



# OpenShift Container Platform 4.16

## About

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. OPENSIFT CONTAINER PLATFORM 4.16 DOCUMENTATION

## Table of Contents

Welcome to the official OpenShift Container Platform 4.16 documentation, where you can learn about OpenShift Container Platform and start exploring its features.

To navigate the OpenShift Container Platform 4.16 documentation, you can use one of the following methods:

- Use the left navigation bar to browse the documentation.
- Select the task that interests you from the contents of this Welcome page.

Start with [Architecture](#) and [Security and compliance](#). Next, view the [release notes](#).

## 1.1. CLUSTER INSTALLER ACTIVITIES

Explore the following OpenShift Container Platform installation tasks:

- **[OpenShift Container Platform installation overview](#)** Depending on the platform, you can install OpenShift Container Platform on installer-provisioned or user-provisioned infrastructure. The OpenShift Container Platform installation program provides the flexibility to deploy OpenShift Container Platform on a range of different platforms.
- **[Installing a cluster on Alibaba Cloud by using the Assisted Installer](#)** On Alibaba Cloud, you can install OpenShift Container Platform by using the Assisted Installer. This is currently a Technology Preview feature only.
- **[Install a cluster on AWS](#)** On AWS, you can install OpenShift Container Platform on installer-provisioned infrastructure or user-provisioned infrastructure.
- **[Install a cluster on Microsoft Azure](#)** On Microsoft Azure, you can install OpenShift Container Platform on installer-provisioned infrastructure or user-provisioned infrastructure.
- **[Install a cluster on Microsoft Azure Stack Hub](#)** On Microsoft Azure Stack Hub, you can install OpenShift Container Platform on installer-provisioned infrastructure or user-provisioned infrastructure.
- **[Installing OpenShift Container Platform with the Assisted Installer](#)** The Assisted Installer is an installation solution that is provided on the Red Hat Red Hat Hybrid Cloud Console. The Assisted Installer supports installing an OpenShift Container Platform cluster on multiple platforms.
- **[Installing OpenShift Container Platform with the Agent-based Installer](#)** You can use the Agent-based Installer to generate a bootable ISO image that contains the Assisted discovery agent, the Assisted Service, and all the other information required to deploy an OpenShift Container Platform cluster. The Agent-based Installer leverages the advantages of the Assisted Installer in a disconnected environment
- **[Install a cluster on bare metal](#)** On bare metal, you can install OpenShift Container Platform on installer-provisioned infrastructure or user-provisioned infrastructure. If none of the available platform and cloud provider deployment options meet your needs, consider using bare metal user-provisioned infrastructure.

- **[Install a cluster on GCP](#)** On Google Cloud Platform (GCP) you can install OpenShift Container Platform on installer-provisioned infrastructure or user-provisioned infrastructure.
- **[Install a cluster on IBM Cloud®](#)** On IBM Cloud®, you can install OpenShift Container Platform on installer-provisioned infrastructure.
- **[Install a cluster on IBM Power® Virtual Server](#)** On IBM Power® Virtual Server, you can install OpenShift Container Platform on installer-provisioned infrastructure.
- **[Install a cluster on IBM Power®](#)** On IBM Power®, you can install OpenShift Container Platform on user-provisioned infrastructure.
- **[Install a cluster on IBM Z® and IBM® LinuxONE](#)** On IBM Z® and IBM® LinuxONE, you can install OpenShift Container Platform on user-provisioned infrastructure.
- **[Install a cluster on Oracle® Cloud Infrastructure \(OCI\)](#)** You can use the Assisted Installer or the Agent-based Installer to install a cluster on OCI. This means that you can run cluster workloads on infrastructure that supports dedicated, hybrid, public, and multiple cloud environments. See [Installing a cluster on Oracle Cloud Infrastructure \(OCI\) by using the Assisted Installer](#) and [Installing a cluster on Oracle Cloud Infrastructure \(OCI\) by using the Agent-based Installer](#).
- **[Install a cluster on Nutanix](#)** On Nutanix, you can install a cluster on your OpenShift Container Platform on installer-provisioned infrastructure.
- **[Install a cluster on Red Hat OpenStack Platform \(RHOSP\)](#)** On RHOSP, you can install OpenShift Container Platform on installer-provisioned infrastructure or user-provisioned infrastructure.
- **[Install a cluster on VMware vSphere](#)** You can install OpenShift Container Platform on supported versions of vSphere.

## 1.2. OTHER CLUSTER INSTALLER ACTIVITIES

- **[Install a cluster in a restricted network](#)** If your cluster uses user-provisioned infrastructure on [Amazon Web Services \(AWS\)](#), [GCP](#), [vSphere](#), [IBM Cloud®](#), [IBM Z® and IBM® LinuxONE](#), [IBM Power®](#), or [bare metal](#) and the cluster does not have full access to the internet, you must mirror the OpenShift Container Platform installation images. To do this action, use one of the following methods, so that you can install a cluster in a restricted network.
  - [Mirroring images for a disconnected installation](#)
  - [Mirroring images for a disconnected installation by using the oc-mirror plug-in](#)
- **[Install a cluster in an existing network](#)** If you use an existing Virtual Private Cloud (VPC) in [Amazon Web Services \(AWS\)](#) or [GCP](#) or an existing [VNet](#) on Microsoft Azure, you can install a cluster. Also consider [Installing a cluster on GCP into a shared VPC](#)
- **[Install a private cluster](#)** If your cluster does not require external internet access, you can install a private cluster on [Amazon Web Services \(AWS\)](#), [Microsoft Azure](#), [GCP](#), or [IBM Cloud®](#). Internet access is still required to access the cloud APIs and installation media.
- **[Installing RHCOS manually on an iSCSI boot device](#) and [Installing RHCOS on an iSCSI boot device using iBFT](#)** You can target iSCSI devices as the root disk for installation of RHCOS. Multipathing is also supported.



- **Check installation logs** Access installation logs to evaluate issues that occur during OpenShift Container Platform installation.
- **Access OpenShift Container Platform** Use credentials output at the end of the installation process to log in to the OpenShift Container Platform cluster from the command line or web console.
- **Install Red Hat OpenShift Data Foundation** You can install Red Hat OpenShift Data Foundation as an Operator to provide highly integrated and simplified persistent storage management for containers.
- **Red Hat Enterprise Linux CoreOS (RHCOS) image layering** As a post-installation task, you can add new images on top of the base RHCOS image. This layering does not modify the base RHCOS image. Instead, the layering creates a custom layered image that includes all RHCOS functions and adds additional functions to specific nodes in the cluster.

## 1.3. DEVELOPER ACTIVITIES

Develop and deploy containerized applications with OpenShift Container Platform. 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:

- **Understand OpenShift Container Platform development** Learn the different types of containerized applications, from simple containers to advanced Kubernetes deployments and Operators.
- **Work with projects** Create projects from the OpenShift Container Platform web console or OpenShift CLI (**oc**) to organize and share the software you develop.
- **Creating applications using the Developer perspective** Use the **Developer** perspective in the OpenShift Container Platform web console to easily create and deploy applications.
- **Viewing application composition using the Topology view** Use the **Topology** view to visually interact with your applications, monitor status, connect and group components, and modify your code base.
- **Create CI/CD Pipelines** Pipelines are serverless, cloud-native, continuous integration and continuous deployment systems that run in isolated containers. Pipelines use standard Tekton custom resources to automate deployments and are designed for decentralized teams that work on microservice-based architecture.
- **Manage your infrastructure and application configurations** GitOps is a declarative way to implement continuous deployment for cloud native applications. GitOps defines infrastructure and application definitions as code. GitOps uses this code to manage multiple workspaces and clusters to simplify the creation of infrastructure and application configurations. GitOps also handles and automates complex deployments at a fast pace, which saves time during deployment and release cycles.
- **Deploy Helm charts** **Helm** is a software package manager that simplifies deployment of applications and services to OpenShift Container Platform clusters. Helm uses a packaging format called *charts*. A Helm chart is a collection of files that describes the OpenShift Container Platform resources.
- **Understand image builds** Choose from different build strategies (Docker, S2I, custom, and pipeline) that can include different kinds of source materials, such as Git repositories, local binary inputs, and external artifacts. You can follow examples of build types from basic builds to

advanced builds.

- **Create container images:** A container image is the most basic building block in OpenShift Container Platform and Kubernetes applications. By defining image streams, you can gather multiple versions of an image in one place as you continue to develop the image stream. With S2I containers, you can insert your source code into a base container. The base container is configured to run code of a particular type, such as Ruby, Node.js, or Python.
- **Create deployments:** Use **Deployment** objects to exert fine-grained management over applications. Deployments create replica sets according to the rollout strategy, which orchestrates pod lifecycles.
- **Create templates:** Use existing templates or create your own templates that describe how an application is built or deployed. A template can combine images with descriptions, parameters, replicas, exposed ports and other content that defines how an application can be run or built.
- **Understand Operators:** Operators are the preferred method for creating on-cluster applications for OpenShift Container Platform 4.16. Learn about the Operator Framework and how to deploy applications by using installed Operators into your projects.
- **Develop Operators:** Operators are the preferred method for creating on-cluster applications for OpenShift Container Platform 4.16. Learn the workflow for building, testing, and deploying Operators. You can then create your own Operators based on [Ansible](#) or [Helm](#), or configure [built-in Prometheus monitoring](#) by using the Operator SDK.
- **Reference the REST API index** Learn about OpenShift Container Platform application programming interface endpoints.
- **Software Supply Chain Security enhancements:** The PipelineRun **details** page in the **Developer** or **Administrator** perspective of the web console provides a visual representation of identified vulnerabilities, which are categorized by severity. Additionally, these enhancements provide an option to download or view Software Bill of Materials (SBOMs) for enhanced transparency and control within your supply chain. Learn about [setting up OpenShift Pipelines in the web console to view Software Supply Chain Security elements](#).

## 1.4. CLUSTER ADMINISTRATOR ACTIVITIES

Manage machines, provide services to users, and follow monitoring and logging reports. Read the following OpenShift Container Platform documentation, so that you can better understand OpenShift Container Platform functions:

- **Understand OpenShift Container Platform management** Learn about components of the OpenShift Container Platform 4.16 control plane. See how OpenShift Container Platform control plane and compute nodes are managed and updated through the [Machine API](#) and [Operators](#).
- **Enable cluster capabilities** As a cluster administrator, you can enable cluster capabilities that were disabled prior to installation.

### 1.4.1. Manage cluster components

- **Manage machines:** Manage [compute](#) and [control plane](#) machines in your cluster with machine sets, by [deploying health checks](#), and [applying autoscaling](#).
- **Manage container registries:** Each OpenShift Container Platform cluster includes a built-in container registry for storing its images. You can also configure a separate [Red Hat Quay](#)

registry to use with OpenShift Container Platform. The [Quay.io](#) website provides a public container registry that stores OpenShift Container Platform containers and Operators.

- **Manage users and groups:** Add users and groups with different levels of permissions to use or modify clusters.
- **Manage authentication:** Learn how user, group, and API authentication works in OpenShift Container Platform. OpenShift Container Platform supports [multiple identity providers](#).
- **Manage ingress, API server, and service certificates:** OpenShift Container Platform creates certificates by default for the Ingress Operator, the API server, and for services needed by complex middleware applications that require encryption. You might need to change, add, or rotate these certificates.
- **Manage networking:** The cluster network in OpenShift Container Platform is managed by the [Cluster Network Operator](#) (CNO). The CNO uses **iptables** rules in [kube-proxy](#) to direct traffic between nodes and pods running on those nodes. The Multus Container Network Interface adds the capability to attach [multiple network interfaces](#) to a pod. By using [network policy](#) features, you can isolate your pods or permit selected traffic.
- **Manage Operators:** Lists of Red Hat, ISV, and community Operators can be reviewed by cluster administrators and [installed on their clusters](#). After you install them, you can [run](#), [upgrade](#), back up, or otherwise manage the Operator on your cluster.
- **Understanding Windows container workloads:** You can use the Red Hat OpenShift support for Windows Containers feature to run Windows compute nodes in an OpenShift Container Platform cluster. This is possible by using the Red Hat Windows Machine Config Operator (WMCO) to install and manage Windows nodes.

### 1.4.2. Change cluster components

- **Use custom resource definitions (CRDs) to modify the cluster:** Cluster features implemented with Operators can be modified with CRDs. Learn to [create a CRD](#) and [manage resources from CRDs](#).
- **Set resource quotas:** Choose from CPU, memory, and other system resources to [set quotas](#).
- **Prune and reclaim resources:** Reclaim space by pruning unneeded Operators, groups, deployments, builds, images, registries, and cron jobs.
- **Scale and tune clusters:** Set cluster limits, tune nodes, scale cluster monitoring, and optimize networking, storage, and routes for your environment.
- **Update a cluster:** Use the Cluster Version Operator (CVO) to upgrade your OpenShift Container Platform cluster. If an update is available from the OpenShift Update Service (OSUS), you apply that cluster update from the OpenShift Container Platform [web console](#) or the [OpenShift CLI \(oc\)](#).
- **Using the OpenShift Update Service in a disconnected environment:** You can use the OpenShift Update Service for recommending OpenShift Container Platform updates in disconnected environments.
- **Improving cluster stability in high latency environments by using worker latency profiles:** If your network has latency issues, you can use one of three worker latency profiles to help ensure that your control plane does not accidentally evict pods in case it cannot reach a worker node. You can configure or modify the profile at any time during the life of the cluster.

### 1.4.3. Observe a cluster

- **OpenShift Logging:** Learn about logging and configure different logging components, such as log storage, log collectors, and the logging web console plugin.
- **Red Hat OpenShift distributed tracing platform:** Store and visualize large volumes of requests passing through distributed systems, across the whole stack of microservices, and under heavy loads. Use the distributed tracing platform for monitoring distributed transactions, gathering insights into your instrumented services, network profiling, performance and latency optimization, root cause analysis, and troubleshooting the interaction between components in modern cloud-native microservices-based applications.
- **Red Hat build of OpenTelemetry:** Instrument, generate, collect, and export telemetry traces, metrics, and logs to analyze and understand your software's performance and behavior. Use open source backends like Tempo or Prometheus, or use commercial offerings. Learn a single set of APIs and conventions, and own the data that you generate.
- **Network Observability:** Observe network traffic for OpenShift Container Platform clusters by using eBPF technology to create and enrich network flows. You can [view dashboards](#), [customize alerts](#), and [analyze network flow](#) information for further insight and troubleshooting.
- **In-cluster monitoring:** Learn to [configure the monitoring stack](#). After configuring monitoring, use the web console to access [monitoring dashboards](#). In addition to infrastructure metrics, you can also scrape and view metrics for your own services.
- **Remote health monitoring:** OpenShift Container Platform collects anonymized aggregated information about your cluster. By using Telemetry and the Insights Operator, this data is received by Red Hat and used to improve OpenShift Container Platform. You can view the [data collected by remote health monitoring](#).
- **Power monitoring for Red Hat OpenShift (Technology Preview):** You can use power monitoring for Red Hat OpenShift to monitor the power usage and identify power-consuming containers running in an OpenShift Container Platform cluster. Power monitoring collects and exports energy-related system statistics from various components, such as CPU and DRAM. Power monitoring provides granular power consumption data for Kubernetes pods, namespaces, and nodes.

## 1.5. STORAGE ACTIVITIES

- **Manage storage:** With OpenShift Container Platform, a cluster administrator can configure persistent storage by using [Red Hat OpenShift Data Foundation](#), [AWS Elastic Block Store](#), [NFS](#), [iSCSI](#), [Container Storage Interface \(CSI\)](#), and more. You can [expand persistent volumes](#), configure [dynamic provisioning](#), and use CSI to [configure](#), [clone](#), and use [snapshots](#) of persistent storage.
- **Persistent storage using CIFS/SMB CSI Driver Operator (Technology Preview):** OpenShift Container Platform is capable of provisioning persistent volumes (PVs) with a Container Storage Interface (CSI) driver for the Common Internet File System (CIFS) dialect/Server Message Block (SMB) protocol. The CIFS/SMB CSI Driver Operator that manages this driver is in Technology Preview status.
- **Changing vSphere CSI maximum number of snapshots:** The default maximum number of snapshots in VMware vSphere Container Storage Interface (CSI) is 3 per volume. In OpenShift Container Platform 4.16, you can now change this maximum number of snapshots to a maximum of 32 per volume. You also have granular control of the maximum number of snapshots for vSAN and Virtual Volume datastores.

- **Volume cloning supported for Azure File (Technology Preview)** OpenShift Container Platform 4.16 introduces volume cloning for the Microsoft Azure File Container Storage Interface (CSI) Driver Operator as a Technology Preview feature.
- **RWOP with SELinux context mount** OpenShift Container Platform 4.16 changes feature status from Technical Preview status to generally available for the access mode **ReadWriteOncePod** (RWOP). RWOP can be used only in a single pod on a single node. If the driver enables it, RWOP uses the SELinux context mount set in the PodSpec or container, which allows the driver to mount the volume directly with the correct SELinux labels.

## 1.6. HOSTED CONTROL PLANE ACTIVITIES

- **Support for Amazon Web Services (AWS)** Hosted control planes for OpenShift Container Platform is now Generally Available on the AWS platform. For more information, see the following documentation:
  - [Configuring the hosting cluster on AWS](#)
- **Technology Preview features** Hosted control planes remains available as a Technology Preview feature on the IBM Power® and IBM Z® platforms and on non-bare metal agent machines. For more information, see the following documentation:
  - [Configuring the hosting cluster on a 64-bit x86 OpenShift Container Platform cluster to create hosted control planes for IBM Power® compute nodes \(Technology Preview\)](#)
  - [Configuring the hosted cluster on 64-bit x86 bare metal for IBM Z® compute nodes \(Technology Preview\)](#)
  - [Configuring hosted control plane clusters using non bare metal agent machines \(Technology Preview\)](#)

## CHAPTER 2. LEARN MORE ABOUT OPENSIFT CONTAINER PLATFORM

Use the following sections to find content to help you learn about and use OpenShift Container Platform.

### 2.1. ARCHITECT

Learn about OpenShift Container Platform	Plan an OpenShift Container Platform deployment	Additional resources
<a href="#">Enterprise Kubernetes with OpenShift</a>	<a href="#">Tested platforms</a>	<a href="#">OpenShift blog</a>
<a href="#">Architecture</a>	<a href="#">Security and compliance</a>	<a href="#">What's new in OpenShift Container Platform</a>
	<a href="#">Networking</a>	<a href="#">OpenShift Container Platform life cycle</a>
	<a href="#">Backup and restore</a>	

### 2.2. CLUSTER ADMINISTRATOR

Learn about OpenShift Container Platform	Deploy OpenShift Container Platform	Manage OpenShift Container Platform	Additional resources
<a href="#">Enterprise Kubernetes with OpenShift</a>	<a href="#">Installing OpenShift Container Platform</a>	<a href="#">Using Insights to identify issues with your cluster</a>	<a href="#">Getting Support</a>
<a href="#">Architecture</a>	<a href="#">Machine configuration overview</a>	<a href="#">Logging</a>	<a href="#">OpenShift Knowledgebase articles</a>
<a href="#">OpenShift Interactive Learning Portal</a>	<a href="#">Networking</a>	<a href="#">Monitoring overview</a>	<a href="#">OpenShift Container Platform Life Cycle</a>
	<a href="#">Storage</a>		
	<a href="#">Backup and restore</a>		
	<a href="#">Updating a cluster</a>		

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

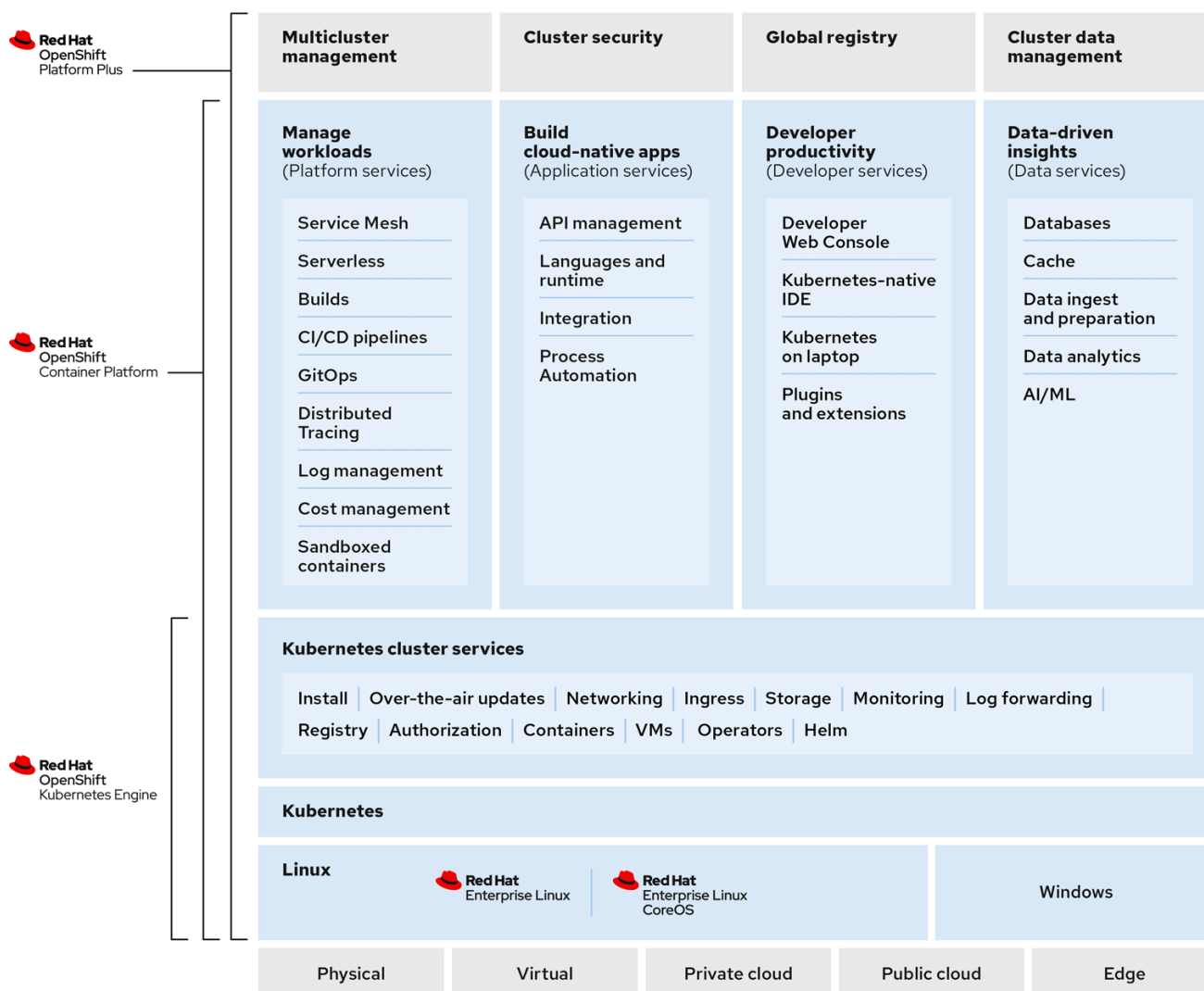
Learn about OpenShift Container Platform	Deploy and manage applications	Additional resources
<a href="#">OpenShift Interactive Learning Portal</a>	<a href="#">Projects</a>	<a href="#">Getting Support</a>
<a href="#">Architecture</a>	<a href="#">Operators</a>	<a href="#">OpenShift Knowledgebase articles</a>
	<a href="#">Logging</a>	<a href="#">OpenShift Container Platform Life Cycle</a>
	<a href="#">Blogs about logging</a>	
	<a href="#">Monitoring</a>	

## 2.4. DEVELOPER

Learn about application development in OpenShift Container Platform	Deploy applications
<a href="#">Getting started with OpenShift for developers (interactive tutorial)</a>	<a href="#">Creating applications</a>
<a href="#">Red Hat Developers site</a>	<a href="#">Builds</a>
<a href="#">Red Hat OpenShift Dev Spaces (formerly Red Hat CodeReady Workspaces)</a>	<a href="#">Operators</a>
	<a href="#">Images</a>
	<a href="#">Developer-focused CLI</a>

## CHAPTER 3. ABOUT OPENSIFT 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.

### 3.1. SIMILARITIES AND DIFFERENCES

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

**Table 3.1. 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
Kubectrl 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
{sandboxed-containers-first}		Yes

### 3.1.1. 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.

### 3.1.2. 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.

### 3.1.3. 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.

### 3.1.4. 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.

### 3.1.5. 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.

### 3.1.6. OpenShift Data Foundation compatible

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

### 3.1.7. 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.

### 3.1.8. OpenShift Serverless

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

### 3.1.9. Quay Integration compatible

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

### 3.1.10. OpenShift Virtualization

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

### 3.1.11. 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 Elasticsearch, 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.

### 3.1.12. 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.

### 3.1.13. OpenShift sandboxed containers

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

### 3.1.14. 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.

### 3.1.15. 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 3.2. 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
Existing RHEL manual attach to cluster (BYO)	Included	Included	N/A
CRIO Runtime	Included	Included	N/A
Over the Air Smart Upgrades and Operating System (RHCOS) Management	Included	Included	N/A
Enterprise Secured Kubernetes	Included	Included	N/A
Kubectl and <b>oc</b> automated command line	Included	Included	N/A
Auth Integrations, RBAC, SCC, Multi-Tenancy Admission Controller	Included	Included	N/A
Operator Lifecycle Manager (OLM)	Included	Included	N/A
Administrator web console	Included	Included	N/A
OpenShift Virtualization	Included	Included	OpenShift Virtualization Operator
Compliance Operator provided by Red Hat	Included	Included	Compliance Operator
File Integrity Operator	Included	Included	File Integrity Operator
Gatekeeper Operator	Not Included - Requires separate subscription	Not Included - Requires separate subscription	Gatekeeper Operator
Klusterlet	Not Included - Requires separate subscription	Not Included - Requires separate subscription	N/A
Kube Descheduler Operator provided by Red Hat	Included	Included	Kube Descheduler Operator

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

Feature	OpenShift Kubernetes Engine	OpenShift Container Platform	Operator name
HAProxy Ingress Controller	Included	Included	N/A
Ingress Cluster-wide Firewall	Included	Included	N/A
Egress Pod and Namespace Granular Control	Included	Included	N/A
Ingress Non-Standard Ports	Included	Included	N/A
Multus and Available Multus Plugins	Included	Included	N/A
Network Policies	Included	Included	N/A
IPv6 Single and Dual Stack	Included	Included	N/A
CNI Plugin ISV Compatibility	Included	Included	N/A
CSI Plugin ISV Compatibility	Included	Included	N/A
RHT and IBM® middleware à la carte purchases (not included in OpenShift Container Platform or OpenShift Kubernetes Engine)	Included	Included	N/A
ISV or Partner Operator and Container Compatibility (not included in OpenShift Container Platform or OpenShift Kubernetes Engine)	Included	Included	N/A
Embedded OperatorHub	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
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
OpenShift Elasticsearch Operator provided by Red Hat	Not Included	Cannot be run standalone	N/A
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
Web Terminal provided by Red Hat	Not Included	Included	Web Terminal Operator
Red Hat OpenShift Pipelines Operator	Not Included	Included	OpenShift Pipelines Operator
Embedded Component of IBM Cloud® Pak and RHT MW Bundles	Not Included	Included	N/A
Red Hat OpenShift GitOps	Not Included	Included	OpenShift GitOps
Red Hat OpenShift Dev Spaces	Not Included	Included	Red Hat OpenShift Dev Spaces
Red Hat OpenShift Local	Not Included	Included	N/A
Quay Bridge Operator provided by Red Hat	Not Included	Included	Quay Bridge Operator
Quay Container Security provided by Red Hat	Not Included	Included	Quay Operator
Red Hat OpenShift distributed tracing platform	Not Included	Included	Red Hat OpenShift distributed tracing platform Operator
Red Hat OpenShift Kiali	Not Included	Included	Kiali Operator
Metering provided by Red Hat (deprecated)	Not Included	Included	N/A
Migration Toolkit for Containers Operator	Not Included	Included	Migration Toolkit for Containers Operator
Cost management for OpenShift	Not included	Included	N/A
JBoss Web Server provided by Red Hat	Not included	Included	JWS Operator
Red Hat Build of Quarkus	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 (odo)	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
{sandboxed-containers-first}	Not included	Not included	{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
OpenShift Data Foundation	Not Included - Requires separate subscription	Not Included - Requires separate subscription	OpenShift Data Foundation
Feature	OpenShift Kubernetes Engine	OpenShift Container Platform	Operator name
Ansible Automation Platform Resource Operator	Not Included - Requires separate subscription	Not Included - Requires separate subscription	Ansible Automation Platform Resource Operator
Business Automation provided by Red Hat	Not Included - Requires separate subscription	Not Included - Requires separate subscription	Business Automation Operator
Data Grid provided by Red Hat	Not Included - Requires separate subscription	Not Included - Requires separate subscription	Data Grid Operator
Red Hat Integration provided by Red Hat	Not Included - Requires separate subscription	Not Included - Requires separate subscription	Red Hat Integration Operator
Red Hat Integration - 3Scale provided by Red Hat	Not Included - Requires separate subscription	Not Included - Requires separate subscription	3scale
Red Hat Integration - 3Scale APICast gateway provided by Red Hat	Not Included - Requires separate subscription	Not Included - Requires separate subscription	3scale APIcast
Red Hat Integration - AMQ Broker	Not Included - Requires separate subscription	Not Included - Requires separate subscription	AMQ Broker
Red Hat Integration - AMQ Broker LTS	Not Included - Requires separate subscription	Not Included - Requires separate subscription	
Red Hat Integration - AMQ Interconnect	Not Included - Requires separate subscription	Not Included - Requires separate subscription	AMQ Interconnect
Red Hat Integration - AMQ Online	Not Included - Requires separate subscription	Not Included - Requires separate subscription	
Red Hat Integration - AMQ Streams	Not Included - Requires separate subscription	Not Included - Requires separate subscription	AMQ Streams
Red Hat Integration - Camel K	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

## 3.2. 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.