



Get started

with Red Hat OpenShift Virtualization

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Resources and information

Introduction

Migrate and manage your virtual machines and containers on a single, unified platform.

Virtualization platforms are core components of modern IT environments. By abstracting hardware resources, virtualization technologies can increase scalability and flexibility across hybrid, multicloud and edge environments. With capabilities that speed and simplify virtual machine (VM) provisioning and management, virtualization platforms can help you optimize infrastructure, streamline operations, and adopt new technologies and services.

With **Red Hat**[®] **OpenShift**[®] **Virtualization**, you can deploy and manage virtual machines at scale and with hardened security across hybrid, multicloud, and edge environments. As the foundation for OpenShift Virtualization, **Red Hat OpenShift** lets you run both virtual machines and containers on a single, unified, enterprise-ready application platform. At the core of OpenShift Virtualization is the Kernel-based Virtual Machine (KVM), a security-focused, high-performance, open source hypervisor that enables the virtualization capabilities to run virtual machines. For organizations needing a dedicated virtualization solution focused solely on virtual machines, Red Hat OpenShift Virtualization Engine provides the same core virtualization capabilities as Red Hat OpenShift, allowing you to deploy, manage, and scale your virtual machines.

Maximize existing investments while adopting cloud-native innovation

OpenShift Virtualization can help you maximize your existing virtualization investments while taking advantage of cloud-native architectures, streamlined operations, and new development approaches.

Read 15 reasons to adopt Red Hat OpenShift Virtualization.

OpenShift Virtualization provides the capabilities needed to manage complete virtual machines lifecycles.

- Create and manage both Linux[®] and Microsoft Windows virtual machines from a single interface.
- Import and clone existing virtual machines from other virtualization platforms.
- Live migrate virtual machines using configurable policies, metrics, and traffic encryption.
- Manage attached network interface controllers and storage disks.
- Back up virtual machines on demand or on fixed schedules, manage saved images, and restore workloads quickly.
- Administer virtual machines on physical servers in private datacenters and public cloud environments.
- Provision and manage virtual machines with graphical web consoles or command line interfaces (CLIs).
- Automate many common virtualization tasks with advanced capabilities in Red Hat Ansible[®]
 Automation Platform and modern practices like GitOps and infrastructure-as-code (laC).

Red Hat OpenShift key concepts

This e-book provides guidance on using OpenShift Virtualization. It's important to understand a few key concepts before getting started:

- Nodes are physical servers in private datacenters or public cloud environments.
- Clusters are sets of nodes that are managed together through a control plane.
- Namespaces provide a mechanism for isolating groups of resources within a cluster, allowing you to divide resources between multiple users.

What you will learn in this e-book

This e-book describes many of the common tasks that you can perform with OpenShift Virtualization. We provide step-by-step guidance for using OpenShift Virtualization to provision, configure, manage, and migrate virtual machines and related resources.

Get started with common use cases

The following sections describe how to accomplish common tasks using OpenShift Virtualization. Each section includes step-by-step instructions and screenshots of the unified interface to help you get started quickly.

Streamline tasks and workflows with automation

You can automate the uses cases described in this e-book with **Ansible Automation Platform**. Start common virtualization tasks as part of scheduled activities, initiate them via events or IT service management (ITSM) requests, or include them as part of larger orchestrated service delivery workflows. And with precomposed automation content available in **Red Hat Ansible Certified Content** collections, you can start automating your virtualization tasks and workflows in less time.

Task 1:

Provision virtual machines by instance type

In some cases, users need more customization options when provisioning virtual machines. With instance types, you can offer a predefined selection of operating system images, workload types, and hardware requirements. Users can self-provision virtual machines from this selection based on their workload requirements, including processor, memory, and operating system. Follow these steps to provision virtual machines using instance types in the web console.

- 1. Navigate to *Virtualization > Catalog* in the left menu bar.
- 2. Select the *InstanceTypes* tab and then select the virtual machine operating system image.

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Home	Create new VirtualMachine							
Operators	InstanceTypes III Template catalog							
Workloads								
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Overview Catalog	Volumes project PR All projects ▼ Filter ▼ S				1-6 of 6			
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3. Click an *InstanceType* tile and select the appropriate resource size for your workload, then click *Create VirtualMachine* at the bottom of the frame.

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4. Navigate to *Virtualization > VirtualMachines* in the left menu bar to view the status of the newly provisioned virtual machine.

Task 2:

Provision virtual machines using templates

Templates are a fast, simple way to provision virtual machines. OpenShift Virtualization includes predefined templates for many common operating systems and hardware configurations. For example, templates are included for both Linux and Microsoft Windows virtual machines. You can also define and customize templates based on your organization's workloads and infrastructure. And in internet-connected clusters, you can automatically download default base images for virtual machines to simplify template management.

OpenShift Virtualization includes capabilities to help you manage provisioning across your organization. Rolebased access control (RBAC) mechanisms regulate access to templates, allowing users to self-provision virtual machines from curated catalogs and in compliance with corporate policies. By defining validation rules in templates, you can allow users to customize virtual machines within defined limits. And hooks that connect OpenShift Virtualization to external tools–including Ansible Automation Platform and ServiceNow–let you create advanced workflows to streamline virtual machine provisioning. Follow these steps to provision virtual machines using default or customized templates in the web console.

Provision a virtual machine using default templates

- 1. Navigate to Virtualization > Catalog in the left menu bar.
- 2. Click a template tile to view the virtual machine details.

3. Click Quick create VirtualMachine to create a virtual machine based on the default template settings.

E Red Hat OpenShift					
🕫 Administrator 👻				Bed Hat Enterprise Linu	v 9 VM
Home >			ľ	rhel9-server-small	
Operators >				Template info	
Workloads >			ſ	Red Hat Enterprise Linux 9 VM	Disk source * 🕲
Virtualization 🗸			۱ د	Workload type Server (default)	
Overview				Description	Disk size *
Catalog				Template for Red Hat Enterprise Linux 9 VM or	- 30 + GiB •
VirtualMachines Templates				available.	Drivers
InstanceTypes			Cent	Refer to documentation 🔀	
Preferences				CPU Memory	
Bootable volumes			Proje 1 Boot		
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Checkups					
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Storage >				rootdisk Disk 30 GiB cloudinitdisk Disk -	
Builds >			Micro wind		
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User Management >				rhel9-tan-cephalopod-78	default Not configured a
Administration >			. '	Start this VirtualMachine after creation	
			Micro		

4. Navigate to *Virtualization > VirtualMachines* in the left menu bar to view the status of the newly provisioned virtual machine.

Provision a virtual machine using customized templates

- 1. Navigate to Virtualization > Catalog in the left menu bar.
- 2. Click a template tile to view the virtual machine details.

3. Click **Customize VirtualMachine** to edit the virtual machine settings.

E Red Hat OpenShift						🗰 🌲 t 🗘 😡 admin 🕶
🕫 Administrator					Fedora VM	
Home					fedora-server-small	
Operators						✓ Storage ⑦ □ Boot from CD ⑦
Workloads					Operating system Fedora VM	Disk source * 🕲
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Overview				Cent	Description	Disk size * - 30 + GiB ▼
Catalog VirtualMachines					Template for Fedora Linux 39 VM or newer. A PVC with the Fedora disk image must be	
Templates				Boot Work	available.	Drivers
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Preferences					CPU Memory	
Bootable volumes					Network interfaces (1)	
Checkups					Name Network Type default Pod networking Masquerade	
Networking					Disks (2) Name Drive Size	
Storage				Boot Work	rootdisk Disk 30 GiB cloudinitdisk Disk -	
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Administration				Proje Boot	Start this VirtualMachine after creation	
				Work CPU Mem		Cancel

4. Expand the **Storage** and **Optional parameters** sections to modify related virtual machine settings, then click **Next** at the bottom of the frame.

Fedora VM fedora-server-small		×
✓ Template info	✓ Storage ⑦ ■ Boot from CD ⑦	- Î
Operating system		
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Workload type	Template default 🔹	
Server (default)	Disk size *	
Description		
Template for Fedora Linux 39 VM or newer. A PVC with the Fedora disk image must be available.		
	Drivers	
Documentation		
Refer to documentation 🙎	Mount Windows drivers disk	

 Customize virtual machine settings in the Overview, Scheduling, Environment, Network interfaces, Disks, Scripts, and Metadata tabs and click Create VirtualMachine.

For example, you can customize the number of processor cores and amount of memory, change connected networks, add additional disks, and include configuration scripts.



6. Navigate to *Virtualization > VirtualMachines* in the left menu bar to view the status of the newly provisioned virtual machine.

Task 3:

Update virtual machine configurations

As workload demands change, you may need to update the configurations of running virtual machines. You can change a selection of configuration options using the OpenShift Virtualization web console.

Follow these steps to reconfigure existing virtual machines in the web console.

- 1. Navigate to *Virtualization > VirtualMachines* in the left menu bar.
- 2. Select a virtual machine to view the *VirtualMachine* details page.



3. Select the *Configuration* tab and edit virtual machine settings in the *Scheduling*, *Environment*, *Network interfaces*, *Disks*, and *Scripts* tabs

≡ [●] Red Hat OpenShift		₩ 🗍 4 🐨 😧 admin 🕶
📽 Administrator	Project default 💌	
Home	VirtualMachines > VirtualMachine details	💽 YAML 📕 😋 📕 Actions 🔻
Operators		
Workloads	Overview Metrics YAML Configuration Events Console Snapshots Diagnostics	
Virtualization Overview Catalog VirtualMachines Templates InstanceTypes Preferences Bootable volumes MigrationPolicies	Contrails Scheduling and resource requirements Node selector Dedicated resources Storage No dedicated resources applied Not events Dedicated resources applied Not events Events Scheduling Affinity rules SSH 0 Affinity rules Descheduler \$ Initial run \$	
Networking	Metadata	
Storage		



Some changes require a restart of the virtual machine. The web console notifies you if a restart is needed.

Task 4:

Create and manage snapshots

Snapshots capture virtual machine state and data at a specific point in time. If you encounter an issue when configuring or updating your infrastructure, you can use snapshots to restore virtual machines to a known state. And in the event of a security incident, snapshots let you preserve virtual machines state for further investigation.

OpenShift Virtualization contains features that simplify snapshot management across your environment:

- Create new snapshots.
- Create copies of virtual machines from snapshots.
- List all snapshots attached to a specific virtual machine.
- Restore virtual machines from snapshots.
- Delete existing snapshots.

OpenShift Virtualization lets you create snapshots of both running and stopped virtual machines. If a virtual machine is running, OpenShift Virtualization waits for data to be written to disk before taking the snapshot. The platform uses mechanisms in the backing storage to snapshot virtual machine data for efficient operation.

Follow these steps to create and restore virtual machine snapshots in the web console.

Create a virtual machine snapshot

- 1. Navigate to Virtualization > VirtualMachines in the left menu bar.
- 2. Select a virtual machine to view the *VirtualMachine* details page.

3. Select the Snapshots tab and click Take Snapshot.

Red Hat OpenShift		 4 4	÷	0	
🗱 Administrator	Project: default 🔻				
Home	VirtualMachines > VartualMachine details		G		Actions 👻
Operators					
	Overview Metrics YAML Configuration Events Console Snapshots Diagnostics				
Workloads					
Virtualization	Snapshots				
Overview	Take snapshot				
Catalog					
VirtualMachines	0				

4. Enter the snapshot name in the *Name* field and click *Save* at the bottom of the frame.

E Red Hat OpenShift		-				
🗱 Administrator		Take snapshot	×			
		 Taking snapshot of running VirtualMachine. 				
Home		Name *	ß			
Operators		snapshot-green-guokka-82				
Workloads						
		Description				
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Catalog		Deadline				
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Templates						
InstanceTypes						
Preferences		A The following disk will not be included in the snapshot				
Bootable volumes		cloudinitdisk - Snapshot is not supported for this volumeSou [cloudinitdisk]				
MigrationPolicies						
Checkups						
Networking						
Storage						

5. Select the Snapshots tab to view the snapshot status.

Restore a virtual machine snapshot

- 1. Navigate to *Virtualization > VirtualMachines* in the left menu bar.
- 2. Select a virtual machine to view the VirtualMachine details page.

3. If the virtual machine is running, click the *Actions* menu and select *Stop*.

Red Hat OpenShift				## 4	🗘 😧 admin v				
🛠 Administrator	÷	Project: default 💌							
Home	,	VirtualMachines > VirtualMachine details		■ C ^a	Actions 👻				
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Workloads	,	Overview Metrics YAML Configuration Events Console Snapshots Diagnostics							
Virtualization	~	Details			Pause Clone				
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VirtualMachines Templates		Status Created Aug 12, 2024, 9:39 AM (37 minutes ago)	Man Alana a La Cal Calabiana - Ang Ana Alana a Ang	Namespace NS default	SSH using virtctl Edit labels				
InstanceTypes		Operating system Red Hat Enterprise Linux 9.4 (Plow)		Node 🚺 node07.pemlab.rc	Edit annotations				

4. Select the **Snapshots** tab to view a list of snapshots for this virtual machine.

Red Hat OpenShift						## 4	0 0	admin -
🗱 Administrator	÷	Project: default 👻						
Home	,	VirtualMachines > VirtualMachine details	78 O Stopped				►	
Operators	>							
Workloads	,	Overview Metrics YAML Co	nfiguration Events Console	Snapshots Diagnostics				
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VirtualMachines								
Templates		Name †	Created 1	Status 1	Last restored	Indications		
InstanceTypes		VMS snapshot-green-quokka-82	😵 1 minute ago	Operation complete				
Preferences								

5. Select *Restore* from the options menu for the desired snapshot, then click *Restore* in the pop-up menu.

Red Hat OpenShift							#	4 🤇	9 0	admin v
🕫 Administrator	÷	Project: default 🔻								
Home	,	VirtualMachines > VirtualMachine details	d-78 © stopped						•	
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Notworking										
Networking										

- 6. Select the **Snapshots** tab to view the snapshot status.
- 7. Click the Actions menu and select Start to restart the virtual machine.

Red Hat OpenShift		9 9 admin -
📽 Administrator	roject default 🔹	
Home	VirtualMachines > VirtualMachine details	Actions •
Operators		Start
Workloads	Overview Metrics YAML Configuration Events Console Snapshots Diagnostics	Restart
Virtualization	Snapshots	
Overview	Take snapshot	
Catalog VirtualMachines	T Filter Name Search by name	Copy SSH command 📳 SSH using virtctl

Task 5:

Live migrate virtual machines

Live migration lets you move virtual machines to different nodes in the cluster without interrupting running workloads. OpenShift Virtualization contains features that speed and simplify virtual machine migrations across your environment:

- Initiate and cancel live migrations.
- Configure live migration settings, including limits and timeouts.
- Customize migration configurations with live migration policies.
- Monitor the progress of all live migrations.
- View and analyze virtual machine migration metrics.

Follow these steps to live migrate running virtual machines in the web console.

1. Navigate to Virtualization > VirtualMachines in the left menu bar.

2. Select *Migrate* from the options menu for the desired virtual machine.

Red Hat OpenShift							\$ 4	0	admin -
🗱 Administrator	-	Î Project: default ▼							
Home	,	VirtualMachines							Create 🔫
Operators	,	▼ Filter ▼ Name ▼				1 - 4 of 4			1 of 1 \rightarrow \gg
Workloads	>	Name †	Status 🗍	Conditions	Node	Created	IP add	dress	
Virtualization	~	000 centos-stream9-tomato- dingo-96	C Running		🕦 node08.pemlab.rdu2.redhat.com	😵 Aug 12, 2024, 9:40 AM			
Overview		(M) fedora-cyan-gopher-13	C Running		N node06.pemlab.rdu2.redhat.com	🚱 Aug 12, 2024, 9:39 AM			
Catalog	_	🧰 fedora-indigo-guanaco-35	C Running		🔞 node07.pemlab.rdu2.redhat.com	🔇 Aug 12, 2024, 9:40 AM			
Templates		i rhel9-tan-cephalopod-78	2 Running		N node07.pemlab.rdu2.redhat.com	🚱 Aug 12, 2024, 9:39 AM			
InstanceTypes Preferences Bootable volumes MigrationPolicies Checkups								Stop Resta Pause Clone Migrat Copy	rt te e to a different Node

3. Navigate to *Virtualization > VirtualMachines* in the left menu bar to view the status of the migrated virtual machine.

Migrate virtual machines between clusters

Included with Red Hat OpenShift, the **migration toolkit for virtualization** lets you migrate virtual machines between clusters—and to OpenShift Virtualization from other platforms—at scale. Define a migration plan through the web console or CLI, and the toolkit manages the entire migration, including data copy and virtual machine management tasks. Warm migration capabilities help minimize potential downtime when migrating virtual machines between clusters.

Learn more about this toolkit.

Task 6:

Administer storage resources

OpenShift Virtualization uses Kubernetes objects—including storage classes, persistent volume claims (PVCs), and persistent volumes (PVs)—to manage storage resources for virtual machines. Storage classes describe and classify available storage resources. Cluster and storage administrators create **StorageClass** objects and include information like quality-of-service levels, backup policies, and organization-specific guidelines. Users can request resources without detailed knowledge of underlying storage volumes via **StorageClass** object names.



Navigate to **Storage > StorageClasses** in the left menu bar to view all available **StorageClasses** for your cluster.

Red Hat OpenShift					8	Ð	0	admin -
≎ Administrator		StorageClasses					Create	StorageClass
Home		Name - Search by name						
Operators		Name 1	Provisioner 1	Reclaim po	licy			
Workloads		C localvols		Delete				
Virtualization		💿 ocs-storagecluster-cephfs	openshift-storage cephfs.csi.ceph.com	Delete				
Networking	>	😒 ocs-storagecluster-ceph-rbd – Default 📎		Delete				
		co ocs-storagecluster-ceph-rbd-virtualization	openshift-storage.rbd.csi.ceph.com	Delete				
Storage		SSS ocs-storagecluster-ceph-rgw		Delete				
Data Foundation		🕥 openshift-storage.noobaa.io		Delete				
Object Storage								
PersistentVolumeClaims								
StorageClasses								

PVCs are requests for storage resources of specific classes, capacities, and access modes. Using the Container Storage Interface (CSI), storage devices receive PVCs, allocate storage as PVs, and bind the PVs to the PVCs. Virtual machines are assigned PVCs, providing access to PVs and underlying storage devices. With OpenShift Virtualization, storage layers manage capacity and migrate data between storage pools. Storage administrators do not need to perform live storage migration activities within storage classes.

Follow these steps to create a persistent volume claim in the web console.

- 1. Navigate to Storage > PersistentVolumeClaims in the left menu bar.
- 2. Click Create PersistentVolumeClaim and select With Form.

Red Hat OpenShift							Ⅲ ▲ 8 O Ø a	
📽 Administrator	Project: All Projects 🔻							
Home	PersistentVolumeC	laims						
Operators	▼ Filter ▼ Name ▼ S						With Form With Data upload form	ł
Workloads	Name 📫	Namespace 🗍	Status 🗍	PersistentVolumes	Capacity	Used	StorageClass	
Virtualization	PVC centos-stream9- tomato-dingo-96	NS default	📀 Bound	(W) pvc-619324bc-4f6e-431a- 9561-e04048039177			sco ocs-storagecluster-ceph- rbd-virtualization	
Networking	(EVC) db-noobaa-db-pg-0	NS openshift-storage	📀 Bound	(1) pvc-05a0ddf1-0b81- 4549-af40-a8ee18f8988b		70.75 MiB	SC ocs-storagecluster-ceph- rbd	
Storage	evo fedora-cyan-gopher- 13	NS default	🔗 Bound	(1) pvc-92b6212d-dd1f-41fd- 8848-5a229f21f471			SC ocs-storagecluster-ceph- rbd-virtualization	
Data Foundation Object Storage	evc fedora-indigo- guanaco-35	NS default	📀 Bound	200 pvc-465290aa-84f3- 46aa-befa- b6038d059bc0			C ocs-storagecluster-ceph- rbd-virtualization	
PersistentVolumes	evc ocs-deviceset- localvols-0-data-	NS openshift-storage	🔗 Bound	w local-pv-33f63af9			🕙 localvols	
StorageClasses VolumeSnapshots VolumeSnapshotClasses	ocs-deviceset- localvols-0-data- 2vksgk	NS) openshift-storage	© Bound	iocal-pv-2c216285			C localvols	

3. Customize the PVC settings and click *Create* to provision the PVC.

Red Hat OpenShift		 \$ 8	•	0	admin v
🛠 Administrator	Project: default 🔹				
Home	Create PersistentVolumeClaim Edit YAML				
Operators	StorageClass				
Workloads	StorageClass for the new claim				
Virtualization	PersistentVolumeClaim name * demo-claim demo-claim				
Networking	A unique name for the storage claim within the project				
Storage Data Foundation Object Storage Persistent/VolumeClaims StorageClasses VolumeSnapehots VolumeSnapehotClasses VolumeSnapehotClasses	Access mode * Single user (RWO) Access mode is set by StorageClass and cannot be changed Size * Desired storage capacity Use label selectors to request storage Persistent/Wolme resources that match all label selectors will be considered for binding. Volume mode * Filesystem Block Create				
Builds					

 Navigate to Storage > PersistentVolumeClaims in the left menu bar to view the status of all PVCs and bound PVs.

Migrate data between storage classes

Included with Red Hat OpenShift, the **migration toolkit for containers** lets you migrate data between storage classes. Define a migration plan and the toolkit performs a warm migration, including copying data and managing persistent volume claims.

Learn more about this toolkit.

Task 7:

Configure network nodes

OpenShift Virtualization lets you define state-driven network configurations across entire clusters. Describe the requested network configuration–including interface types, domain name system (DNS), and routing–for nodes in the cluster using a node network configuration policy. Using the **Kubernetes NMState Operator**, OpenShift Virtualization monitors and updates each node's network configuration to ensure compliance with the policy.

Follow these steps to create a node network configuration policy in the web console.

- 1. Navigate to *Networking > NodeNetworkConfigurationPolicy* in the left menu bar.
- 2. Click Create and select From Form.

Red Hat OpenShift				 ₿	0	0	admin -
☆ Administrator	NodeNetworkConfigurationPolicy						
Home	T Filter • Name • Search by name	m					From Form
Operators		Matched nodes	Enactment states				WITTAME
Workloads	(INCP) br-flat						
Virtualization							
Networking							

3. Enter the policy name in the *Policy name* field, and optionally add a description in the *Description* field.

Red Hat OpenShift		
🗱 Administrator	Create NodeNetworkConfigurationPolicy	
Home	Node network is configured and managed by NM state. Create a node network configuration policy to describe the requested network configuration on your nodes in the cluster. The node network	to
Operators	configuration enactment reports the network policies enacted upon each node. Apply this NodeNetworkConfigurationPolicy only to specific subsets of nodes using the node	Ø
Workloads	selector	
Virtualization	Policy name	
Networking	Description	
Routes	Policy Interface(s)	
Ingresses	Policy interface(s)	
NetworkPolicies	Add another interface to the policy	

By default, configurations are applied to all nodes. Use the *Node Selector* check box at the top of the form to apply policies to a subset of nodes.

Red Hat OpenShift					
	Create NodeNetworkConfiguration				
Workloads					
		Node Selector			
		Key	Value		•
		Add Label			
		No matching Nodes found for the Scheduling will not be possible at the Scheduling will not be possible at the	labels is state	¢.	
NodeNetworkState					
Observe					

4. Define policy interfaces, including the required *Interface name*, *Network state*, and *Type* fields. Set optional fields as necessary. Click *Create* to complete policy creation.

Services			
Routes		✓ Bridge br0	•
Ingresses		Interface name *	
NetworkPolicies			
NetworkAttachmentDefi			
NodeNetworkConfigurat	tionPolicy	Network state *	
NodeNetworkState			•
Storage	\$	Туре *	
		Bridge	
Builds		IP configuration	
Observe			
		- .	
Compute		Port	
User Management			
		Enable STP	
Administration			
		Create	

Task 8:

Connect virtual machines to networks

Network attachment definitions let you connect virtual machines to virtual local area networks (VLANs) across your cluster. Because network attachment definitions are managed namespaces, you can easily control the virtual machines connected to any VLAN. Using namespaces, you can create a common network that all users can access and prohibit users from placing virtual machines on unauthorized networks. Follow these steps to connect a virtual machine to a VLAN in the web console.

Follow these steps to connect a VM to a VLAN in the web console.

- 1. Navigate to Networking > NetworkAttachmentDefinitions in the left menu bar.
- 2. Click Create Network Attachment Definition.
- 3. Enter a unique name and optional description for the network attachment definition. Select CNV Linux bridge from the Network Type list and enter the bridge name in the Bridge name field. Set optional fields as necessary and click Create at the bottom of the frame to create the network attachment definition.

Red Hat OpenShift		==	\$ 8	Ð	0	
📽 Administrator	Project: default 💌					
Home	Create network attachment definition					
Operators 3	Name " O					
Workloads 3	vtan0					
Virtualization 3	Uescription					
Networking	Network Type *					
Services						
Routes	Bridge mapping Θ^*					
Ingresses	br-flat					
NetworkPolicies	мти					
NetworkAttachmentDefinitions						
NodeNetworkConfigurationPolic	VLAN					
NodeNetworkState						
Storage						
Builds						

4. Provision a virtual machine (**Task 1**). Under the **Network interfaces** tab, select the newly created network attachment definition.

Task 9:

Set up secondary networks

OpenShift Virtualization also lets you connect virtual machines to **Open Virtual Network (OVN)-Kubernetes** secondary networks. Support for layer 2 topologies allows you to connect virtual machines on different nodes via a cluster-wide logical switch, without configuring any additional physical networking infrastructure. Using a localnet topology, you can connect secondary networks to physical underlays to support east-west cluster traffic and access to services outside the cluster.

The process for setting up and connecting virtual machines to a secondary network largely follows the same steps as configuring a VLAN (Task 8). Follow these steps to set up and connect virtual machines to a secondary network in the web console.

- 1. Navigate to Networking > NetworkAttachmentDefinitions in the left menu bar.
- 2. Click Create Network Attachment Definition.
- 3. Enter a unique name and optional description for the network attachment definition.
- 4. Select OVN Kubernetes L2 overlay network from the Network Type list and click Create to create the network attachment definition.
- Connect virtual machines to the newly created network by updating their configurations (Task 3). Under the Network interfaces tab, select the newly created network attachment definition.

Task 10:

Back up and recover virtual machines

OpenShift Virtualization supports data protection operations—including on-demand backup, scheduled backup, and restore. With these operations, you can save virtual machine state and data to storage resources in a private datacenter or public cloud environment outside of your cluster. In the event of a failure or scheduled maintenance, you can quickly restore your entire cluster.

Follow these steps to back up and restore virtual machines in the web console.

Configure OpenShift APIs for Data Protection

As part of Red Hat OpenShift, OpenShift APIs for Data Protection (OADP) is an **operator** that offers comprehensive disaster recovery protection. Created and supported by Red Hat, OADP backs up and restores virtual machines, including any persistent volume claims and metadata objects like virtual machine definitions, and Kubernetes **ConfigMaps** and **Secrets**. **DataProtectionApplication** custom resources define OADP configurations, allowing you to specify backup and snapshot locations along with their secrets using YAML.

Here is an example OADP configuration:

```
spec:
  backupLocations:
    - velero
        config:
          profile: default
          region: localstorage
          s3ForcePathStyle: 'true'
          s3Url: 'http://s3.openshift-storage.svc'
        credential:
          key: cloud
          name: cloud-credentials
        default: true
        objectStorage:
          bucket: backups-0bc357d1-31db-4453-b54e-9c4bde5a98c8
          prefix: velero
        provider: aws
```

configuration:

velero:

- defaultPlugins:
 - csi
 - openshift
 - aws
 - kubevirt
- featureFlags:
 - EnableCSI

Explore an ecosystem of solutions

Our certified partner ecosystem includes many third-party products for **data storage**, backup, and restoration. Using the Red Hat OpenShift Operator Framework, OpenShift Virtualization lets you perform backup and recovery operations using many of these products directly from the web console.

Find the right partner solutions in our Red Hat Ecosystem Catalog.

Create a virtual machine backup

 Create a backup custom resource using YAML that defines the namespaces and virtual machines included in the back up.

```
apiVersion: velero.io/v1
kind: Backup
metadata:
  name: backup-fedora02
  labels:
    velero.io/storage-location: default
  namespace: openshift-adp
spec:
  hooks: {}
  orLabelSelectors:
  - matchLabels:
      app: fedora02
  - matchLabels:
      vm.kubevirt.io/name: fedora02
  includedNamespaces:
  - vmexamples
  storageLocation: oadp-dpa-1
  ttl: 720h0m0s
```

- 2. Navigate to Operators > Installed Operators in the left menu bar.
- 3. Select OADP Operator from the list.

4. Select the *Backup* tab and click *Create Backup*.

Red Hat OpenShift				4	Ð	>_	0	admin -
🕫 Administrator		Project-openshift-adp 🔹						
Home		Installed Operators > Operator details OADP Operator OADP Operator						Actions 👻
Operators		140 provided by Red Hat						
OperatorHub		Details YAML Subscription Events All instances BackupRepository Backup BackupStorageLocation DeleteBackupRequest	Dow	nloadR	equest		odVolum	eBackup I
Installed Operators							_	
Workloads		Backups					<u> </u>	eate Backup
Virtualization	>	No operands found						

5. Select YAML view, copy the backup custom resource into the window, and click Create.

■ ^{ed} Red Hat OpenShift		₩ 🗍 4 🗘 >_ 🚱 admin -
📽 Administrator	Project: openshift-adp 🔹	
Home	Create Backup	
Operators OperatorHub	Create by compresing the round certain values may be provided by the operation aduitors.	
Installed Operators	Alt + F1 Accessibility help View shortcuts Image: Show tooltips	Backup X
Workloads	1 apiVersion: veleto.io/v1 Terrer 2 k/ini Sackup 3 metadata:	Schema
Virtualization	<pre>4 name.usc.precolary 5 labels: 6 velero.lo/storage-location: default 7 namesonce: onerwidtfc.adp</pre>	Backup is a Velero resource that represents the capture of Kubernetes cluster state at a point in time (API objects and associated volume state).
Migration	8 spec: 9 hooks: ()	apiVersion string
Networking	10 orlabeJselectors: 11 - matchlabeJs: 12 app: fedora02	APIVersion defines the versioned schema of this representation of an object. Servers should convert recognized schemas to the latest
Storage	13 mocchander). 14 vn.kubevirt.io/name: fedora02 15 includedNamespaces:	internal value, and may reject unrecognized values. More info: https://git.k8s.io/community/contributors/devel/sig-architecture/api- conventions.md/resources
Builds	16 - vmexamples 17 storageLocation: oadp-dpa-1 18 ttl: 720h0m05	
Observe		• king string Kind is a string value representing the REST resource this object
Compute		represents. Servers may infer this from the endpoint the client submits requests to. Cannot be updated. In CamelCase. More info: https://doi.bl.go.commontlict.com/informational/formal/formational/formal/formational/formal/fo
User Management		conventions.md#types-kinds
Administration		• metadata object
		Standard object's metadata. More info: https://git.k8s.io/community/contributors/devel/sig-architecture/api- conventions.md#metadata
		View details

6. Select the *Backup* tab of the *OADP Operator* to view the status of the backup operation.

Restore a virtual machine from a backup

1. Create a backup custom resource using YAML that defines the backup and resources to restore.

```
apiVersion: velero.io/v1
kind: Restore
metadata:
   name: restore-fedora02
   namespace: openshift-adp
spec:
   backupName: backup-fedora02
   includedResources: []
   excludedResources: []
   excludedResources:
        - nodes
        - events
        - events.events.k8s.io
        - backups.velero.io
        - restores.velero.io
```

restorePVs: true

2. Navigate to Operators > Installed Operators in the left menu bar.

- 3. Select OADP Operator from the list.
- 4. Select the *Restore* tab and click *Create Restore*.
- 5. Select YAML view, copy the backup custom resource into the window, and click Create.
- 6. Select the *Restore* tab of the *OADP Operator* to view the status of the restore operation.

Task 11:

Update and upgrade a cluster

With OpenShift Virtualization, you can update an entire Red Hat OpenShift cluster with a single operation. Follow these steps to perform an upgrade of your cluster in the web console.

- 1. Navigate to Administration > Cluster Settings in the left menu bar.
- 2. Select the *Details* tab, and then click *Select a version*.

Red Hat OpenShift		 4 2	Ð	>_	Ø	admin -	
🛠 Administrator	Cluster Settings						
Home							
Operators							
Workloads	Current version Update status Channel Al524 Available updates stable-4.16						
Virtualization	View release hotes (# 415.24 416.5 416.6 						
Migration							
Networking	Subscription OpenShift Cluster Manager (f.						

3. Choose a Red Hat OpenShift version in the Select new version menu, and click Update.



Task 12:

Add new physical hosts

OpenShift Virtualization uses the **Bare Metal Operator** to perform cluster level capacity management. With this operator, you can manage physical hosts directly in the web console:

- Provision bare-metal hosts to clusters with specific images.
- Format host disk contents before provisioning or after deprovisioning.
- Turn a host on or off.
- Change firmware settings.
- View host hardware details.

Follow these steps to provision new physical hosts. Sample YAML code for steps 1 and 2 can be found in the **Red Hat OpenShift documentation**.

- 1. Create a BareMetalHost custom resource using YAML that defines the new host.
- 2. Create a Secret custom resource using YAML that defines the username and password of the new host.
- 3. Create the bare-metal host object: \$ oc create -f bmh.yaml
- 4. Verify that the provisioning state of the host is provisioned:
 \$ oc get bmh -A
- 5. Get the list of pending certificate signing requests (CSRs):\$ oc get csr
- Approve the CSR:
 - \$ oc adm certificate approve <csr_name>

Task 13:

Observe and manage virtual machines

OpenShift Virtualization lets you observe and manage your virtual machines from a single console:

- Get a comprehensive overview of your entire virtualization footprint.
- > Analyze virtual machine resource use graphically over time.
- Monitor streaming alerts.
- Access the virtual machine console directly.
- Review snapshot history.
- Check the status and condition of various resources, including virtual machines, DataVolumes, and snapshots.
- Access the Guest log system.
- View virtual machine configurations as a web form or in YAML format.

Follow these steps to observe and manage virtual machines in the web console.

1. In the top left corner, click the *Administrator* menu and select *Virtualization*.



2. View the complete virtualization footprint in the main window.





3. Select the *Top consumers* tab to view the 5 virtual machines using the most resources across types– including central processing units (CPU), memory, and storage throughput.

Overview Top con	sumers Migrations	Settings						
Top consumers							Last 30 minutes Show top 5	
Resource	Ву СРО						By memory swap traffic VM Usage Usage	
CPU rhel9-purple-ostrich-86 rhel9-pbronze-sole-24 rhel9-copper-qazelle-20		0.004 s 0.003 s	Memory rhel9-purple-ostrich-86 rhel-9-bronze-sole-24 rhel9-copper-gazelle-20		 0.354 GiB 0.329 GiB 	Memory swap traffic	No data available 🔊	
		0.003 s			0.315 GiB			
Resource	By vCPU wait			By throughput 🔻			By IOPS VM Usage	
vCPU wait	No data available 🕜		Storage throughput rhel9-copper-gazelle-20 rhel9-bronze-sole-24 rhel8-purple-ostrich-86		543.2 B 39.08 B 34.27 B	Storage IOPS rhel9-copper-gazelle-20 rhel-9-bronze-sole-24 rhel9-purple-ostrich-86	0.08 IOPS 0.01 IOPS 0.01 IOPS	

4. Navigate to *VirtualMachines* in the left menu bar to view details of individual virtual machines. Use the *Filter* menu to narrow the list by name, label, IP address, or virtual machine status—including migrating, paused, provisioning, running, started, or stopped.

Red Hat OpenShift							≣ . ≜ 11	0 0	kube:ac	dmin v
Virtualization •	Project: All Projects 👻									
Overview										
Catalog	VirtualMachines								Crea	ate 🔻
VirtualMachines										
Bootable volumes	T Filter - Name -						1-3 of 3 👻		1 of 1	
Templatas		Namespace 1	Status 📫	Conditions	Node	Created		IP addres	55	
InstanceTypes	wwww.rhel-9-bronze-sole-24		2 Running		NodeO6.pemlab.rdu2.redhat.c om	🚱 Oct 25, 2024, 3	3:28 AM			
Preferences	VM rhel9-copper-gazelle-20	NS virtual-	C Running		node08.pemlab.rdu2.redhat.c	😵 Oct 25, 2024, 1		fe80::41:2	cff:fe00:1	
MigrationPolicies										
Checkups	wwwww.rhel9-purple-ostrich-86		C Running		N node07.pemlab.rdu2.redhat.c	🛇 Oct 25, 2024, 1				
Cluster >										

5. Select a virtual machine to view details including status, creation time, operating system, and CPU, memory, storage, and network transfer utilization.

Project: virtual-ma	chines 🔻				
VirtualMachines > V VM rhel9-pt	VirtualMachine details urple-ostrich-86 & Running				C II Actions -
Overview Me	trics YAML Configuration Events	Console Snapshots Diagnos			
Details				Alerts (0)	
Name	rhel9-purple-ostrich-86	VNC console			
Status Created	C Running Oct 25, 2024, 9:58 AM (3 hours ago)	 Market Angel Levin Levin Carlo Market and Angel Market Angel Levin Carlo Market and Angel Levin Carlo Market Angel Angel Levin Carlo Market Angel Levin Carlo Market Angel Levin Market Angel Levin Carlo Market Angel Levin Angel Levin Carlo Market Angel Lev		Namespace	NS virtual-machines
Operating system	Red Hat Enterprise Linux 9.4 (Plow)			Node	N node07.pemlab.rdu2.redhat.com
CPU Memory	2 CPU 4 GiB Memory			VirtualMachineInstance	VMI rhel9-purple-ostrich-86
Time zone	EDT			Pod	P virt-launcher-rhel9-purple-ostrich-86-k
Template	1 rhel9-server-small			Owner	
Hostname	rhel9-purple-ostrich-86				
Machine type	pc-q35-rhel9.4.0				
					No snapshots found
Utilization					
CPU	Memory Requested of Used of	Used of	Network transfer Breakdown by network	Name	IP address
0.01m	0.20m 363 MIB 4 GiB	1.77 GIB 29.87 GIB	O Bps Total	default	10.130.1.163 🍺

rhel9-purple-ostrich-86.headless.virtual-...

30 GiB

Name

rootdis

Drive

Interface

6. Click the *Actions* menu to manage the virtual machine. You can stop, restart, pause, clone, migrate, and take a snapshot of the selected virtual machine.

	🔳 C' 💵	Actions 🗸
		Stop
		Restart
		Pause
Alerts (0)		Clone
		Take snapshot
General		Migrate Migrate to a different Node
Namespace	NS virtual-machines	Copy SSH command 📋 SSH using virtctl
Node	N node07.pemlab.rd	Edit labels
Virtual Machine Instance	VMI) rhel9-purple-os	Edit annotations
Pod	P virt-launcher-rhel	Delete
Owner		

Resources and information

Red Hat offers many resources to help you progress more quickly on your virtualization and migration journey.

Explore OpenShift Virtualization demonstrations

Explore Red Hat OpenShift Virtualization's interactive experiences for step-by-step guidance on the fundamentals of using the virtualization solution.

Explore guided demos

Participate in a workshop

Learn about OpenShift Virtualization from Red Hat experts in a half-day, in-person workshop and tailored, hands-on lab.

Register for events

Explore our disaster recovery solutions

See how your environment can recover after a site outage with OpenShift Virtualization.

Read the guide

Watch a demonstration video

Check out a demo of some of the capabilities of OpenShift Virtualization and how it can work with your modernization strategy.

Watch the video

Deploy virtual machines yourself

Try Red Hat OpenShift Virtualization Engine yourself with a 60 day trial to see how to deploy, manage, and migrate virtual machines on a platform that grows with you.

Start a trial

See success in action

Learn how B2 Impact modernizes IT with a unified approach through OpenShift Virtualization.

Read the case study

Read product documentation

Find documentation for OpenShift Virtualization, including release notes, installation guides, and operational information.

Read the documentation

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