1 worker node to explore the capabilities.

**Free**

#### Standard

Ready for production? Create a fully-customizable cluster with your choice of hardware isolation.

**Starting from \$0.11 hourly**

Learn more about the differences between Free and Standard clusters in our [docs](#).

**Cluster name**  
mycluster

**Tags:** ⓘ  
Examples: env:dev, version-1

**Resource Group**  
Default

**Geography**  
North America

**Metro**  
Dallas

Create cluster

#### Order summary

Free


1 worker node **Free**

**Total: Free**

Additional charges for bandwidth might apply. [Learn more.](#)

Create cluster

Add to estimate

 Need help? [Contact IBM Cloud Sales](#)





## Instructor demonstration

If you choose to use a standard cluster, you can select the Kubernetes version and *flavors* of compute resources.



Cluster type and version ⓘ

 Kubernetes 1.13.7 (Stable, Default) ▼	 OpenShift 3.11.104 (Latest, Stable, Default) ▼
---	--

Cluster name: mycluster

Tags: ⓘ  
Examples: env:dev, version-1

Resource group: default ▼

Geography: North America ▼

Location

Availability ⓘ

Single zone | Multizone

Metro: Washington DC ▼

Worker zones ⓘ

<input checked="" type="checkbox"/> Washington DC 04	No VLANs exist: VLANs will be created for you.
<input checked="" type="checkbox"/> Washington DC 06	No VLANs exist: VLANs will be created for you.
<input checked="" type="checkbox"/> Washington DC 07	No VLANs exist: VLANs will be created for you.

**Enable VLAN Spanning**  
To add multiple zones, you must [enable VLAN spanning](#). This allows worker nodes to communicate between zones. If you don't have the required permissions, contact your system administrator.

Master service endpoint ⓘ

Public endpoint only ▼



# Accessing your cluster

Wait for your cluster to provision, and then access it by using the `kubectl` command.



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Clusters / ikscluster

Expires in a month ● Deploying env:demo owner:mihai

Kubernetes Dashboard

Access Overview Worker Nodes Worker Pools Add-ons

### Gain access to your cluster

Prerequisites

Download and install a few CLI tools and the IBM Kubernetes Service plug-in.

```
curl -sL https://ibm.biz/ibt-installer | bash
```

Gain access to your cluster

1. Log in to your IBM Cloud account.

```
ibmcloud login -a https://api.eu-gb.ibm.com
```

If you have a federated ID, use `ibmcloud login --sso` to log in to the IBM Cloud CLI.

2. Target the IBM Cloud Container Service region in which you want to work.

```
ibmcloud cs region-set uk-south
```

3. Get the command to set the environment variable and download the Kubernetes configuration files.

```
ibmcloud cs cluster-config ikscluster
```

4. Set the KUBECONFIG environment variable. Copy the output from the previous command and paste it in your terminal. The command output should look similar to the following.

```
export KUBECONFIG=/Users/$USER/.bluemix/plugins/container-service/clusters/ikscluster/kube-config-mil01-ikscluster.yml
```

Alternatively, you may directly [download](#) your kubeconfig files to manually configure the kubernetes cluster context.

5. Verify that you can connect to your cluster by listing your worker nodes.

```
kubectl get nodes
```

Summary		Worker Nodes 1	
Cluster ID	1420ca602def4156b98e9133d5cc4f61	100% Normal	
Kubernetes version	1.10.12_1543	0 Warning	
Zones	mil01	0 Critical	
Owner	CRMIHAI1@ie.ibm.com	0 Pending	
Resource group	default		
Key protect (Beta)	<a href="#">Enable</a>		

# Scaling out

The cluster can scale out by adding more worker nodes.



Access Overview **Worker Nodes** Worker Pools Add-ons

**Worker Nodes**

Search Add workers +

<input type="checkbox"/>	Name ^	Status	Worker Pool	Zone	Private IP	Public IP	Kubernetes Version
<input checked="" type="checkbox"/>	w1	Normal	default	mil01	10.144.195.165	169.51.194.169	1.10.12_1543
<b>ID</b> kube-mil01-pa1420ca602def4156b98e9133d5cc4f61-w1							
<b>Flavor</b> Free			<b>Public VLAN</b> 2218179	<b>Private VLAN</b> 2218181		<b>Hardware isolation</b> Shared	

Items per page: 10 | 1-1 of 1 items 1 of 1 pages < 1 >

**Worker Pools**

Search Add workers +

Name ^	Zones	Workers Per Zone	Actual / Declared Workers	Flavor
default	mil01	1	1 / 1	Free

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# Kubernetes Dashboard

You can also access the Web UI (Dashboard).



The screenshot shows the Kubernetes Dashboard interface. At the top, there's a header with the Kubernetes logo, a search bar, and a '+ CREATE' button. Below the header is a blue navigation bar with 'Overview' selected. The left sidebar contains a list of resources: Cluster, Namespaces, Nodes, Persistent Volumes, Roles, Storage Classes, Namespace (with a dropdown set to 'default'), Overview (highlighted), Workloads, Cron Jobs, Daemon Sets, Deployments, Jobs, Pods, and Replica Sets. The main content area is divided into two sections: 'Discovery and Load Balancing' and 'Config and Storage'. The 'Discovery and Load Balancing' section displays a table of 'Services'. The 'Config and Storage' section displays a table of 'Secrets'.

Name	Labels	Cluster IP	Internal endpoints	External endpoints	Age
✓ <a href="#">kubernetes</a>	componen... provider: k..	172.21.0.1	kubernete...	-	21 minutes

Name	Type	Age
<a href="#">bluemix-default-secret-int...</a>	kubernetes.io/dockerconfi...	19 minutes
<a href="#">bluemix-default-secret-reg...</a>	kubernetes.io/dockerconfi...	19 minutes
<a href="#">bluemix-default-secret</a>	kubernetes.io/dockerconfi...	19 minutes
<a href="#">default-token-skb6f</a>	kubernetes.io/service-acc...	21 minutes

## Exercise 5: Part 1

- For exercise 5, you must create a new Kubernetes cluster by clicking **Free Cluster** and then clicking **Create Cluster** on the IBM Cloud console.
  - It takes 30 minutes to provision the cluster.
- Perform Exercise 5, *Part 1. Creating an IBM Cloud Kubernetes Service cluster now*.
- Notify the instructor after you click **Create Cluster** to proceed.

IBM Cloud

← View All

Create new cluster

Cluster type

Free ☒ Standard

New to Kubernetes? Create a cluster with 1 worker node to explore the capabilities. Free

Ready for production? Create a fully-customizable cluster with your choice of hardware isolation. Starting from \$0.11 hourly

Learn more about the differences between Free and Standard clusters in our [docs](#).

Resource Group: default Location: London

Tags: env:demo owner:mihai

Cluster name: ikscluster

Create Cluster

Order Summary

Free

1 worker node Free

Total: Free

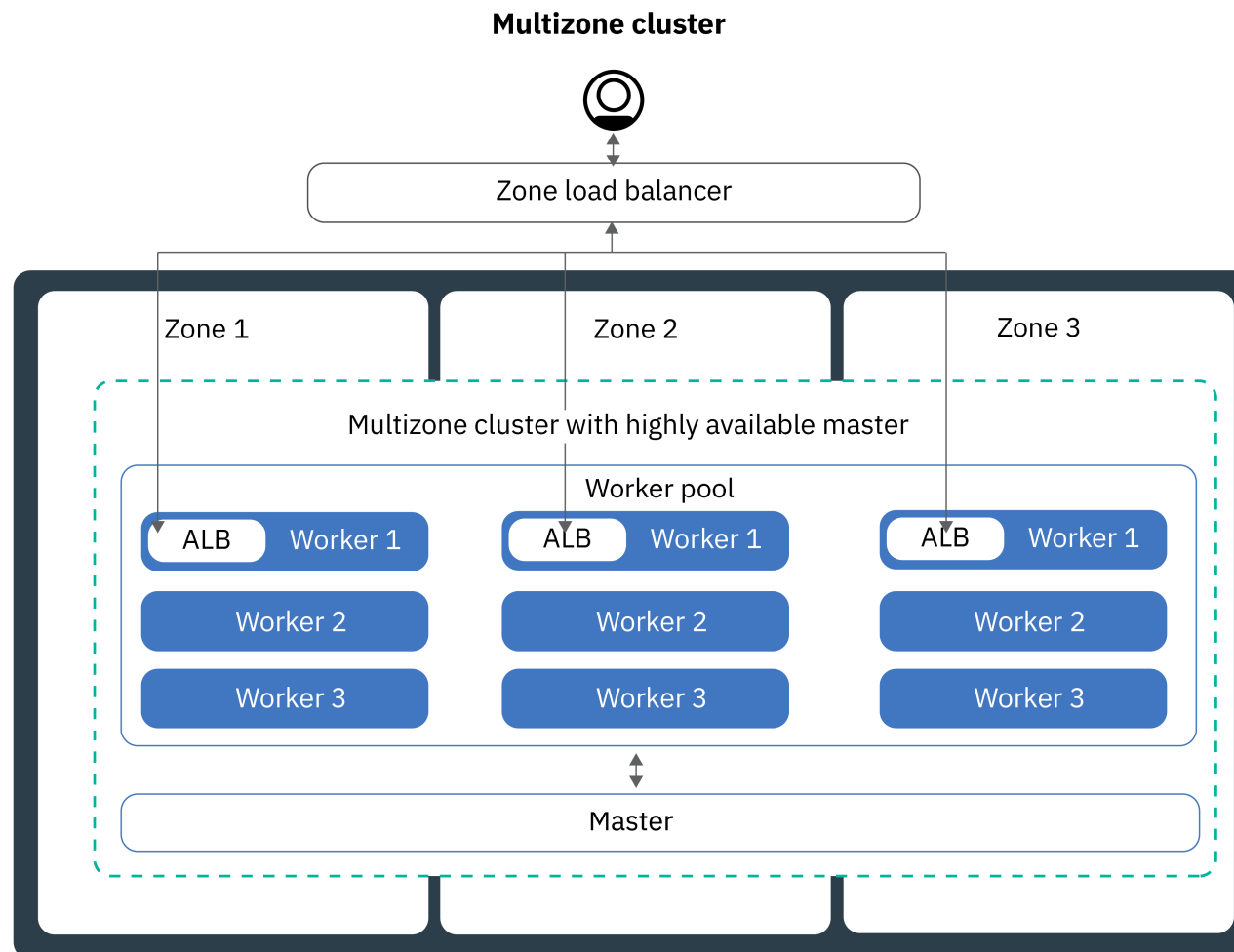
Create Cluster

Add to Estimate

Need help? [Contact IBM Cloud Sales](#)

## Planning your cluster for high availability

IBM Cloud Kubernetes Service can also deploy across multiple availability zones.



# Accessing IBM Cloud Kubernetes Service by using kubectl

Access the Kubernetes cluster by using the `kubectl` command.

```
# 1. Log in to your IBM Cloud account:
```

```
ibmcloud login -a https://cloud.ibm.com
```

```
# 2. Target the IBM Cloud Kubernetes Service region:
```

```
ibmcloud ks region-set uk-south
```

```
# 3. Get the command to set the environment variables and download  
the Kubernetes configuration files:
```

```
ibmcloud ks cluster-config ikscluster
```

```
# 4. Set the KUBECONFIG environment variable:
```

```
export KUBECONFIG=/Users/cmihai/.bluemix/plugins/container-  
service/clusters/ikscluster/kube-config-mil01-ikscluster.yml
```

```
# 5. Verify that you can connect to your cluster:
```

```
kubectl get nodes
```

```
kubectl get all
```


```
kubectl get pods --all-namespaces
```

# IBM Cloud Container Registry

- Multi-tenant private image registry with an integrated Vulnerability Advisor.
- Check images for known vulnerabilities and create deployment rules to prevent using vulnerable images.


Quick Start

Contents




Namespaces

1



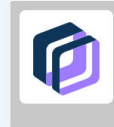
Repositories

2



Images

2







Images

URL: registry.eu-gb.bluemix.net

Create image

An image is the basis for creating a deployed container.

<input type="checkbox"/>	Repository	Tags	Digest	Created ▾	Size	Security Status
<input type="checkbox"/>	 /cmihaiereg/genealgo	v1, v2	28c2ecd11e53	3 months ago	495 MB	 <a href="#">12 issues</a>
<input type="checkbox"/>	 /cmihaiereg/cmihai-docker-demo	latest	183e234b88bb	2 years ago	16 MB	 <a href="#">29 issues</a>

Items per page: 10 ▾ | 1-2 of 2 items

1 of 1 pages < 1 >





# Vulnerability Advisor

- Detailed view of detected vulnerabilities.
- Vulnerability Advisor provides security management for IBM Cloud Container Registry and provides functions to help you secure your images.

Kubernetes Service / Registry / cmihai-docker-demo:latest





 cmihai-docker-demo:latest registry.eu-gb.ibmcloud.ibm.com/cmihai-reg/cmihai-docker-demo:latest

Image Details Issues by Type Associated Containers

Overview

 **Do Not Deploy**  **29 Vulnerabilities**  **7 Configuration Issues**

**Vulnerabilities**

Vulnerability Advisor checks your images for known vulnerabilities based on official community maintained lists. [Learn more](#)

Search

Vulnerability ID	Policy Status	Affected Packages	How to Resolve
> CVE-2017-0379	● Active	libgcrypt	Upgrade libgcrypt to >= 1.7.10-r0
> CVE-2018-0495	● Active	libgcrypt	Upgrade libgcrypt to >= 1.7.10-r0
> CVE-2017-16931	● Active	libxml2	Upgrade libxml2 to >= 2.9.8-r1
> CVE-2017-5969	● Active	libxml2	Upgrade libxml2 to >= 2.9.8-r1
> CVE-2018-14404	● Active	libxml2	Upgrade libxml2 to >= 2.9.8-r1
> CVE-2018-14567	● Active	libxml2	Upgrade libxml2 to >= 2.9.8-r1

# Using the Private Image Registry

## Command-line usage

```
# List images
ibmcloud cr login
ibmcloud cr image-list

# Creating a namespace
ibmcloud cr namespace-list
ibmcloud cr namespace-add <my_namespace>

# Tag and push an image
ibmcloud cr build -t
us.icr.io/<my_namespace>/<my_repository>:<my_tag> .
```

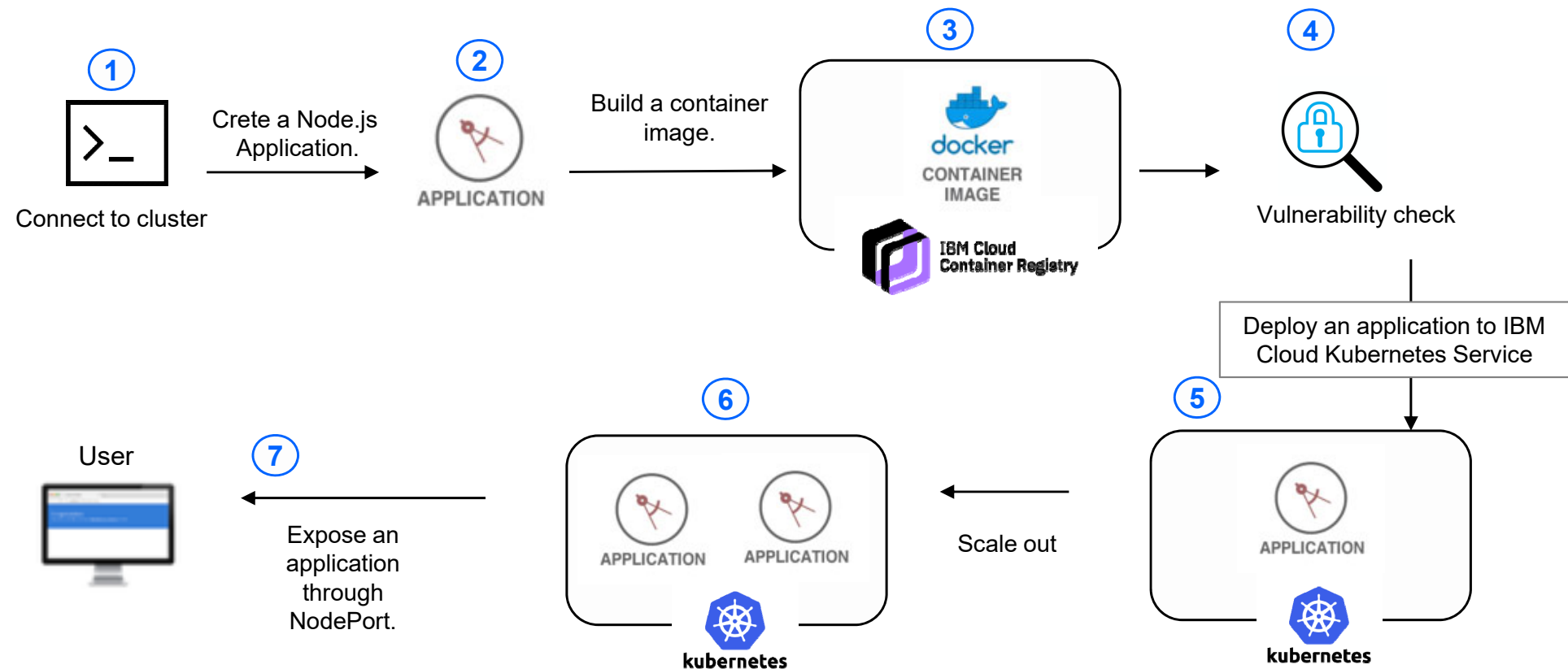
# Deploying an application

## Topics

- IBM Cloud Kubernetes Service
- ▶ Deploying an application
- Summary and further reading

# Deploying an application on IBM Cloud Kubernetes Service

You can deploy an application according to the steps that are shown in this slide. The circled numbers are matched with each step of the next slide.



## Deploy an application on IBM Cloud Kubernetes Service

You deploy an application in exercise 6 by completing the following steps:

1. Connect to your cluster by using the CLI.
2. Create a Node.js sample application.
  - IBM Cloud App Service starter kits provide a pre-configured sample application.
3. Build a container image.
  - You build your images directly on the IBM Cloud Container Registry service.
4. Check the security status of container images.
  - IBM Cloud Container Registry provides the Vulnerability Advisor service.
5. Deploy an application to IBM Cloud Kubernetes Service.
  - You can directly manipulate deployment through YAML.
6. Scale out an application.
  - You can scale an application manually or set up the autoscale function.
7. Expose the app over the internet.
  - You expose the service by using NodePort.

# Summary and further reading



## Topics

- IBM Cloud Kubernetes Service
- Deploying an application
- ▶ Summary and further reading


## Further reading

- <https://kubernetes.io/docs/concepts/overview/what-is-kubernetes/>
- <https://www.ibm.com/cloud/garage/content/course/kubernetes-101>
- <https://cognitiveclass.ai>

### Containers, microservices, Kubernetes, and Istio on the Cloud


After completing this learning path, you'll understand 12-factor apps and how microservices are managed with the IBM Cloud Kubernetes Service and Istio. You'll get hands-on experience working with containers, Kubernetes, and how to deploy containerized apps. You'll learn how to deploy microservices in a cluster and how to connect, manage, and secure those microservices.

#### COURSES




##### Container & Kubernetes Essentials with IBM Cloud

Effort: 3      Level: Beginner      Available in: English




**About the course**  
Get hands-on experience with Kubernetes container orchestration. Learn how Kubernetes and IBM Cloud Kubernetes Service help you more easily deploy and scale containers and applications.

[Learn more](#)




##### Getting started with Microservices with Istio and IBM Cloud Kubernetes Service

Effort: 3      Level: Beginner      Available in: English



**About the course**  
Discover how microservices and Istio pair together for cloud-native apps. Learn how Istio and IBM Cloud Kubernetes Service help you securely and seamlessly deploy containers and apps.

[Learn more](#)



##### Beyond the Basics: Istio and IBM Cloud Kubernetes Service

Effort: 4 hours      Level: Advanced      Available in: English

#### TELL YOUR FRIENDS

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**AUDIENCE:**  
Developers who build and manage microservices and containers in a Kubernetes and Istio environment

**LEARNING PATH LEVEL:**  
Intermediate

**3 BADGES**

**3 COURSES**

IBM Cloud Kubernetes Service overview

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## Unit summary

- Create a Kubernetes cluster by using the IBM Cloud Kubernetes Service.
- Create containers and build on the IBM Cloud Container Registry.
- Work with helm charts.
- Deploy an application to IBM Kubernetes Service.

## **Exercise 5: Managing IBM Cloud Kubernetes Service clusters**

## Exercise objectives



- This exercise demonstrates how to create an IBM Kubernetes Service cluster and manage it by using the **kubectl** CLI.
- After completing this exercise, you should be able to:
  - Create an IBM Cloud Kubernetes Service cluster.
  - Connect to a cluster on IBM Cloud Kubernetes Service.
  - List the worker nodes in a cluster.

## **Exercise 6: Deploying an application on Kubernetes**

## Exercise objectives



- In this exercise, you build a containerized application and deploy it to IBM Cloud Kubernetes Service.
- After completing this exercise, you should be able to:
  - Create a containerized Node.js application and build it on IBM Cloud Container Registry.
  - Explain how the container security analysis capability of Vulnerability Advisor can identify the security vulnerabilities by scanning an image.
  - Create a deployment and scale it.
  - Expose your application on the internet.