



# OpenShift Container Platform 4.20

## Overview

Introduction to OpenShift Container Platform



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## Introduction to OpenShift Container Platform

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## Abstract

This document provides an overview of the OpenShift Container Platform features.

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# CHAPTER 1. OPENSHIFT CONTAINER PLATFORM 4.20 DOCUMENTATION

## Table of Contents

Welcome to the official OpenShift Container Platform 4.20 documentation, where you can learn about OpenShift Container Platform and start exploring its features.

To navigate the OpenShift Container Platform 4.20 documentation, you can use one of the following methods:

- Use the navigation bar to browse the documentation.
- Select the task that interests you from [Learn more about OpenShift Container Platform](#).
- OpenShift Container Platform has a variety of layered offerings to add additional functionality and extend the capabilities of a cluster. For more information, see [OpenShift Container Platform Operator Life Cycles](#)

# CHAPTER 2. INTRODUCTION TO OPENSHIFT CONTAINER PLATFORM

OpenShift Container Platform is a cloud-based Kubernetes container platform. The foundation of OpenShift Container Platform is based on Kubernetes and therefore shares the same technology. It is designed to allow applications and the data centers that support them to expand from just a few machines and applications to thousands of machines that serve millions of clients.

OpenShift Container Platform enables you to do the following:

- Provide developers and IT organizations with cloud application platforms that can be used for deploying applications on secure and scalable resources.
- Require minimal configuration and management overhead.
- Bring the Kubernetes platform to customer data centers and cloud.
- Meet security, privacy, compliance, and governance requirements.

With its foundation in Kubernetes, OpenShift Container Platform incorporates the same technology that serves as the engine for massive telecommunications, streaming video, gaming, banking, and other applications. Its implementation in open Red Hat technologies lets you extend your containerized applications beyond a single cloud to on-premise and multi-cloud environments.

OpenShift Container Platform is a platform for developing and running containerized applications. It is designed to allow applications and the data centers that support them to expand from just a few machines and applications to thousands of machines that serve millions of clients.

## 2.1. UNDERSTANDING OPENSIFT CONTAINER PLATFORM

OpenShift Container Platform is a Kubernetes environment for managing the lifecycle of container-based applications and their dependencies on various computing platforms, such as bare metal, virtualized, on-premise, and in cloud. OpenShift Container Platform deploys, configures and manages containers. OpenShift Container Platform offers usability, stability, and customization of its components.

OpenShift Container Platform utilises a number of computing resources, known as nodes. A node has a lightweight, secure operating system based on Red Hat Enterprise Linux (RHEL), known as Red Hat Enterprise Linux CoreOS (RHCOS).

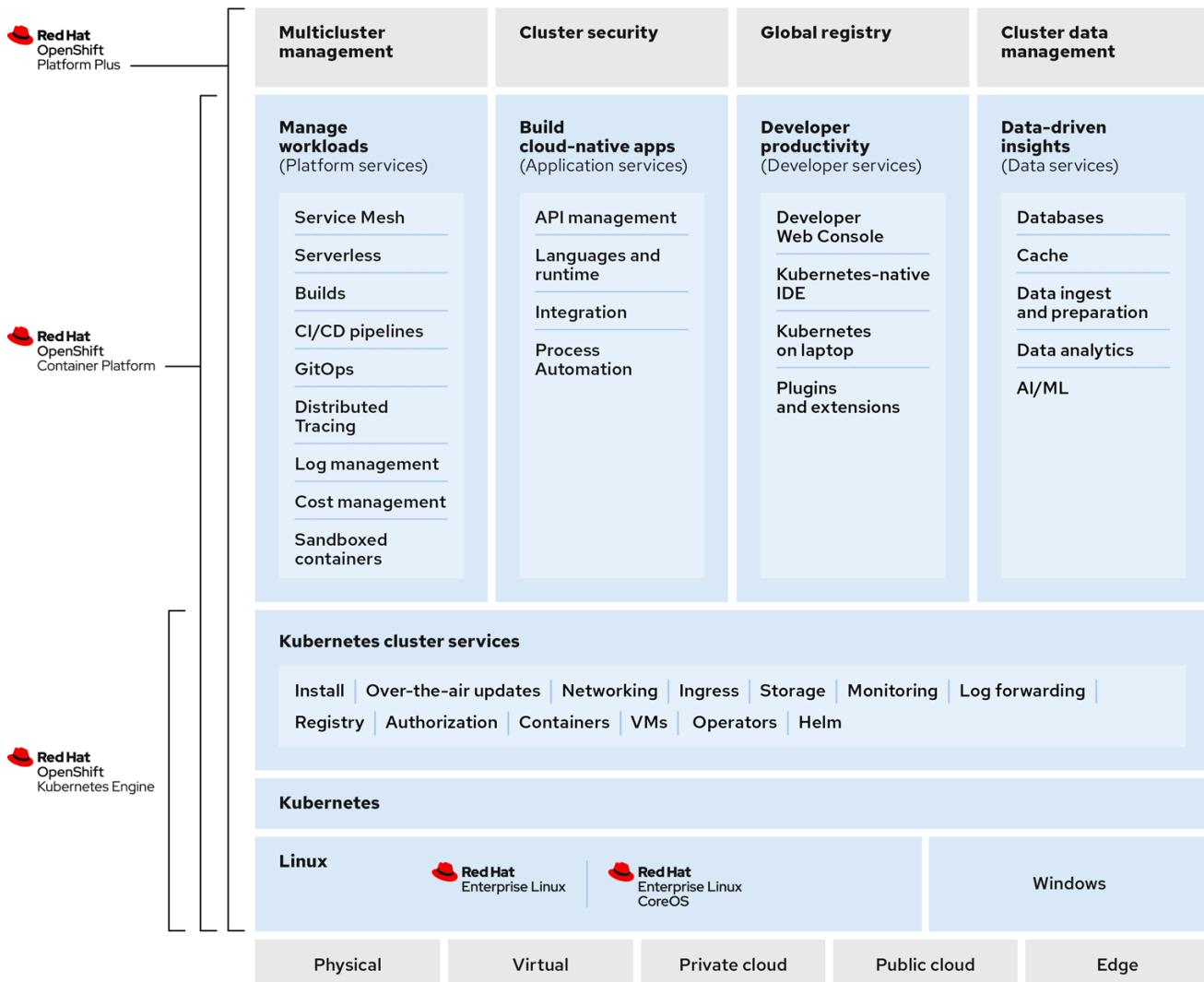
After a node is booted and configured, it obtains a container runtime, such as CRI-O or Docker, for managing and running the images of container workloads scheduled to it. The Kubernetes agent, or kubelet schedules container workloads on the node. The kubelet is responsible for registering the node with the cluster and receiving the details of container workloads.

OpenShift Container Platform configures and manages the networking, load balancing and routing of the cluster. OpenShift Container Platform adds cluster services for monitoring the cluster health and performance, logging, and for managing upgrades.

The container image registry and software catalog provide Red Hat certified products and community built softwares for providing various application services within the cluster. These applications and services manage the applications deployed in the cluster, databases, frontends and user interfaces, application runtimes and business automation, and developer services for development and testing of container applications.

You can manage applications within the cluster either manually by configuring deployments of containers running from pre-built images or through resources known as Operators. You can build custom images from pre-build images and source code, and store these custom images locally in an internal, private or public registry.

The Multicloud Management layer can manage multiple clusters including their deployment, configuration, compliance and distribution of workloads in a single console.



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## 2.1.1. Use cases

Red Hat OpenShift is widely adopted across industries to support various use cases, enabling organizations to modernize applications, optimize infrastructure, and enhance operational efficiency.

### OpenShift virtualization

- Provides a unified platform for managing virtual machines (VMs) and containers in parallel, which streamlines operations and reduces complexity.
- Provides a robust infrastructure to scale VM workloads efficiently.
- Provides enhanced security features to protect VM environments, ensuring compliance and data integrity.

For detailed implementation guidelines and a sample architecture, refer to the [OpenShift](#)

[Virtualization - Reference Implementation Guide](#). This document offers best practices for deploying OpenShift as a hosting solution for virtualization workloads, designed for environments transitioning from platforms such as VMware Cloud Foundation, VMware vSphere Foundation, Red Hat Virtualization, and OpenStack to OpenShift Virtualization.

## Application modernization including artificial intelligence and machine learning (AI/ML) operations

- Enables containerization and refactoring of legacy applications.
- Preserves business logic while making applications cloud-ready and maintainable.
- Supports model training and inference workloads with standardized ML infrastructure.
- Seamlessly integrates with data science workflows.

## Multi-cloud and hybrid cloud deployments

- Provides a consistent platform across on-premises data centers and multiple public clouds.
- Helps avoid vendor lock-in and optimize workload placement.

## DevOps enablement

- Built-in continuous delivery and continuous integration (CI/CD) pipelines and GitOps workflows streamline software development.
- Offers developer self-service capabilities to accelerate software delivery.

## Edge computing

- Enables distributed computing closer to data sources in industries such as telecommunications, retail, and manufacturing.
- Supports lightweight deployment patterns, including three-node clusters, single-node clusters and Red Hat Device Edge or MicroShift.
- Provides support for on-premises deployments.

## Regulatory compliance

Provides robust security features to meet compliance requirements for financial services, healthcare, and government agencies.

## Microservices architecture

Supports cloud-native application development using service mesh, API management, and serverless capabilities.

## Enterprise SaaS delivery

- Facilitates multi-tenant SaaS application deployment with consistent operations.
- Includes features like Hosted Control Planes, cluster-as-a-service, and fleet-level management with Advanced Cluster Management (ACM) and Advanced Cluster Security (ACS).

To explore more use cases, see [Use cases](#).

For additional recommended solutions tailored to various use cases, see [Solution Patterns from Red Hat](#).

#### Additional resources

- [Preparing to install on a single node](#)

# CHAPTER 3. LEARN MORE ABOUT OPENSHIFT CONTAINER PLATFORM

Use the following sections to find content to help you learn about and better understand OpenShift Container Platform functions:

## 3.1. LEARNING AND SUPPORT

Learn about OpenShift Container Platform	Optional additional resources
<a href="#">What's new in OpenShift Container Platform</a>	<a href="#">OpenShift blog</a>
<a href="#">OpenShift Container Platform Life Cycle Policy</a>	<a href="#">OpenShift Container Platform life cycle</a>
<a href="#">OpenShift Interactive Learning Portal</a>	<a href="#">OpenShift Knowledgebase articles</a>
<a href="#">Getting Support</a>	<a href="#">Gathering data about your cluster</a>

## 3.2. ARCHITECTURE

Learn about OpenShift Container Platform	Optional additional resources
<a href="#">Enterprise Kubernetes with OpenShift</a>	<a href="#">Tested platforms</a>
<a href="#">Architecture</a>	<a href="#">Security and compliance</a>
<a href="#">Networking</a>	<a href="#">OVN-Kubernetes architecture</a>
<a href="#">Backup and restore</a>	<a href="#">Restoring to a previous cluster state</a>

## 3.3. INSTALLATION

Explore the following OpenShift Container Platform installation tasks:

Learn about installation on OpenShift Container Platform	Optional additional resources
<a href="#">OpenShift Container Platform installation overview</a>	<a href="#">Selecting a cluster installation method and preparing it for users</a>
<a href="#">Installing a cluster in FIPS mode</a>	<a href="#">About FIPS compliance</a>

## 3.4. OTHER CLUSTER INSTALLER TASKS

Learn about other installer tasks on OpenShift Container Platform	Optional additional resources
Troubleshooting installation issues	Validating an installation
Install Red Hat OpenShift Data Foundation	image mode for OpenShift

### 3.4.1. Install a cluster in a restricted network

Learn about installing in a restricted network	Optional additional resources
About disconnected installation mirroring	<p>If your cluster uses user-provisioned infrastructure, and the cluster does not have full access to the internet, you must mirror the OpenShift Container Platform installation images.</p> <ul style="list-style-type: none"> <li>● <a href="#">Amazon Web Services (AWS)</a></li> <li>● <a href="#">Google Cloud</a></li> <li>● <a href="#">vSphere</a></li> <li>● <a href="#">IBM Cloud®</a></li> <li>● <a href="#">IBM Z® and IBM® LinuxONE</a></li> <li>● <a href="#">IBM Power®</a></li> <li>● <a href="#">bare metal</a></li> </ul>

### 3.4.2. Install a cluster in an existing network

Learn about installing in a restricted network	Optional additional resources
If you use an existing Virtual Private Cloud (VPC) in <a href="#">Amazon Web Services (AWS)</a> or <a href="#">Google Cloud</a> or an existing <a href="#">VNet</a> on Microsoft Azure, you can install a cluster	<a href="#">Installing a cluster on Google Cloud into a shared VPC</a>

## 3.5. CLUSTER ADMINISTRATOR

Learn about OpenShift Container Platform cluster activities	Optional additional resources

Learn about OpenShift Container Platform cluster activities	Optional additional resources
Understand OpenShift Container Platform management	<ul style="list-style-type: none"> <li>● Machine API</li> <li>● Operators</li> <li>● * etcd</li> </ul>
Enable cluster capabilities	Optional cluster capabilities in OpenShift Container Platform 4.20

### 3.5.1. Managing and changing cluster components

#### 3.5.1.1. Managing cluster components

Learn about managing cluster components	Optional additional resources
Manage <a href="#">compute</a> and <a href="#">control plane</a> machines with machine sets	Deploy machine health checks
Apply autoscaling to an OpenShift Container Platform cluster	Including pod priority in pod scheduling decisions
Manage container registries	Red Hat Quay
Manage users and groups	Impersonating the system:admin user
Manage authentication	Multiple identity providers
Manage <a href="#">Ingress</a> , <a href="#">API server</a> , and <a href="#">Service</a> certificates	Network security
Manage networking	<ul style="list-style-type: none"> <li>● Cluster Network Operator</li> <li>● Multiple network interfaces</li> <li>● Network policy</li> </ul>
Manage Operators	Creating applications from installed Operators

#### 3.5.1.2. Changing cluster components

Learn more about changing cluster components	Optional additional resources
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Learn more about changing cluster components	Optional additional resources
<a href="#">Introduction to OpenShift updates</a>	<ul style="list-style-type: none"> <li>● Updating a cluster using the web console</li> <li>● Updating using the CLI</li> <li>● Using the OpenShift Update Service in a disconnected environment</li> </ul>
<a href="#">Use custom resource definitions (CRDs) to modify the cluster</a>	<ul style="list-style-type: none"> <li>● Create a CRD</li> <li>● Manage resources from CRDs</li> </ul>
<a href="#">Set resource quotas</a>	Resource quotas across multiple projects
<a href="#">Prune and reclaim resources</a>	Performing advanced builds
<a href="#">Scale and tune clusters</a>	OpenShift Container Platform scalability and performance

## 3.6. OBSERVE A CLUSTER

Learn about OpenShift Container Platform	Optional additional resources
<a href="#">Release notes for the Red Hat OpenShift Distributed Tracing Platform</a>	Red Hat OpenShift Distributed Tracing Platform (Jaeger)
<a href="#">Red Hat build of OpenTelemetry</a>	Gathering the observability data from multiple clusters
<a href="#">About Network Observability</a>	<ul style="list-style-type: none"> <li>● Using metrics with dashboards and alerts</li> <li>● Observing the network traffic from the Traffic flows view</li> </ul>
<a href="#">About OpenShift Container Platform monitoring</a>	<ul style="list-style-type: none"> <li>● Remote health monitoring</li> <li>● Power monitoring for Red Hat OpenShift (Technology Preview)</li> </ul>

## 3.7. STORAGE ACTIVITIES

Learn about OpenShift Container Platform	Optional additional resources
Storage types	<ul style="list-style-type: none"> <li>● Persistent storage</li> <li>● Ephemeral storage</li> </ul>

## 3.8. APPLICATION SITE RELIABILITY ENGINEER (APP SRE)

Learn about OpenShift Container Platform	Optional additional resources
Building applications overview	Projects
Operators	Cluster Operator reference

## 3.9. DEVELOPER

OpenShift Container Platform is a platform for developing and deploying containerized applications. Read the following OpenShift Container Platform documentation, so that you can better understand OpenShift Container Platform functions:

Learn about application development in OpenShift Container Platform	Optional additional resources
Getting started with OpenShift for developers (interactive tutorial)	<ul style="list-style-type: none"> <li>● Understanding OpenShift Container Platform development</li> <li>● Working with projects</li> <li>● Create deployments</li> </ul>
Red Hat Developers site	Understanding image builds
Red Hat OpenShift Dev Spaces (formerly Red Hat CodeReady Workspaces)	Operators
Create container images	Managing images overview
odo	Developer-focused CLI
Viewing application composition using the Topology view	Exporting applications
Understanding OpenShift Pipelines	Create CI/CD Pipelines

Learn about application development in OpenShift Container Platform	Optional additional resources
<p>Configuring an OpenShift cluster by deploying an application with cluster configurations</p>	<ul style="list-style-type: none"> <li>● Controlling pod placement using node taints</li> <li>● Creating infrastructure machine sets</li> </ul>

## 3.10. HOSTED CONTROL PLANES

Learn about hosted control planes	Optional additional resources
<p>Hosted control planes overview</p>	<p>Versioning for hosted control planes</p>
<p>Preparing to deploy</p>	<ul style="list-style-type: none"> <li>● Requirements for hosted control planes</li> <li>● Sizing guidance for hosted control planes</li> <li>● Overriding resource utilization measurements</li> <li>● Installing the hosted control planes command-line interface</li> <li>● Distributing hosted cluster workloads</li> <li>● Enabling or disabling the hosted control planes feature</li> </ul>
<p>Deploying hosted control planes</p>	<ul style="list-style-type: none"> <li>● Deploying hosted control planes on OpenShift Virtualization</li> <li>● Deploying hosted control planes on AWS</li> <li>● Deploying hosted control planes on bare metal</li> <li>● Deploying hosted control planes on non-bare-metal agent machines</li> <li>● Deploying hosted control planes on IBM Z</li> <li>● Deploying hosted control planes on IBM Power</li> </ul>
<p>Deploying hosted control planes in a disconnected environment</p>	<ul style="list-style-type: none"> <li>● Deploying hosted control planes on bare metal in a disconnected environment</li> <li>● Deploying hosted control planes on OpenShift Virtualization in a disconnected environment</li> </ul>

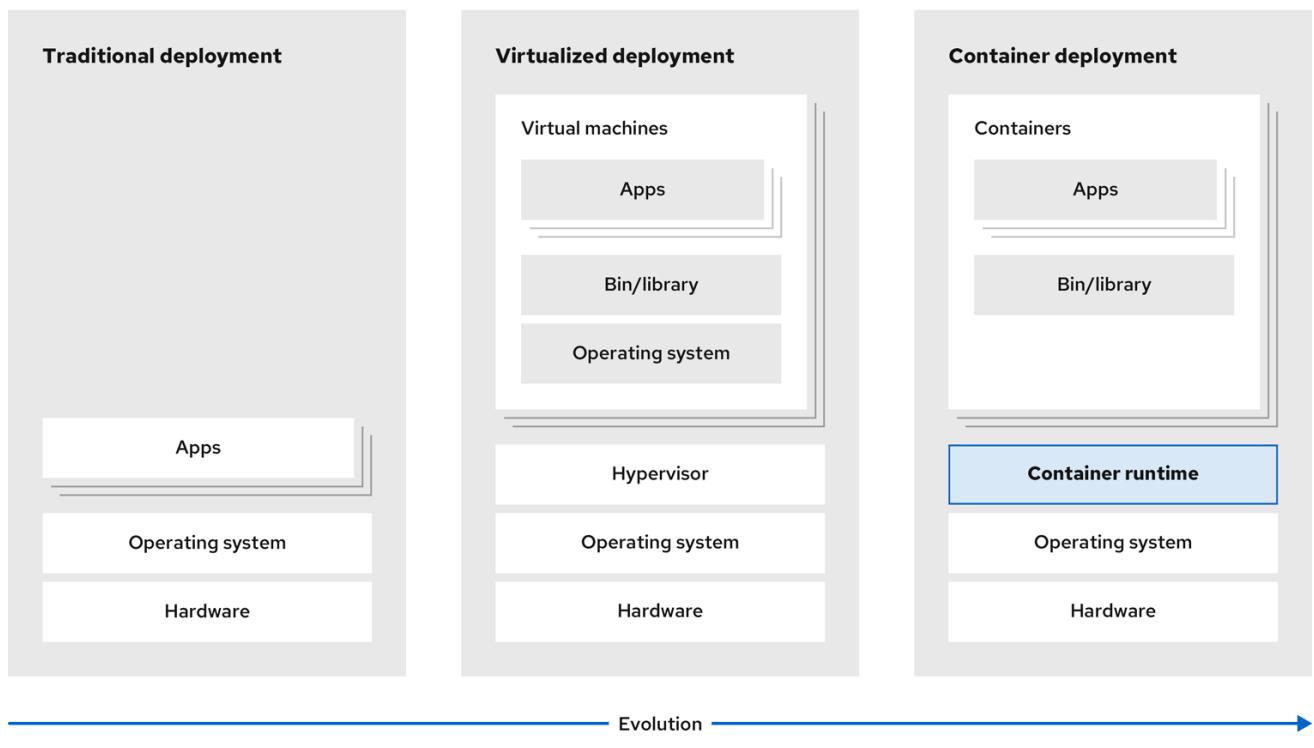
Learn about hosted control planes	Optional additional resources
<a href="#">Troubleshooting hosted control planes</a>	Gathering information to troubleshoot hosted control planes

## CHAPTER 4. KUBERNETES OVERVIEW

Kubernetes is an open source container orchestration tool developed by Google. You can run and manage container-based workloads by using Kubernetes. The most common Kubernetes use case is to deploy an array of interconnected microservices, building an application in a cloud native way. You can create Kubernetes clusters that can span hosts across on-premise, public, private, or hybrid clouds.

Traditionally, applications were deployed on top of a single operating system. With virtualization, you can split the physical host into several virtual hosts. Working on virtual instances on shared resources is not optimal for efficiency and scalability. Because a virtual machine (VM) consumes as many resources as a physical machine, providing resources to a VM such as CPU, RAM, and storage can be expensive. Also, you might see your application degrading in performance due to virtual instance usage on shared resources.

**Figure 4.1. Evolution of container technologies for classical deployments**



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To solve this problem, you can use containerization technologies that segregate applications in a containerized environment. Similar to a VM, a container has its own filesystem, vCPU, memory, process space, dependencies, and more. Containers are decoupled from the underlying infrastructure, and are portable across clouds and OS distributions. Containers are inherently much lighter than a fully-featured OS, and are lightweight isolated processes that run on the operating system kernel. VMs are slower to boot, and are an abstraction of physical hardware. VMs run on a single machine with the help of a hypervisor.

You can perform the following actions by using Kubernetes:

- Sharing resources
- Orchestrating containers across multiple hosts
- Installing new hardware configurations
- Running health checks and self-healing applications

- Scaling containerized applications

## 4.1. KUBERNETES COMPONENTS

Table 4.1. Kubernetes components

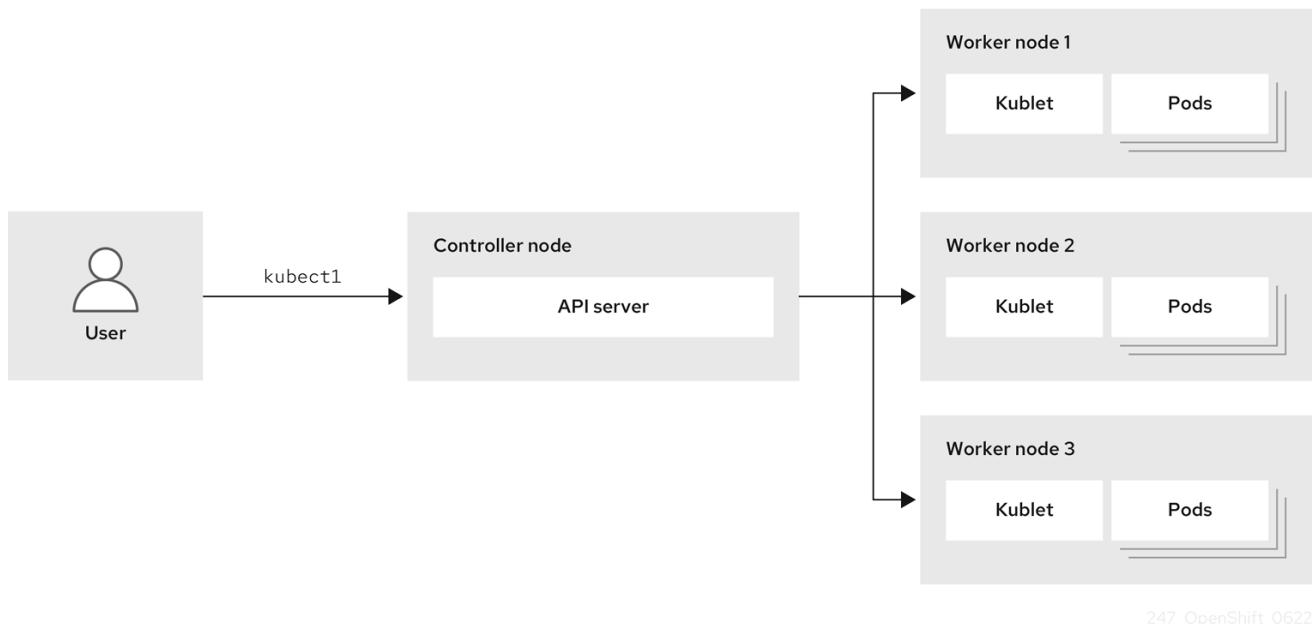
Component	Purpose
<b>kube-proxy</b>	Runs on every node in the cluster and maintains the network traffic between the Kubernetes resources.
<b>kube-controller-manager</b>	Governs the state of the cluster.
<b>kube-scheduler</b>	Allocates pods to nodes.
<b>etcd</b>	Stores cluster data.
<b>kube-apiserver</b>	Validates and configures data for the API objects.
<b>kubelet</b>	Runs on nodes and reads the container manifests. Ensures that the defined containers have started and are running.
<b>kubectl</b>	Allows you to define how you want to run workloads. Use the <b>kubectl</b> command to interact with the <b>kube-apiserver</b> .
Node	Node is a physical machine or a VM in a Kubernetes cluster. The control plane manages every node and schedules pods across the nodes in the Kubernetes cluster.
container runtime	container runtime runs containers on a host operating system. You must install a container runtime on each node so that pods can run on the node.
Persistent storage	Stores the data even after the device is shut down. Kubernetes uses persistent volumes to store the application data.
<b>container-registry</b>	Stores and accesses the container images.
Pod	The pod is the smallest logical unit in Kubernetes. A pod contains one or more containers to run in a worker node.

## 4.2. KUBERNETES RESOURCES

A custom resource is an extension of the Kubernetes API. You can customize Kubernetes clusters by using custom resources. Operators are software extensions which manage applications and their components with the help of custom resources. Kubernetes uses a declarative model when you want a fixed desired result while dealing with cluster resources. By using Operators, Kubernetes defines its states in a declarative way. You can modify the Kubernetes cluster resources by using imperative

commands. An Operator acts as a control loop which continuously compares the desired state of resources with the actual state of resources and puts actions in place to bring reality in line with the desired state.

**Figure 4.2. Kubernetes cluster overview**



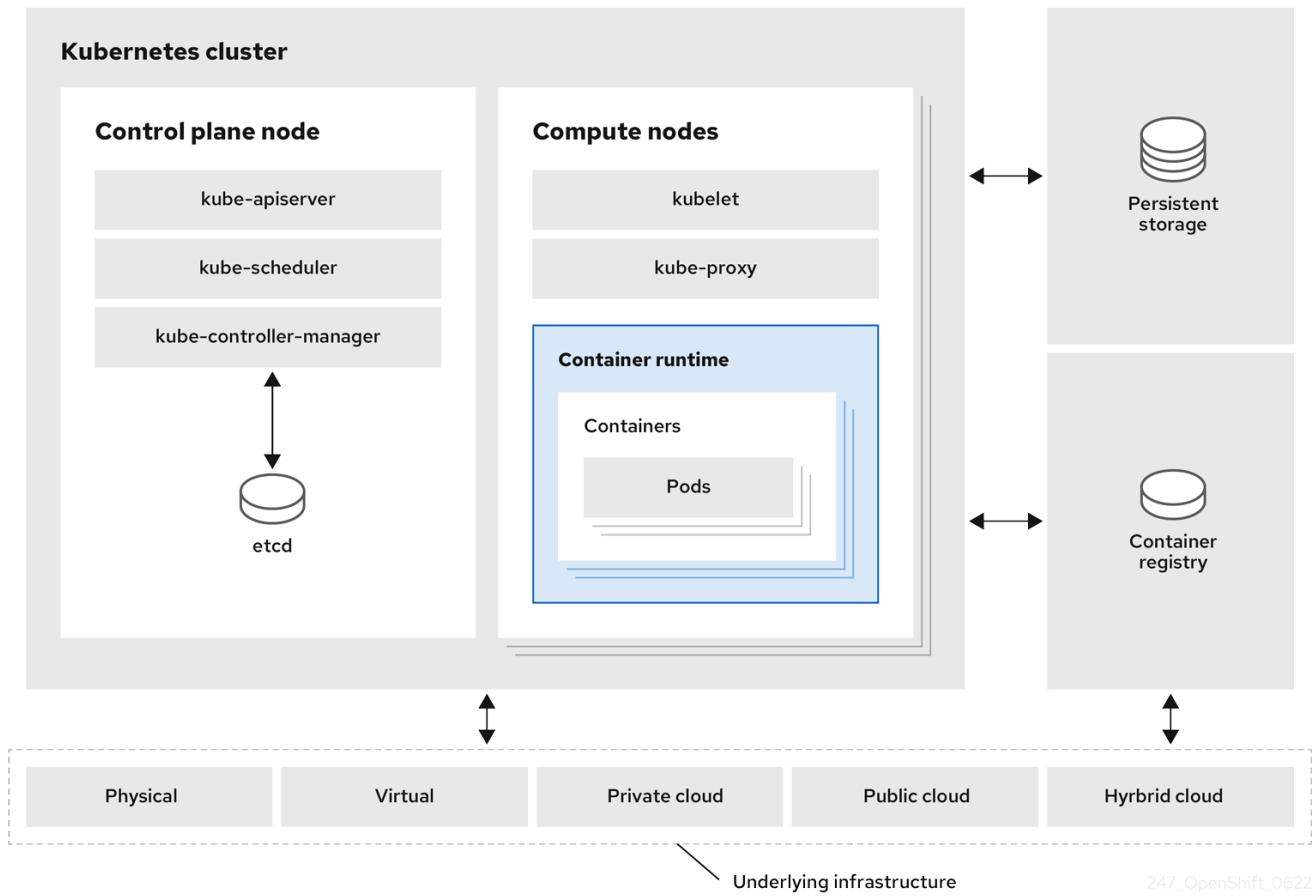
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**Table 4.2. Kubernetes Resources**

Resource	Purpose
Service	Kubernetes uses services to expose a running application on a set of pods.
<b>ReplicaSets</b>	Kubernetes uses the <b>ReplicaSets</b> to maintain the constant pod number.
Deployment	A resource object that maintains the life cycle of an application.

Kubernetes is a core component of an OpenShift Container Platform. You can use OpenShift Container Platform for developing and running containerized applications. With its foundation in Kubernetes, the OpenShift Container Platform incorporates the same technology that serves as the engine for massive telecommunications, streaming video, gaming, banking, and other applications. You can extend your containerized applications beyond a single cloud to on-premise and multi-cloud environments by using the OpenShift Container Platform.

Figure 4.3. Architecture of Kubernetes



A cluster is a single computational unit consisting of multiple nodes in a cloud environment. A Kubernetes cluster includes a control plane and worker nodes. You can run Kubernetes containers across various machines and environments. The control plane node controls and maintains the state of a cluster. You can run the Kubernetes application by using worker nodes. You can use the Kubernetes namespace to differentiate cluster resources in a cluster. Namespace scoping is applicable for resource objects, such as deployment, service, and pods. You cannot use namespace for cluster-wide resource objects such as storage class, nodes, and persistent volumes.

### 4.3. KUBERNETES CONCEPTUAL GUIDELINES

Before getting started with the OpenShift Container Platform, consider these conceptual guidelines of Kubernetes:

- Start with one or more worker nodes to run the container workloads.
- Manage the deployment of those workloads from one or more control plane nodes.
- Wrap containers in a deployment unit called a pod. By using pods provides extra metadata with the container and offers the ability to group several containers in a single deployment entity.
- Create special kinds of assets. For example, services are represented by a set of pods and a policy that defines how they are accessed. This policy allows containers to connect to the services that they need even if they do not have the specific IP addresses for the services. Replication controllers are another special asset that indicates how many pod replicas are required to run at a time. You can use this capability to automatically scale your application to adapt to its current demand.

The API to OpenShift Container Platform cluster is 100% Kubernetes. Nothing changes between a container running on any other Kubernetes and running on OpenShift Container Platform. No changes to the application. OpenShift Container Platform brings added-value features to provide enterprise-ready enhancements to Kubernetes. OpenShift Container Platform CLI tool (**oc**) is compatible with **kubectl**. While the Kubernetes API is 100% accessible within OpenShift Container Platform, the **kubectl** command-line lacks many features that could make it more user-friendly. OpenShift Container Platform offers a set of features and command-line tool like **oc**. Although Kubernetes excels at managing your applications, it does not specify or manage platform-level requirements or deployment processes. Powerful and flexible platform management tools and processes are important benefits that OpenShift Container Platform offers. You must add authentication, networking, security, monitoring, and logs management to your containerization platform.

# CHAPTER 5. RED HAT OPENSHIFT EDITIONS

Red Hat OpenShift is offered in several editions to support a wide range of deployment models and operational preferences. Each edition delivers a consistent Kubernetes platform with integrated tools, security features, and developer experiences. OpenShift is available in cloud services and self-managed editions.

## 5.1. CLOUD SERVICES EDITIONS

Red Hat OpenShift offers various cloud service editions to cater to different organizational needs. These editions provide fully managed application platforms from major cloud providers.

### **Red Hat OpenShift Service on AWS (ROSA)**

A fully managed application platform that helps organizations build, deploy, and scale applications in a native AWS environment. For more information, see [Red Hat OpenShift Service on AWS](#).

### **Microsoft Azure Red Hat OpenShift**

A fully managed application platform that helps organizations build, deploy, and scale applications on Azure. For more information, see [Microsoft Azure Red Hat OpenShift](#).

### **Red Hat OpenShift Dedicated**

A managed Red Hat OpenShift offering available on Google Cloud Platform (GCP). For more information, see [Red Hat OpenShift Dedicated](#).

### **Red Hat OpenShift on IBM Cloud**

A managed OpenShift cloud service that reduces operational complexity and helps developers build and scale applications on IBM Cloud. For more information, see [Red Hat OpenShift on IBM Cloud](#).

## 5.2. SELF-MANAGED EDITIONS

Red Hat OpenShift offers self-managed editions for organizations that prefer to deploy, configure, and manage OpenShift on their own infrastructure. These editions provide flexibility and control over the platform while leveraging the capabilities of OpenShift.

### **Red Hat OpenShift Container Platform (OCP)**

Provides complete set of operations and developer services and tools for building and scaling containerized applications. For more information, see [Red Hat OpenShift Container Platform](#).

### **Red Hat OpenShift Platform Plus**

Builds on the capabilities of OpenShift Container Platform. For more information, see [Red Hat OpenShift Platform Plus](#).

### **Red Hat OpenShift Kubernetes Engine**

Delivers the foundational, security-focused capabilities of enterprise Kubernetes on Red Hat Enterprise Linux CoreOS (RHCOS) to run containers in hybrid cloud environments. For more information, see [Red Hat OpenShift Kubernetes Engine](#).

### **Red Hat OpenShift Virtualization Engine**

Provides the virtualization capabilities of Red Hat OpenShift in a streamlined, cost-effective solution to deploy, manage, and scale VMs exclusively. For more information, see [Red Hat OpenShift Virtualization Engine](#).

# CHAPTER 6. GLOSSARY OF COMMON TERMS FOR OPENSIFT CONTAINER PLATFORM

This glossary defines common Kubernetes and OpenShift Container Platform terms.

## access policies

A set of roles that dictate how users, applications, and entities within a cluster interact with one another. An access policy increases cluster security.

## admission plugins

Admission plugins enforce security policies, resource limitations, or configuration requirements.

## authentication

To control access to an OpenShift Container Platform cluster, a cluster administrator can configure user authentication to ensure only approved users access the cluster. To interact with an OpenShift Container Platform cluster, you must authenticate with the OpenShift Container Platform API. You can authenticate by providing an OAuth access token or an X.509 client certificate in your requests to the OpenShift Container Platform API.

## bootstrap

A temporary machine that runs minimal Kubernetes and deploys the OpenShift Container Platform control plane.

## build

A build is the process of transforming input parameters, such as source code, into a runnable container image. This process is defined by a BuildConfig object, which specifies the entire build workflow. OpenShift Container Platform utilizes Kubernetes to create containers from the build images and push them to the integrated container registry.

## certificate signing requests (CSRs)

A resource requests a denoted signer to sign a certificate. This request might get approved or denied.

## Cluster Version Operator (CVO)

An Operator that checks with the OpenShift Container Platform Update Service to see the valid updates and update paths based on current component versions and information in the graph.

## compute nodes

Nodes that are responsible for executing workloads for cluster users.

## configuration drift

A situation where the configuration on a node does not match what the machine config specifies.

## container

Container is a lightweight, portable application instance that runs in OCI-compliant environments on compute nodes. Each container is a runtime instance of an Open Container Initiative (OCI)-compliant image, which is a binary package containing the application and its dependencies. A single compute node can host multiple containers, with its capacity determined by the memory and CPU resources available, whether on cloud infrastructure, physical hardware, or virtualized environments.

## container orchestration engine

Software that automates the deployment, management, scaling, and networking of containers.

## container workloads

Applications that are packaged and deployed in containers.

## control groups (cgroups)

Partitions sets of processes into groups to manage and limit the resources processes consume.

**control plane**

A container orchestration layer that exposes the API and interfaces to define, deploy, and manage the life cycle of containers. Control planes are also known as control plane machines.

**CRI-O**

A Kubernetes native container runtime implementation that integrates with the operating system to deliver an efficient Kubernetes experience.

**Deployment and DeploymentConfig**

OpenShift Container Platform supports both Kubernetes Deployment objects and OpenShift Container Platform DeploymentConfig objects for managing application rollout and scaling.

A Deployment object defines how an application is deployed as pods. It specifies the container image to pull from the registry, the number of replicas to maintain, and the labels that guide scheduling onto compute nodes. The Deployment creates and manages a ReplicaSet, which ensures the specified number of pods are running. Additionally, Deployment objects support various rollout strategies to update pods while maintaining application availability.

A DeploymentConfig object extends Deployment functionality by introducing change triggers, which automatically create new deployment versions when a new container image version becomes available or when other defined changes occur. This enables automated rollout management within OpenShift Container Platform.

**Dockerfile**

A text file that contains the user commands to perform on a terminal to assemble the image.

**hosted control planes**

A OpenShift Container Platform feature that enables hosting a control plane on the OpenShift Container Platform cluster from its data plane and workers. This model performs the following actions:

- Optimize infrastructure costs required for the control planes.
- Improve the cluster creation time.
- Enable hosting the control plane using the Kubernetes native high level primitives. For example, deployments and stateful sets.
- Allow a strong network segmentation between the control plane and workloads.

**hybrid cloud deployments**

Deployments that deliver a consistent platform across bare metal, virtual, private, and public cloud environments. This offers speed, agility, and portability.

**Ignition**

A utility that RHCOS uses to manipulate disks during initial configuration. It completes common disk tasks, including partitioning disks, formatting partitions, writing files, and configuring users.

**installer-provisioned infrastructure**

The installation program deploys and configures the infrastructure that the cluster runs on.

**kubelet**

A primary node agent that runs on each node in the cluster to ensure that containers are running in a pod.

**Kubernetes**

Kubernetes is an open source container orchestration engine for automating deployment, scaling, and management of containerized applications.

**kubernetes manifest**

Specifications of a Kubernetes API object in a JSON or YAML format. A configuration file can include deployments, config maps, secrets, daemon sets.

**Machine Config Daemon (MCD)**

A daemon that regularly checks the nodes for configuration drift.

**Machine Config Operator (MCO)**

An Operator that applies the new configuration to your cluster machines.

**machine config pools (MCP)**

A group of machines, such as control plane components or user workloads, that are based on the resources that they handle.

**metadata**

Additional information about cluster deployment artifacts.

**microservices**

An approach to writing software. Applications can be separated into the smallest components, independent from each other by using microservices.

**mirror registry**

A registry that holds the mirror of OpenShift Container Platform images.

**monolithic applications**

Applications that are self-contained, built, and packaged as a single piece.

**namespaces**

A namespace isolates specific system resources that are visible to all processes. Inside a namespace, only processes that are members of that namespace can see those resources.

**networking**

Network information of OpenShift Container Platform cluster.

**node**

A compute machine in the OpenShift Container Platform cluster. A node is either a virtual machine (VM) or a physical machine.

**OpenShift CLI (oc)**

A command line tool to run OpenShift Container Platform commands on the terminal.

**OpenShift Dedicated**

A managed RHEL OpenShift Container Platform offering on Amazon Web Services (AWS) and Google Cloud Platform (GCP). OpenShift Dedicated focuses on building and scaling applications.

**OpenShift Update Service (OSUS)**

For clusters with internet access, Red Hat Enterprise Linux (RHEL) provides over-the-air updates by using an OpenShift update service as a hosted service located behind public APIs.

**OpenShift image registry**

A registry provided by OpenShift Container Platform to manage images.

**Operator**

The preferred method of packaging, deploying, and managing a Kubernetes application in an OpenShift Container Platform cluster. An Operator is a Kubernetes-native application designed to translate operational knowledge into a software that is packaged and shared with customers. Traditionally, tasks such as installation, configuration, scaling, updates, and failover were managed manually by administrators by using scripts or automation tools like Ansible. Operators bring these capabilities into Kubernetes, making them natively integrated and automated within the cluster.

Operators manage both Day 1 operations such as installation and configuration, and Day 2 operations such as scaling, updates, backups, failover and restores. By leveraging Kubernetes APIs and concepts, Operators provide an automated and consistent way to manage complex applications.

### **OperatorHub**

A platform that contains various OpenShift Container Platform Operators to install.

### **Operator Lifecycle Manager (OLM)**

OLM helps you to install, update, and manage the lifecycle of Kubernetes native applications. OLM is an open source toolkit designed to manage Operators in an effective, automated, and scalable way.

### **OSTree**

An upgrade system for Linux-based operating systems that performs atomic upgrades of complete file system trees. OSTree tracks meaningful changes to the file system tree using an addressable object store, and is designed to complement existing package management systems.

### **over-the-air (OTA) updates**

The OpenShift Container Platform Update Service (OSUS) provides over-the-air updates to OpenShift Container Platform, including Red Hat Enterprise Linux CoreOS (RHCOS).

### **pod**

A pod is one or more containers deployed together on one host. It consists of a colocated group of containers with shared resources such as volumes and IP addresses. A pod is also the smallest compute unit defined, deployed, and managed. In OpenShift Container Platform, pods replace individual application containers as the smallest deployable unit. Pods are the orchestrated unit in OpenShift Container Platform. OpenShift Container Platform schedules and runs all containers in a pod on the same node. Complex applications are made up of multiple pods, each with their own containers. They interact externally and also with another inside the OpenShift Container Platform environment.

### **private registry**

OpenShift Container Platform can use any server implementing the container image registry API as a source of the image which helps the developers to push and pull their private container images.

### **project**

OpenShift Container Platform uses projects to enable groups of users or developers to work together. A project defines the scope of resources, manages user access, and enforces resource quotas and limits.

A project is a Kubernetes namespace with additional annotations that provide role-based access control (RBAC) and management capabilities. It serves as the central mechanism for organizing resources, ensuring isolation between different user groups.

### **public registry**

OpenShift Container Platform can use any server implementing the container image registry API as a source of the image which allows the developers to push and pull their public container images.

### **RHEL OpenShift Container Platform Cluster Manager**

A managed service where you can install, modify, operate, and upgrade your OpenShift Container Platform clusters.

### **RHEL Quay Container Registry**

A Quay.io container registry that serves most of the container images and Operators to OpenShift Container Platform clusters.

### **replication controllers**

An asset that indicates how many pod replicas are required to run at a time.

### **ReplicaSet and ReplicationController**

The Kubernetes **ReplicaSet** and **ReplicationController** objects ensure that the desired number of pod replicas are running at all times. If a pod fails, exits, or is deleted, these controllers automatically create new pods to maintain the specified replica count. Conversely, if there are more pods than required, the ReplicaSet or ReplicationController scales down by terminating excess pods to match the defined replica count.

### **role-based access control (RBAC)**

A key security control to ensure that cluster users and workloads have only access to resources required to execute their roles.

### **route**

A route is a way to expose a service by giving it an externally reachable hostname, such as `www.example.com`. Each route consists of a route name, a service selector, and optionally, a security configuration.

### **router**

A router processes defined routes and their associated service endpoints, enabling external clients to access applications. While deploying a multi-tier application in OpenShift Container Platform is straightforward, external traffic cannot reach the application without the routing layer.

### **scaling**

The increasing or decreasing of resource capacity.

### **service**

A service in OpenShift Container Platform defines a logical set of pods and the access policies for reaching them. It provides a stable internal IP address and hostname, ensuring seamless communication between application components as pods are created and destroyed.

### **Source-to-Image (S2I) image**

An image created based on the programming language of the application source code in OpenShift Container Platform to deploy applications.

### **storage**

OpenShift Container Platform supports many types of storage, both for on-premise and cloud providers. You can manage container storage for persistent and non-persistent data in an OpenShift Container Platform cluster.

### **telemetry**

A component to collect information such as size, health, and status of OpenShift Container Platform.

### **template**

A template describes a set of objects that can be parameterized and processed to produce a list of objects for creation by OpenShift Container Platform.

### **user-provisioned infrastructure**

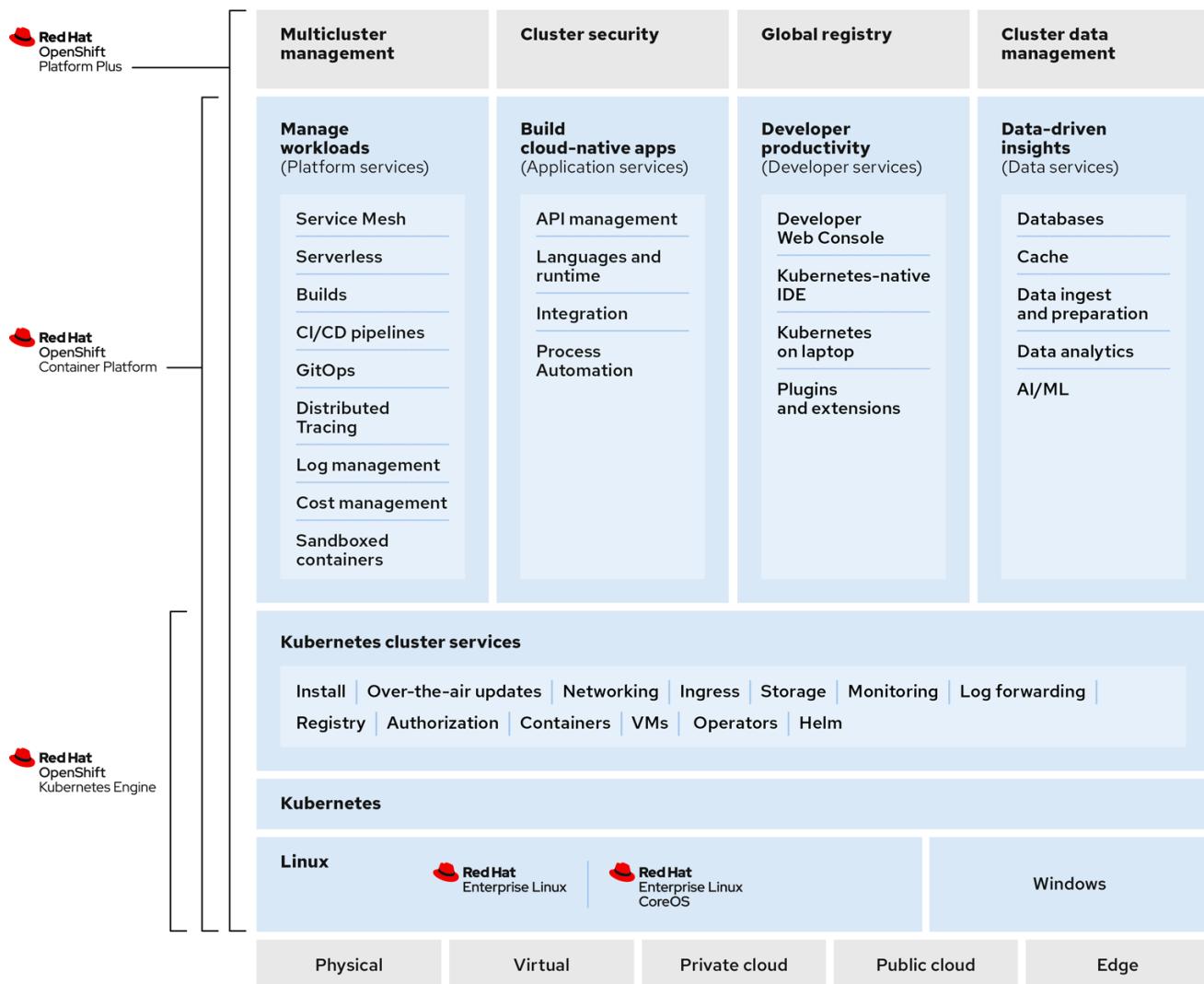
You can install OpenShift Container Platform on the infrastructure that you provide. You can use the installation program to generate the assets required to provision the cluster infrastructure, create the cluster infrastructure, and then deploy the cluster to the infrastructure that you provided.

### **web console**

A user interface (UI) to manage OpenShift Container Platform.

# CHAPTER 7. ABOUT OPENSHIFT KUBERNETES ENGINE

As of 27 April 2020, Red Hat has decided to rename Red Hat OpenShift Container Engine to Red Hat OpenShift Kubernetes Engine to better communicate what value the product offering delivers.



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Red Hat OpenShift Kubernetes Engine is a product offering from Red Hat that lets you use an enterprise class Kubernetes platform as a production platform for launching containers. You download and install OpenShift Kubernetes Engine the same way as OpenShift Container Platform as they are the same binary distribution, but OpenShift Kubernetes Engine offers a subset of the features that OpenShift Container Platform offers.

## 7.1. SIMILARITIES AND DIFFERENCES

You can see the similarities and differences between OpenShift Kubernetes Engine and OpenShift Container Platform in the following table:

Table 7.1. Product comparison for OpenShift Kubernetes Engine and OpenShift Container Platform

	OpenShift Kubernetes Engine	OpenShift Container Platform
Fully Automated Installers	Yes	Yes
Over the Air Smart Upgrades	Yes	Yes
Enterprise Secured Kubernetes	Yes	Yes
Kubectl and oc automated command line	Yes	Yes
Operator Lifecycle Manager (OLM)	Yes	Yes
Administrator Web console	Yes	Yes
OpenShift Virtualization	Yes	Yes
User Workload Monitoring		Yes
Cluster Monitoring	Yes	Yes
Cost Management SaaS Service	Yes	Yes
Platform Logging		Yes
Developer Web Console		Yes
Developer Application Catalog		Yes
Source to Image and Builder Automation (Tekton)		Yes
OpenShift Service Mesh (Maistra, Kiali, and Jaeger)		Yes
OpenShift distributed tracing (Jaeger)		Yes
OpenShift Serverless (Knative)		Yes
OpenShift Pipelines (Jenkins and Tekton)		Yes
Embedded Component of IBM Cloud® Pak and RHT MW Bundles		Yes
OpenShift sandboxed containers		Yes

### 7.1.1. Core Kubernetes and container orchestration

OpenShift Kubernetes Engine offers full access to an enterprise-ready Kubernetes environment that is easy to install and offers an extensive compatibility test matrix with many of the software elements that you might use in your data center.

OpenShift Kubernetes Engine offers the same service level agreements, bug fixes, and common vulnerabilities and errors protection as OpenShift Container Platform. OpenShift Kubernetes Engine includes a Red Hat Enterprise Linux (RHEL) Virtual Datacenter and Red Hat Enterprise Linux CoreOS (RHCOS) entitlement that allows you to use an integrated Linux operating system with container runtime from the same technology provider.

The OpenShift Kubernetes Engine subscription is compatible with the Red Hat OpenShift support for Windows Containers subscription.

### 7.1.2. Enterprise-ready configurations

OpenShift Kubernetes Engine uses the same security options and default settings as the OpenShift Container Platform. Default security context constraints, pod security policies, best practice network and storage settings, service account configuration, SELinux integration, HAProxy edge routing configuration, and all other standard protections that OpenShift Container Platform offers are available in OpenShift Kubernetes Engine. OpenShift Kubernetes Engine offers full access to the integrated monitoring solution that OpenShift Container Platform uses, which is based on Prometheus and offers deep coverage and alerting for common Kubernetes issues.

OpenShift Kubernetes Engine uses the same installation and upgrade automation as OpenShift Container Platform.

### 7.1.3. Standard infrastructure services

With an OpenShift Kubernetes Engine subscription, you receive support for all storage plugins that OpenShift Container Platform supports.

In terms of networking, OpenShift Kubernetes Engine offers full and supported access to the Kubernetes Container Network Interface (CNI) and therefore allows you to use any third-party SDN that supports OpenShift Container Platform. It also allows you to use the included Open vSwitch software defined network to its fullest extent. OpenShift Kubernetes Engine allows you to take full advantage of the OVN Kubernetes overlay, Multus, and Multus plugins that are supported on OpenShift Container Platform. OpenShift Kubernetes Engine allows customers to use a Kubernetes Network Policy to create microsegmentation between deployed application services on the cluster.

You can also use the **Route** API objects that are found in OpenShift Container Platform, including its sophisticated integration with the HAProxy edge routing layer as an out of the box Kubernetes Ingress Controller.

### 7.1.4. Core user experience

OpenShift Kubernetes Engine users have full access to Kubernetes Operators, pod deployment strategies, Helm, and OpenShift Container Platform templates. OpenShift Kubernetes Engine users can use both the **oc** and **kubectl** command-line interfaces. OpenShift Kubernetes Engine also offers an administrator web-based console that shows all aspects of the deployed container services and offers a container-as-a-service experience. OpenShift Kubernetes Engine grants access to the Operator Life Cycle Manager that helps you control access to content on the cluster and life cycle operator-enabled services that you use. With an OpenShift Kubernetes Engine subscription, you receive access to the Kubernetes namespace, the OpenShift **Project** API object, and cluster-level Prometheus monitoring metrics and events.

### 7.1.5. Maintained and curated content

With an OpenShift Kubernetes Engine subscription, you receive access to the OpenShift Container Platform content from the Red Hat Ecosystem Catalog and Red Hat Connect ISV marketplace. You can access all maintained and curated content that the OpenShift Container Platform eco-system offers.

### 7.1.6. OpenShift Data Foundation compatible

OpenShift Kubernetes Engine is compatible and supported with your purchase of OpenShift Data Foundation.

### 7.1.7. Red Hat Middleware compatible

OpenShift Kubernetes Engine is compatible and supported with individual Red Hat Middleware product solutions. Red Hat Middleware Bundles that include OpenShift embedded in them only contain OpenShift Container Platform.

### 7.1.8. OpenShift Serverless

OpenShift Kubernetes Engine does not include OpenShift Serverless support. Use OpenShift Container Platform for this support.

### 7.1.9. Quay Integration compatible

OpenShift Kubernetes Engine is compatible and supported with a Red Hat Quay purchase.

### 7.1.10. OpenShift Virtualization

OpenShift Kubernetes Engine includes support for the Red Hat product offerings derived from the kubevirt.io open source project.

### 7.1.11. Advanced cluster management

OpenShift Kubernetes Engine is compatible with your additional purchase of Red Hat Advanced Cluster Management (RHACM) for Kubernetes. An OpenShift Kubernetes Engine subscription does not offer a cluster-wide log aggregation solution or support Fluentd, or Kibana-based logging solutions. Red Hat OpenShift Service Mesh capabilities derived from the open-source istio.io and kiali.io projects that offer OpenTracing observability for containerized services on OpenShift Container Platform are not supported in OpenShift Kubernetes Engine.

### 7.1.12. Advanced networking

The standard networking solutions in OpenShift Container Platform are supported with an OpenShift Kubernetes Engine subscription. The OpenShift Container Platform Kubernetes CNI plugin for automation of multi-tenant network segmentation between OpenShift Container Platform projects is entitled for use with OpenShift Kubernetes Engine. OpenShift Kubernetes Engine offers all the granular control of the source IP addresses that are used by application services on the cluster. Those egress IP address controls are entitled for use with OpenShift Kubernetes Engine. OpenShift Container Platform offers ingress routing to on cluster services that use non-standard ports when no public cloud provider is in use via the VIP pods found in OpenShift Container Platform. That ingress solution is supported in OpenShift Kubernetes Engine. OpenShift Kubernetes Engine users are supported for the Kubernetes ingress control object, which offers integrations with public cloud providers. Red Hat Service Mesh,

which is derived from the istio.io open source project, is not supported in OpenShift Kubernetes Engine. Also, the Kourier Ingress Controller found in OpenShift Serverless is not supported on OpenShift Kubernetes Engine.

### 7.1.13. OpenShift sandboxed containers

OpenShift Kubernetes Engine does not include OpenShift sandboxed containers. Use OpenShift Container Platform for this support.

### 7.1.14. Developer experience

With OpenShift Kubernetes Engine, the following capabilities are not supported:

- The OpenShift Container Platform developer experience utilities and tools, such as Red Hat OpenShift Dev Spaces.
- The OpenShift Container Platform pipeline feature that integrates a streamlined, Kubernetes-enabled Jenkins and Tekton experience in the user's project space.
- The OpenShift Container Platform source-to-image feature, which allows you to easily deploy source code, dockerfiles, or container images across the cluster.
- Build strategies, builder pods, or Tekton for end user container deployments.
- The **odo** developer command line.
- The developer persona in the OpenShift Container Platform web console.

### 7.1.15. Feature summary

The following table is a summary of the feature availability in OpenShift Kubernetes Engine and OpenShift Container Platform. Where applicable, it includes the name of the Operator that enables a feature.

**Table 7.2. Features in OpenShift Kubernetes Engine and OpenShift Container Platform**

Feature	OpenShift Kubernetes Engine	OpenShift Container Platform	Operator name
Fully Automated Installers (IPI)	Included	Included	N/A
Customizable Installers (UPI)	Included	Included	N/A
Disconnected Installation	Included	Included	N/A
Red Hat Enterprise Linux (RHEL) or Red Hat Enterprise Linux CoreOS (RHCOS) entitlement	Included	Included	N/A

Feature	OpenShift Kubernetes Engine	OpenShift Container Platform	Operator name
<b>Existing RHEL manual attach to cluster (BYO)</b>	Included	Included	N/A
<b>CRI-O Runtime</b>	Included	Included	N/A
<b>Over the Air Smart Upgrades and Operating System (RHCOS) Management</b>	Included	Included	N/A
<b>Enterprise Secured Kubernetes</b>	Included	Included	N/A
<b>Kubectl and OC automated command line</b>	Included	Included	N/A
<b>Auth Integrations, RBAC, SCC, Multi-Tenancy Admission Controller</b>	Included	Included	N/A
<b>Operator Lifecycle Manager (OLM)</b>	Included	Included	N/A
<b>Administrator web console</b>	Included	Included	N/A
<b>OpenShift Virtualization</b>	Included	Included	OpenShift Virtualization Operator
<b>Compliance Operator provided by Red Hat</b>	Included	Included	Compliance Operator
<b>File Integrity Operator</b>	Included	Included	File Integrity Operator
<b>Gatekeeper Operator</b>	Not Included - Requires separate subscription	Not Included - Requires separate subscription	Gatekeeper Operator
<b>Klusterlet</b>	Not Included - Requires separate subscription	Not Included - Requires separate subscription	N/A
<b>Kube Descheduler Operator provided by Red Hat</b>	Included	Included	Kube Descheduler Operator

Feature	OpenShift Kubernetes Engine	OpenShift Container Platform	Operator name
<b>Local Storage provided by Red Hat</b>	Included	Included	Local Storage Operator
<b>Node Feature Discovery provided by Red Hat</b>	Included	Included	Node Feature Discovery Operator
<b>Performance Profile controller</b>	Included	Included	N/A
<b>PTP Operator provided by Red Hat</b>	Included	Included	PTP Operator
<b>Service Telemetry Operator provided by Red Hat</b>	Not Included	Included	Service Telemetry Operator
<b>SR-IOV Network Operator</b>	Included	Included	SR-IOV Network Operator
<b>Vertical Pod Autoscaler</b>	Included	Included	Vertical Pod Autoscaler
<b>Cluster Monitoring (Prometheus)</b>	Included	Included	Cluster Monitoring
<b>Device Manager (for example, GPU)</b>	Included	Included	N/A
<b>Log Forwarding</b>	Included	Included	Red Hat OpenShift Logging Operator
<b>Telemeter and Insights Connected Experience</b>	Included	Included	N/A
Feature	OpenShift Kubernetes Engine	OpenShift Container Platform	Operator name
<b>OpenShift Cloud Manager SaaS Service</b>	Included	Included	N/A
<b>OVS and OVN SDN</b>	Included	Included	N/A
<b>MetalLB</b>	Included	Included	MetalLB Operator

Feature	OpenShift Kubernetes Engine	OpenShift Container Platform	Operator name
<b>HAProxy Ingress Controller</b>	Included	Included	N/A
<b>Ingress Cluster-wide Firewall</b>	Included	Included	N/A
<b>Egress Pod and Namespace Granular Control</b>	Included	Included	N/A
<b>Ingress Non-Standard Ports</b>	Included	Included	N/A
<b>Multus and Available Multus Plugins</b>	Included	Included	N/A
<b>Network Policies</b>	Included	Included	N/A
<b>IPv6 Single and Dual Stack</b>	Included	Included	N/A
<b>CNI Plugin ISV Compatibility</b>	Included	Included	N/A
<b>CSI Plugin ISV Compatibility</b>	Included	Included	N/A
<b>RHT and IBM® middleware à la carte purchases (not included in OpenShift Container Platform or OpenShift Kubernetes Engine)</b>	Included	Included	N/A
<b>ISV or Partner Operator and Container Compatibility (not included in OpenShift Container Platform or OpenShift Kubernetes Engine)</b>	Included	Included	N/A
<b>Embedded software catalog</b>	Included	Included	N/A

Feature	OpenShift Kubernetes Engine	OpenShift Container Platform	Operator name
Embedded Marketplace	Included	Included	N/A
Quay Compatibility (not included)	Included	Included	N/A
OpenShift API for Data Protection (OADP)	Included	Included	OADP Operator
RHEL Software Collections and RHT SSO Common Service (included)	Included	Included	N/A
Embedded Registry	Included	Included	N/A
Helm	Included	Included	N/A
User Workload Monitoring	Not Included	Included	N/A
Cost Management SaaS Service	Included	Included	Cost Management Metrics Operator
Platform Logging	Not Included	Included	Red Hat OpenShift Logging Operator
Developer Web Console	Not Included	Included	N/A
Developer Application Catalog	Not Included	Included	N/A
Source to Image and Builder Automation (Tekton)	Not Included	Included	N/A
OpenShift Service Mesh	Not Included	Included	OpenShift Service Mesh Operator
Feature	OpenShift Kubernetes Engine	OpenShift Container Platform	Operator name
Red Hat OpenShift Serverless	Not Included	Included	OpenShift Serverless Operator

Feature	OpenShift Kubernetes Engine	OpenShift Container Platform	Operator name
<b>Web Terminal provided by Red Hat</b>	Not Included	Included	Web Terminal Operator
<b>Red Hat OpenShift Pipelines Operator</b>	Not Included	Included	OpenShift Pipelines Operator
<b>Embedded Component of IBM Cloud® Pak and RHT MW Bundles</b>	Not Included	Included	N/A
<b>Red Hat OpenShift GitOps</b>	Not Included	Included	OpenShift GitOps
<b>Red Hat OpenShift Dev Spaces</b>	Not Included	Included	Red Hat OpenShift Dev Spaces
<b>Red Hat OpenShift Local</b>	Not Included	Included	N/A
<b>Quay Bridge Operator provided by Red Hat</b>	Not Included	Included	Quay Bridge Operator
<b>Quay Container Security provided by Red Hat</b>	Not Included	Included	Quay Operator
<b>Red Hat OpenShift distributed tracing platform</b>	Not Included	Included	Red Hat OpenShift distributed tracing platform Operator
<b>Red Hat OpenShift Kiali</b>	Not Included	Included	Kiali Operator
<b>Metering provided by Red Hat (deprecated)</b>	Not Included	Included	N/A
<b>Migration Toolkit for Containers Operator</b>	Not Included	Included	Migration Toolkit for Containers Operator
<b>Cost management for OpenShift</b>	Not included	Included	N/A
<b>JBoss Web Server provided by Red Hat</b>	Not included	Included	JWS Operator
<b>Red Hat Build of Quarkus</b>	Not included	Included	N/A

Feature	OpenShift Kubernetes Engine	OpenShift Container Platform	Operator name
Kourier Ingress Controller	Not included	Included	N/A
RHT Middleware Bundles Sub Compatibility (not included in OpenShift Container Platform)	Not included	Included	N/A
IBM Cloud® Pak Sub Compatibility (not included in OpenShift Container Platform)	Not included	Included	N/A
OpenShift Do ( <code>odo</code> )	Not included	Included	N/A
Source to Image and Tekton Builders	Not included	Included	N/A
OpenShift Serverless FaaS	Not included	Included	N/A
IDE Integrations	Not included	Included	N/A
OpenShift sandboxed containers	Not included	Not included	OpenShift sandboxed containers Operator
Windows Machine Config Operator	Community Windows Machine Config Operator included - no subscription required	Red Hat Windows Machine Config Operator included - Requires separate subscription	Windows Machine Config Operator
Red Hat Quay	Not Included - Requires separate subscription	Not Included - Requires separate subscription	Quay Operator
Red Hat Advanced Cluster Management	Not Included - Requires separate subscription	Not Included - Requires separate subscription	Advanced Cluster Management for Kubernetes
Red Hat Advanced Cluster Security	Not Included - Requires separate subscription	Not Included - Requires separate subscription	N/A

Feature	OpenShift Kubernetes Engine	OpenShift Container Platform	Operator name
<b>OpenShift Data Foundation</b>	Not Included - Requires separate subscription	Not Included - Requires separate subscription	OpenShift Data Foundation
Feature	OpenShift Kubernetes Engine	OpenShift Container Platform	Operator name
<b>Ansible Automation Platform Resource Operator</b>	Not Included - Requires separate subscription	Not Included - Requires separate subscription	Ansible Automation Platform Resource Operator
<b>Business Automation provided by Red Hat</b>	Not Included - Requires separate subscription	Not Included - Requires separate subscription	Business Automation Operator
<b>Data Grid provided by Red Hat</b>	Not Included - Requires separate subscription	Not Included - Requires separate subscription	Data Grid Operator
<b>Red Hat Integration provided by Red Hat</b>	Not Included - Requires separate subscription	Not Included - Requires separate subscription	Red Hat Integration Operator
<b>Red Hat Integration - 3Scale provided by Red Hat</b>	Not Included - Requires separate subscription	Not Included - Requires separate subscription	3scale
<b>Red Hat Integration - 3Scale APICast gateway provided by Red Hat</b>	Not Included - Requires separate subscription	Not Included - Requires separate subscription	3scale APIcast
<b>Red Hat Integration - AMQ Broker</b>	Not Included - Requires separate subscription	Not Included - Requires separate subscription	AMQ Broker
<b>Red Hat Integration - AMQ Broker LTS</b>	Not Included - Requires separate subscription	Not Included - Requires separate subscription	
<b>Red Hat Integration - AMQ Interconnect</b>	Not Included - Requires separate subscription	Not Included - Requires separate subscription	AMQ Interconnect
<b>Red Hat Integration - AMQ Online</b>	Not Included - Requires separate subscription	Not Included - Requires separate subscription	
<b>Red Hat Integration - AMQ Streams</b>	Not Included - Requires separate subscription	Not Included - Requires separate subscription	AMQ Streams
<b>Red Hat Integration - Camel K</b>	Not Included - Requires separate subscription	Not Included - Requires separate subscription	Camel K

Feature	OpenShift Kubernetes Engine	OpenShift Container Platform	Operator name
<b>Red Hat Integration - Fuse Console</b>	Not Included - Requires separate subscription	Not Included - Requires separate subscription	Fuse Console
<b>Red Hat Integration - Fuse Online</b>	Not Included - Requires separate subscription	Not Included - Requires separate subscription	Fuse Online
<b>Red Hat Integration - Service Registry Operator</b>	Not Included - Requires separate subscription	Not Included - Requires separate subscription	Service Registry
<b>API Designer provided by Red Hat</b>	Not Included - Requires separate subscription	Not Included - Requires separate subscription	API Designer
<b>JBoss EAP provided by Red Hat</b>	Not Included - Requires separate subscription	Not Included - Requires separate subscription	JBoss EAP
<b>Smart Gateway Operator</b>	Not Included - Requires separate subscription	Not Included - Requires separate subscription	Smart Gateway Operator
<b>Kubernetes NMState Operator</b>	Included	Included	N/A

## 7.2. SUBSCRIPTION LIMITATIONS

OpenShift Kubernetes Engine is a subscription offering that provides OpenShift Container Platform with a limited set of supported features at a lower list price. OpenShift Kubernetes Engine and OpenShift Container Platform are the same product and, therefore, all software and features are delivered in both. There is only one download, OpenShift Container Platform. OpenShift Kubernetes Engine uses the OpenShift Container Platform documentation and support services and bug errata for this reason.

## CHAPTER 8. PROVIDING FEEDBACK ON OPENSHIFT CONTAINER PLATFORM DOCUMENTATION

To report an error or to improve our documentation, log in to your Red Hat Jira account and submit an issue. If you do not have a Red Hat Jira account, then you will be prompted to create an account.

### Procedure

1. Click one of the following links:
  - To create a [Jira issue](#) for OpenShift Container Platform
  - To create a [Jira issue](#) for OpenShift Virtualization
2. Enter a brief description of the issue in the **Summary**.
3. Provide a detailed description of the issue or enhancement in the **Description**. Include a URL to where the issue occurs in the documentation.
4. Click **Create** to create the issue.