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# Exercise 5. Managing IBM Kubernetes Service clusters

## Estimated time

00:30



### Important

It takes about 30 minutes to provision a cluster. Part 1 should be started during the lecture or before a break.

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## Overview

This exercise demonstrates how to create an IBM Kubernetes Service cluster and manage it by using the `kubect1` CLI.

## Objectives

After completing this exercise, you should be able to:

- Create an IBM Kubernetes Service cluster.
- Connect to a cluster on IBM Cloud Kubernetes Service.
- List the worker nodes in a cluster.

## Introduction

IBM Cloud Kubernetes Service creates a cluster of compute hosts and deploys highly available containers. It provides intelligent scheduling, self-healing, horizontal scaling, service discovery and load balancing, automated rollouts and rollbacks, and secret and configuration management.

Developers can easily roll out and roll back application versions, whether they are collaborating in development and test environments or deploying to production. Therefore, developers can spend more time coding and less time working with the infrastructure.

## Requirements

- You must have a Pay-As-You-Go or Subscription IBM Cloud account so that you can create a cluster. If you are a university student, you can apply for a no-charge feature code.
- The IBM Cloud CLI must be installed.
- The Kubernetes CLI, the IBM Cloud Kubernetes Service plug-in, and the IBM Cloud Container Registry plug-in must be installed.

## Exercise instructions

In this exercise, you complete the following tasks:

- \_\_\_ 1. Create an IBM Cloud Kubernetes Service cluster.
- \_\_\_ 2. Connect to your cluster on IBM Cloud Kubernetes Service.
- \_\_\_ 3. List the worker nodes in your cluster.

### Part 1: Creating an IBM Cloud Kubernetes Service cluster

Before you dive into Kubernetes, you must provision a cluster for your containerized app. A cluster is a set of resources, worker nodes, networks, and storage devices that keep apps highly available. After you have your cluster, you can deploy your apps into the containers.

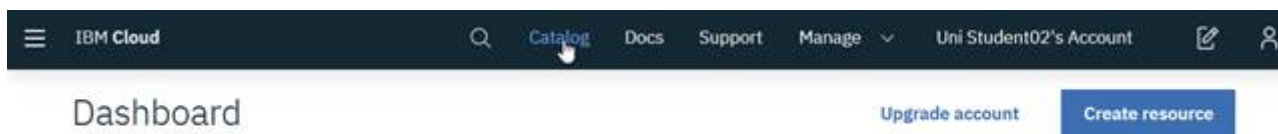


#### Important

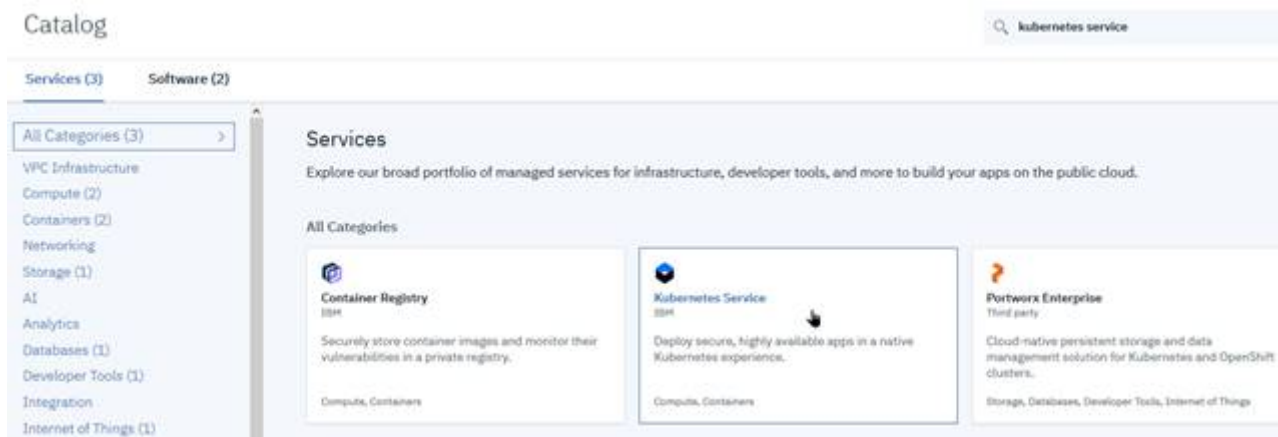
It takes about 30 minutes to provision a cluster. This part should be started during the lecture or before a break.

Complete the following steps:

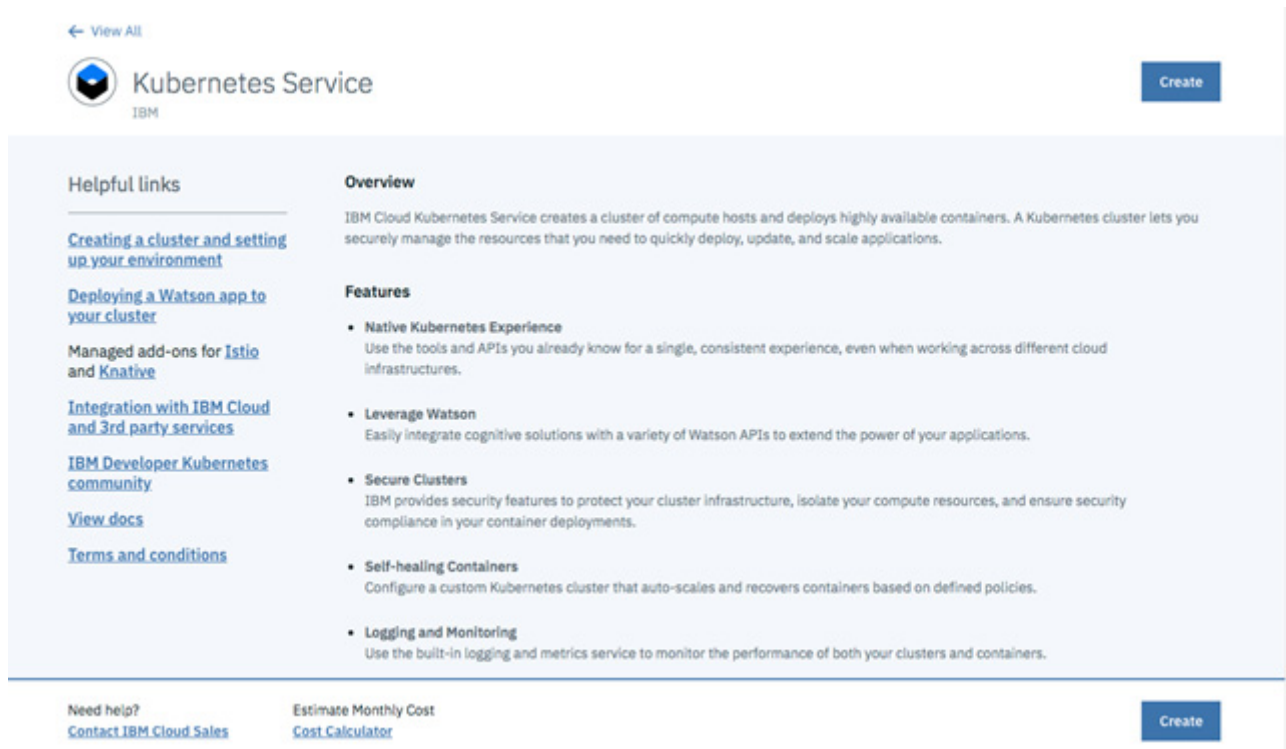
- \_\_\_ 1. Log in to <https://cloud.ibm.com> and click **Catalog**, as shown in the following figure.




- \_\_\_ 2. In the search field, enter **Kubernetes Service** and click the service, as shown in the following figure.



- \_\_\_ 3. In the upper right, click **Create**, as shown in the following figure.



← View All

 **Kubernetes Service** IBM [Create](#)

**Helpful links**

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- [Deploying a Watson app to your cluster](#)
- [Managed add-ons for Istio and Knative](#)
- [Integration with IBM Cloud and 3rd party services](#)
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**Overview**

IBM Cloud Kubernetes Service creates a cluster of compute hosts and deploys highly available containers. A Kubernetes cluster lets you securely manage the resources that you need to quickly deploy, update, and scale applications.

**Features**

- **Native Kubernetes Experience**  
Use the tools and APIs you already know for a single, consistent experience, even when working across different cloud infrastructures.
- **Leverage Watson**  
Easily integrate cognitive solutions with a variety of Watson APIs to extend the power of your applications.
- **Secure Clusters**  
IBM provides security features to protect your cluster infrastructure, isolate your compute resources, and ensure security compliance in your container deployments.
- **Self-healing Containers**  
Configure a custom Kubernetes cluster that auto-scales and recovers containers based on defined policies.
- **Logging and Monitoring**  
Use the built-in logging and metrics service to monitor the performance of both your clusters and containers.


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Estimate Monthly Cost [Cost Calculator](#)

[Create](#)

- \_\_\_ 4. For the plan, select **Free** and keep the defaults. Click **Create cluster**, as shown in the following figure.

A free cluster creates only one worker node, which is fine for this exercise, but you should consider a standard cluster for a production environment.



## 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 type and version



**Kubernetes**

1.14.9 (Latest, Stable, Default) ▾

Cluster name

Resource group

Create cluster

### Order summary

Free - 2 vCPUs 4GB RAM	
1 worker node	<b>Free</b>
<b>Total*</b>	<b>Free</b>


\*Actual monthly total will vary with [tiered pricing](#).

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

Create cluster



Add to estimate

Need help? [Contact IBM Cloud](#)



\_\_\_ 5. Explore the page that opens. You will perform these steps in this exercise.

Clusters / mycluster

 mycluster  Preparing master, workers... Expires in 30 days

[Access](#) [Overview](#) [Worker Nodes](#) [Worker Pools](#) [Add-ons](#) [DevOps](#) [New](#)

Before your cluster provisions, set up your CLI tools

Run this command with your PowerShell to download and install a few CLI tools and plugins.

```
Set-ExecutionPolicy Unrestricted; iex(New-Object Net.WebClient).DownloadStr
```

After your cluster provisions, gain access

1. Log in to your IBM Cloud account. Include the `--sso` option if using a federated ID.

```
ibmcloud login -a cloud.ibm.com -r us-south -g Default
```

2. Download the kubeconfig files for your cluster.

```
ibmcloud ks cluster config --cluster bniji8hd0ml53nh47g8g
```

3. Set the KUBECONFIG environment variable. Copy the output from the previous command and paste it in your terminal. The command output looks similar to the following example:


```
export KUBECONFIG=%HOMEPATH%\bluemix\plugins\container-service\clusters\bniji8hd0ml53nh47g8g\kube-config-hou02-mycluster.yml
```




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


6. Open the **Worker Nodes** tab, as shown in the following figure.

You can see the progress in the Worker Nodes tab.

Clusters / mycluster



 mycluster



 Preparing master, workers...  Expires in 30 days [Web terminal](#) [Kubernetes dashboard](#) [Connect via CLI](#) 

[Access](#) [Overview](#) [Worker Nodes](#) [Worker Pools](#) [Add-ons](#) [DevOps](#) 

### Worker Nodes

[Add worker pool](#)

<input type="checkbox"/>	Name	Status	Worker Pool	Zone	Private IP	Public IP	Version
> <input type="checkbox"/>	0000000a	 Provision pending	default	hou02	--	--	 1.14.9_1541

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





7. Wait until the status becomes Normal, as shown in the following figure. When the status reaches Normal, you can start working with your cluster.




### Note

It might take several minutes (approximately 30 minutes) to deploy the cluster.



Clusters / mycluster



 mycluster  Normal  Expires in 30 days [Web terminal](#) [Kubernetes dashboard](#) [Connect via CLI](#) 

[Access](#) [Overview](#) [Worker Nodes](#) [Worker Pools](#) [Add-ons](#) [DevOps](#) 

### Worker Nodes

[Add worker pool](#)

<input type="checkbox"/>	Name	Status	Worker Pool	Zone	Private IP	Public IP	Version
> <input type="checkbox"/>	0000000a	 Normal	default	hou02	10.76.152.49	173.193.102.51	 1.14.9_1541

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

## Part 2: Connecting to your cluster on IBM Cloud Kubernetes Service

You can access your cluster with the IBM Cloud CLI by completing the following steps:

- \_\_\_ 1. Log in to IBM Cloud by using the IBM Cloud CLI. Open a command prompt and run the following command:

```
ibmcloud login -a https://cloud.ibm.com -r <your region> -u <your IBM ID email> -p <your password> -g <your resource group>
```

Example:

```
ibmcloud login -a https://cloud.ibm.com -r us-south -u myuser@example.com -p mypassword -g Default
```



### Note

A resource group is a way for you to organize your account resources in customizable groupings. You have a default resource group in your account that is called **Default** which you can use in this exercise.

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### Optional

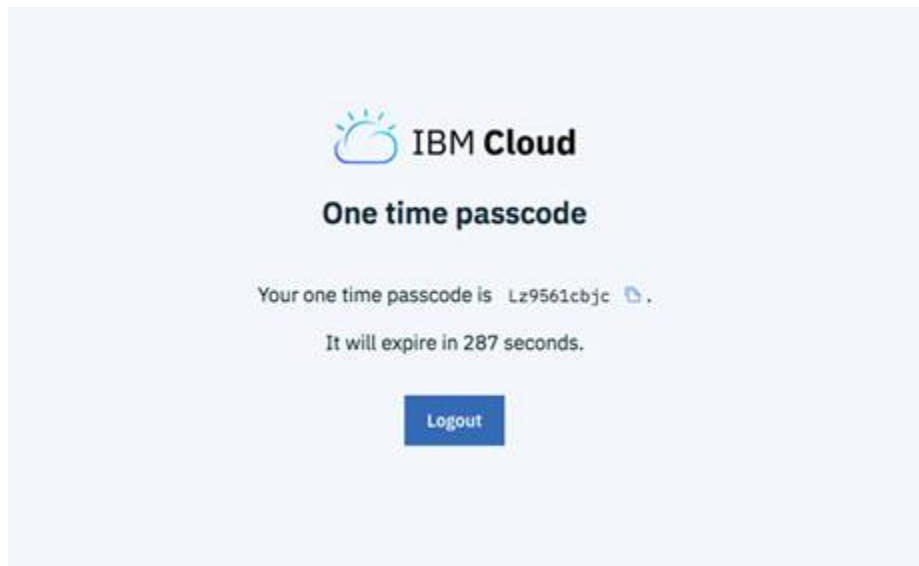
If you have a federated ID, use `ibmcloud login --sso` to log in to get started.

```
~/Box Sync $ ibmcloud login --sso
API endpoint: https://cloud.ibm.com

Get One Time Code from https://identity-1.ap-north.iam.cloud.ibm.com/identity/passcode to proceed.
Open the URL in the default browser? [Y/n]> Y
```

After you press `Y`, log in to IBM Cloud by using your federated ID (IBM ID account in this example). Copy the passcode, and paste it into the command prompt, as shown in the following figure.





The following table shows the Kubernetes Service region and the corresponding IBM Cloud location.

IBM Cloud Kubernetes Service region	Corresponding IBM Cloud location
ap-north (standard clusters only)	Tokyo
ap-south	Sydney
eu-central	Frankfurt
uk-south	London
us-east (standard clusters only)	Washington DC
us-south	Dallas

The following figure shows the output of the `ibmcloud login` command.

```
C:\Users>ibmcloud login -a https://cloud.ibm.com -r us-south -u uni_student02@yahoo.com -p K1verplated -g Default
API endpoint: https://cloud.ibm.com
Authenticating...
OK
Targeted account Uni Student02's Account (982419359bb3ef0787bbeb395b906e1c)
Targeted resource group Default
Targeted region us-south

API endpoint:      https://cloud.ibm.com
Region:           us-south
User:             uni_student02@yahoo.com
Account:          Uni Student02's Account (982419359bb3ef0787bbeb395b906e1c)
Resource group:   Default
CF API endpoint:
Org:
Space:
```

- \_\_\_ 2. Get the command to set the environment variable and download the Kubernetes configuration files and certificates to connect to your cluster by using `kubectl` commands.

`ibmcloud ks cluster-config --cluster <cluster_name_or_ID>`



Specify the cluster name that you created in Part 1. For example:

```
ibmcloud ks cluster-config mycluster
```

This command downloads the configuration files that are needed to access your Kubernetes cluster locally from your machine. It outputs an environment variable that is called `KUBECONFIG`, as shown in the following figure, which you copy and paste into your terminal or command prompt so that the `kubectl` tool can point to your cluster.

```
C:\Users>ibmcloud ks cluster-config mycluster
Kubernetes version 1.16 has removed deprecated APIs. For more information, see <http://ibm.biz/k8s-1-16-apis>

OK
The configuration for mycluster was downloaded successfully.

Export environment variables to start using Kubernetes.

PowerShell
$env:KUBECONFIG = "C:\Users\MarcelaAdan\.bluemix\plugins\container-service\clusters\mycluster\kube-config-hou02-mycluster.yml"

Command Prompt
SET KUBECONFIG=C:\Users\MarcelaAdan\.bluemix\plugins\container-service\clusters\mycluster\kube-config-hou02-mycluster.yml
```

- \_\_\_ 3. Set the `KUBECONFIG` environment variable. Copy the output from the previous command and paste it into your terminal or command prompt. The command output looks similar to the following examples.

### **1+1=2** Example

MacOS (Enter the command in a single line)

```
export
KUBECONFIG=/Users/<user_name>/.bluemix/plugins/container-service/clusters/pr_firm_
cluster/kube-config-prod-par02-pr_firm_cluster.yml
```

```
~/Box Sync $ ibmcloud ks cluster-config mycluster
OK
The configuration for mycluster was downloaded successfully.

Export environment variables to start using Kubernetes.

export KUBECONFIG=/Users/junghyeonyoo/.bluemix/plugins/container-service/clusters/mycluster/kube-config-hou02-mycluster.y
ml
```

## 1+1=2 Example

Windows (enter the command in a single line).

## 1+1=2 Example

SET

KUBECONFIG=C:\Users\\.bluemix\plugins\container-service\clusters\mycluster\kube-config-mel01-mycluster.yml

```
C:\Users\ITSOUSER>ibmcloud ks cluster-config --cluster mycluster
OK
The configuration for mycluster was downloaded successfully.
Export environment variables to start using Kubernetes.
SET KUBECONFIG=C:\Users\ITSOUSER\.bluemix\plugins\container-service\clusters\mycluster\kube-config-hou02-mycluster.yml
```



## Note

For Windows PowerShell users, instead of copying and pasting the **SET** command from the output of **ibmcloud ks cluster-config**, you must set the KUBECONFIG environment variable by running, for example, the following command:

```
$env:KUBECONFIG =
"C:\Users\\.bluemix\plugins\container-service\clusters\mycluster\kube-config-prod-dal10-mycluster.yml"
```

```
PS C:\Users> ibmcloud ks cluster-config mycluster
OK
The configuration for mycluster was downloaded successfully. Export environment variables to start using Kubernetes.
SET KUBECONFIG=C:\Users\lab21\bluemix\plugins\container-service\clusters\mycluster\kube-config-mel01-mycluster.yml
PS C:\Users> $env:KUBECONFIG="C:\Users\lab21\bluemix\plugins\container-service\clusters\mycluster\kube-config-mel01-mycluster.yml"
```

- \_\_\_ 4. Verify that the **kubectl** commands run properly with your cluster by checking the Kubernetes CLI server version:

```
kubectl version --short
```

The **kubectl version --short** command output is shown in the following figure.

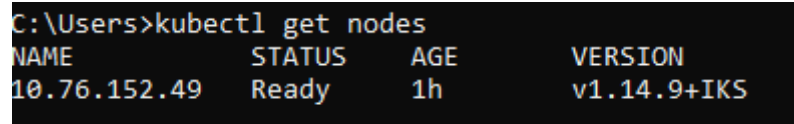
```
C:\Users>kubectl version --short
Client Version: v1.7.0
Server Version: v1.14.9+IKS
```

### ***Part 3: Listing the worker nodes in your cluster***

By using `kubectl` commands, you can manage your apps, cluster, and cluster resources. Verify that you can connect to your cluster by listing your worker nodes. Run the following command:

```
kubectl get nodes
```

The `kubectl get nodes` command output is shown in the following figure.



```
C:\Users>kubectl get nodes
NAME              STATUS    AGE           VERSION
10.76.152.49      Ready     1h            v1.14.9+IKS
```

**End of exercise**

## Exercise review and wrap-up

Now that you completed this exercise, you understand what Kubernetes is, how it works, and how you can access the cluster.

You also know how to retrieve cluster information.