



# Workflows

## NetApp Solutions

NetApp  
August 03, 2021

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# Workflows

## Workflows: Red Hat OpenShift Virtualization with NetApp ONTAP

### Create VM

VMs are stateful deployments that require volumes to host the operating system and data. With CNV, because the VMs are run as pods, the VMs are backed by PVs hosted on NetApp ONTAP through Trident. These volumes are attached as disks and store the entire filesystem including the boot source of the VM.



To create a virtual machine on the OpenShift cluster, complete the following steps:

1. Navigate to **Workloads > Virtualization > Virtual Machines** and click **Create > With Wizard**.
2. Select the desired the operating system and click 'Next'.
3. If the selected operating system has no boot source configured, you must configure it. For Boot Source, select whether you want to import the OS image from an URL or from a registry, and provide the corresponding details. Expand Advanced and select the Trident-backed StorageClass. Then click Next.

## Boot source

This template does not have a boot source. Provide a custom boot source for this **CentOS 8.0+ VM** virtual machine.

### Boot source type \*

Import via URL (creates PVC) ▼

### Import URL \*

<https://access.cdn.redhat.com/content/origin/files/sha256/58/588167f828001e57688ec4b9b31c11a59d532489f527488ebc89ac5e952...>

Example: For RHEL, visit the [RHEL download page](#) (requires login) and copy the download link URL of the KVM guest image

☒ Mount this as a CD-ROM boot source ?

### Persistent Volume Claim size \*

5

GiB ▼

Ensure your PVC size covers the requirements of the uncompressed image and any other space requirements. More storage can be added later.

### ▼ Advanced

### Storage class \*

basic (default) ▼

### Access mode \*

Single User (RWO) ▼

### Volume mode \*

Filesystem ▼

4. If the selected operating system already has a boot source configured, the previous step can be skipped.
5. In the Review and Create pane, select the project you want to create the VM in and furnish the VM details. Make sure that the boot source is selected to be Clone and boot from CD-ROM with the appropriate PVC assigned for the selected OS.

- 1 Select template
- 2 Review and create

### Review and create

You are creating a virtual machine from the **Red Hat Enterprise Linux 8.0+** VM template.

Project \*

PR default

Virtual Machine Name \* ⓘ

rhel8-light-bat

Flavor \*

Small: 1 CPU | 2 GiB Memory

Storage

Workload profile ⓘ

40 GiB

server

Boot source

Clone and boot from CD-ROM

PVC rhel8

ⓘ A new disk has been added to support the CD-ROM boot source. Edit this disk by customizing the virtual machine.

▼ Disk details

rootdisk-install - Blank - 20GiB - virtio - default Storage class

☒ Start this virtual machine after creation

Create virtual machine

Customize virtual machine

Back

Cancel

6. If you wish to customize the virtual machine, click **Customize Virtual Machine** and modify the required parameters.
7. Click **Create Virtual Machine** to create the virtual machine; this spins up a corresponding pod in the background.

When a boot source is configured for a template or an operating system from an URL or from a registry, it creates a PVC in the `openshift-virtualization-os-images` project and downloads the KVM guest image to the PVC. You must make sure that template PVCs have enough provisioned space to accommodate the KVM guest image for the corresponding OS. These PVCs are then cloned and attached as rootdisks to virtual machines when they are created using the respective templates in any project.

Next: [Workflows: VM Live Migration](#).

## Workflows: Red Hat OpenShift Virtualization with NetApp ONTAP

### VM Live Migration

Live Migration is a process of migrating a VM instance from one node to another in an OpenShift cluster with no downtime. For live migration to work in an OpenShift cluster, VMs must be bound to PVCs with shared ReadWriteMany access mode. A NetApp Trident backend configured with an SVM on a NetApp ONTAP cluster that is enabled for NFS protocol supports shared ReadWriteMany access for PVCs. Therefore, the VMs with PVCs that are requested from StorageClasses provisioned by Trident from NFS-enabled SVM can be migrated with no downtime.



To create a VM bound to PVCs with shared ReadWriteMany access:

1. Navigate to **Workloads > Virtualization > Virtual Machines** and click **Create > With Wizard**.
2. Select the desired the operating system and click Next. Let us assume the selected OS already had a boot source configured with it.
3. In the Review and Create pane, select the project you want to create the VM in and furnish the VM details. Make sure that the boot source is selected to be Clone and boot from CD-ROM with the appropriate PVC assigned for the selected OS.
4. Click Customize Virtual Machine and then click Storage.
5. Click on the ellipsis next to rootdisk, make sure that the storageclass provisioned using Trident is selected. Expand Advanced and select Shared Access (RWX) for Access Mode. Then click Save.

## Edit Disk

Type

Disk

Interface \*

virtio

Storage Class

basic (default)

▼ Advanced

Volume Mode

Filesystem

Volume Mode is set by Source PVC

Access Mode

Shared Access (RWX) - Not recommended for basic storage class

 **Access and Volume modes should follow storage feature matrix**  
[Learn more](#) 

Cancel

Save

6. Click Review and confirm and then click Create Virtual Machine.

To manually migrate a VM to another node in the OpenShift cluster, complete the following steps.

1. Navigate to `Workloads > Virtualization > Virtual Machines`.

2. For the VM you wish to migrate, click the ellipsis, and then click Migrate the Virtual Machine.
3. Click Migrate when the message pops up to confirm.



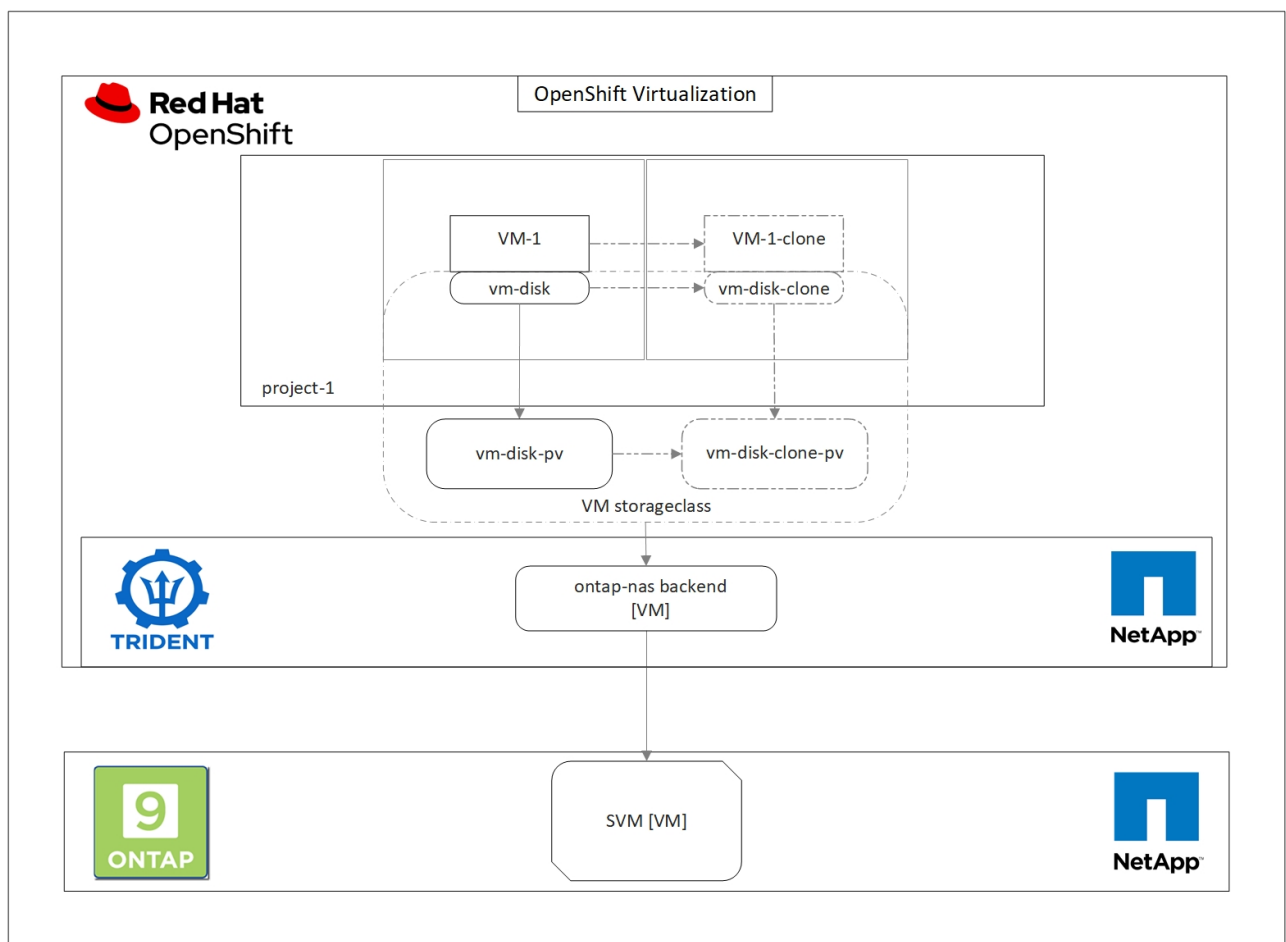
A VM instance in an OpenShift cluster automatically migrates to another node when the original node is placed into maintenance mode if the evictionStrategy is set to LiveMigrate.

Next: [Workflows: VM Cloning](#).

## Workflows: Red Hat OpenShift Virtualization with NetApp ONTAP

### VM cloning

Cloning an existing VM in OpenShift is achieved with the support of NetApp Trident's Volume CSI cloning feature. CSI volume cloning allows for creation of a new PVC using an existing PVC as the data source by duplicating its PV. After the new PVC is created, it functions as a separate entity and without any link to or dependency on the source PVC.



There are certain restrictions with CSI volume cloning to consider:

1. Source PVC and destination PVC must be in the same project.



2. Cloning is supported within the same storage class.
3. Cloning can be performed only when source and destination volumes use the same VolumeMode setting; for example, a block volume can only be cloned to another block volume.

VMs in an OpenShift cluster can be cloned in two ways:

1. By shutting down the source VM
2. By keeping the source VM live

### **By Shutting down the source VM**

Cloning an existing VM by shutting down the VM is a native OpenShift feature that is implemented with support from NetApp Trident. Complete the following steps to clone a VM.

1. Navigate to `Workloads > Virtualization > Virtual Machines` and click the ellipsis next to the virtual machine you wish to clone.
2. Click Clone Virtual Machine and provide the details for the new VM.

# Clone Virtual Machine

Name \*

rhel8-short-frog-clone

Description

Namespace \*

default



Start virtual machine on clone

Configuration

Operating System

Red Hat Enterprise Linux 8.0 or higher

Flavor

Small: 1 CPU | 2 GiB Memory

Workload Profile

server

NICs

default - virtio

Disks

cloudinitdisk - cloud-init disk

rootdisk - 20Gi - basic



The VM rhel8-short-frog is still running. It will be powered off while cloning.

Cancel

Clone Virtual Machine

3. Click Clone Virtual Machine; this shuts down the source VM and initiates the creation of the clone VM.
4. After this step is completed, you can access and verify the content of the cloned VM.

## By keeping the source VM live

An existing VM can also be cloned by cloning the existing PVC of the source VM and then creating a new VM using the cloned PVC. This method does not require you to shut down the source VM. Complete the following steps to clone a VM without shutting it down.

1. Navigate to Storage → PersistentVolumeClaims` and click the ellipsis next to the PVC that is attached to the source VM.
2. Click Clone PVC and furnish the details for the new PVC.

# Clone

Name \*

rhel8-short-frog-rootdisk-28dvb-clone

Access Mode \*

☐ Single User (RWO) ☒ Shared Access (RWX) ☐ Read Only (ROX)

Size \*

20

GiB



PVC details

Namespace

 default

Requested capacity

20 GiB

Access mode

Shared Access (RWX)

Storage Class

 basic

Used capacity

2.2 GiB

Volume mode

Filesystem

Cancel

Clone

3. Then click Clone. This creates a PVC for the new VM.
4. Navigate to `Workloads > Virtualization > Virtual Machines` and click `Create > With YAML`.
5. In the `spec > template > spec > volumes` section, attach the cloned PVC instead of the container disk. Provide all other details for the new VM according to your requirements.

```
- name: rootdisk
  persistentVolumeClaim:
    claimName: rhel8-short-frog-rootdisk-28dvvb-clone
```

6. Click Create to create the new VM.

7. After the VM is created successfully, access and verify that the new VM is a clone of the source VM.

[Next: Workflows: Create VM from a Snapshot.](#)

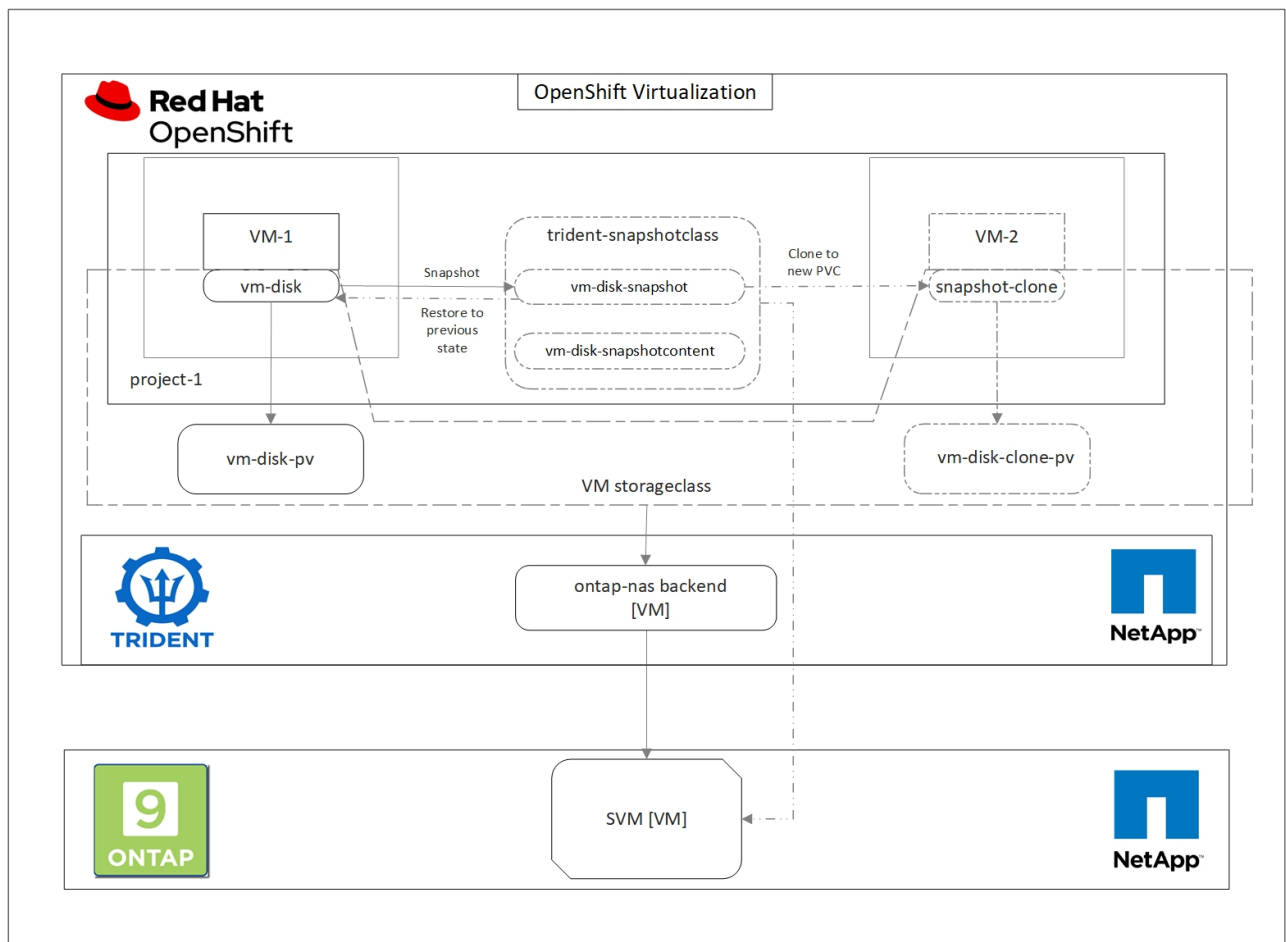
## Workflows: Red Hat OpenShift Virtualization with NetApp ONTAP

### Create VM from a Snapshot

With NetApp Trident and Red Hat OpenShift, users can take a snapshot of a persistent volume on Storage Classes provisioned by it. With this feature, users can take a point-in-time copy of a volume and use it to create a new volume or restore the same volume back to a previous state. This enables or supports a variety of use-cases, from rollback to clones to data restore.

For Snapshot operations in OpenShift, the resources `VolumeSnapshotClass`, `VolumeSnapshot`, and `VolumeSnapshotContent` must be defined.

- A `VolumeSnapshotContent` is the actual snapshot taken from a volume in the cluster. It is cluster-wide resource analogous to `PersistentVolume` for storage.
- A `VolumeSnapshot` is a request for creating the snapshot of a volume. It is analogous to a `PersistentVolumeClaim`.
- `VolumeSnapshotClass` lets the administrator specify different attributes for a `VolumeSnapshot`. It allows you to have different attributes for different snapshots taken from the same volume.



To create Snapshot of a VM, complete the following steps:

1. Create a VolumeSnapshotClass that can then be used to create a VolumeSnapshot. Navigate to [Storage > VolumeSnapshotClasses](#) and click Create VolumeSnapshotClass.
2. Enter the name of the Snapshot Class, enter `csi.trident.netapp.io` for the driver, and click Create.

```
1  apiVersion: snapshot.storage.k8s.io/v1
2  kind: VolumeSnapshotClass
3  metadata:
4    name: trident-snapshot-class
5  driver: csi.trident.netapp.io
6  deletionPolicy: Delete
7
```

[Create](#)[Cancel](#)[Download](#)

- Identify the PVC that is attached to the source VM and then create a Snapshot of that PVC. Navigate to [Storage > VolumeSnapshots](#) and click Create VolumeSnapshots.
- Select the PVC that you want to create the Snapshot for, enter the name of the Snapshot or accept the default, and select the appropriate VolumeSnapshotClass. Then click Create.

## Create VolumeSnapshot

[Edit YAML](#)

PersistentVolumeClaim \*

**PVC** rhel8-short-frog-rootdisk-28dvb ▼

Name \*

rhel8-short-frog-rootdisk-28dvb-snapshot

Snapshot Class \*

**VSC** trident-snapshot-class ▼

[Create](#)[Cancel](#)

- This creates the snapshot of the PVC at that point in time.

## Create a new VM from the snapshot

1. First, restore the Snapshot into a new PVC. Navigate to [Storage > VolumeSnapshots](#), click the ellipsis next to the Snapshot that you wish to restore, and click on 'Restore as new PVC'.
2. Enter the details of the new PVC and click Restore. This creates a new PVC.

## Restore as new PVC

When restore action for snapshot **rhel8-short-frog-rootdisk-28dvb-snapshot** is finished a new crash-consistent PVC copy will be created.

Name \*

rhel8-short-frog-rootdisk-28dvb-snapshot-restore

Storage Class \*

 basic

Access Mode \*

☐ Single User (RWO) ☒ Shared Access (RWX) ☐ Read Only (ROX)

Size \*

20

GiB

### VolumeSnapshot details


Created at

 May 21, 12:46 am

Namespace

 default

Status

 Ready

API version

snapshot.storage.k8s.io/v1

Size

20 GiB

3. Next, create a new VM from this PVC. Navigate to [Workloads > Virtualization > Virtual Machines](#) and click [Create → With YAML](#).

4. In the `spec > template > spec > volumes` section, specify the new PVC created from Snapshot instead of the container disk. Provide all other details for the new VM according to your requirements.

```
- name: rootdisk
  persistentVolumeClaim:
    claimName: rhel8-short-frog-rootdisk-28dvh-snapshot-restore
```

5. Click Create to create the new VM.
6. After the VM is created successfully, access and verify that the new VM has the same state as that of the VM whose PVC was used to create the snapshot at the time when the snapshot was created.



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