



# **OpenShift Virtualization on ROSA**

## **NetApp Solutions**

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# OpenShift Virtualization on ROSA

## Deploy Red Hat OpenShift Virtualization with FSxN on ROSA

### Overview

This section provides details for setting up FSx for NetApp ONTAP as the default Storage Class for the ROSA cluster, and then create a Virtual Machine that will leverage FSx ONTAP storage for its volumes. We will also look into connecting to the Virtual Machine using the guest credentials, and restarting the VM. And finally, we will perform a live migration of the Virtual Machine from the current node to a new node. We will examine the contents of the disk storage after a VM restart and the live migration .

### Prerequisites

- [AWS account](#)
- [A Red Hat account](#)
- IAM user [with appropriate permissions](#) to create and access ROSA cluster
- [AWS CLI](#)
- [ROSA CLI](#)
- [OpenShift command-line interface \(oc\)](#)
- [Helm 3 documentation](#)
- [A HCP ROSA cluster](#) (with at least 3 bare-metal worker nodes)
- [OpenShift Virtualization installed on ROSA Cluster](#)
- [Access to Red Hat OpenShift web console](#)

### Initial Setup

This section shows how to set up the default storage class to be trident-csi and the default VolumeSnapshotClass to be the FSx Volume Snapshot class. Then it shows how to create a VM from a template and then connect and login to it using the guest credentials.

Ensure default Storage Class is set to trident-csi



StorageClasses			Create StorageClass
Name	Provisioner	Reclaim policy	
SC gp2-csi	ebs.csi.aws.com	Delete	⋮
SC gp3-csi	ebs.csi.aws.com	Delete	⋮
SC trident-csi - Default	csi.trident.netapp.io	Retain	⋮

Ensure default VolumeSnapShotClasses is set as shown

VolumeSnapshotClasses				Create VolumeSnapshotClass
Name ▾	Search by name... /			
Name ↑	Driver ↓	Deletion policy ↓		
VSC csi-aws-vsc	ebs.csi.aws.com	Delete		⋮
VSC fsx-snapclass - Default	csitrident.netapp.io	Delete		⋮

If the defaults are not set, you can set it up either from the console or from command line

```
$ oc patch storageclass trident-csi -p '{"metadata": {"annotations": {"storageclass.kubernetes.io/is-default-class": "true"}}}'
```

```
$ oc patch VolumeSnapshotClasses fsx-snapclass -p '{"metadata": {"annotations": {"snapshot.storage.kubernetes.io/is-default-class": "true"}}}'
```

## Create a VM from the template

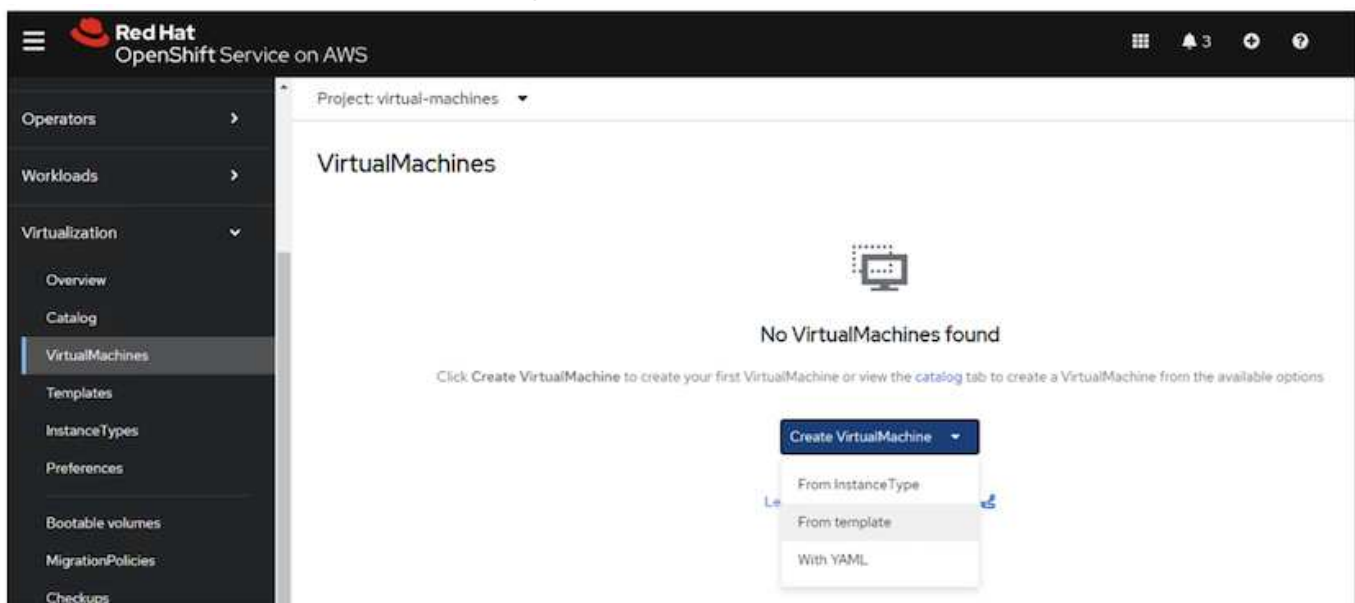
Use the web console to create a VM from a template.

From the RedHat OpenShiftService on AWS console, create a virtual machine. There are templates available on the cluster that can be used to create the VM.

In the screenshot below, we choose fedora VM from this list. Give the VM a name, and then click on **Customize Virtual Machine**. Select the **Disks** tab and click on **Add disks**.

Change the name of the disk preferably to something meaningful, ensure that **trident-csi** is selected for storage class. Click on **Save**. Click on **Create VirtualMachine**

After a few minutes, the VM is in the running state



Red Hat OpenShift Service on AWS

Project: virtual-machines

## Create new VirtualMachine

Select an option to create a VirtualMachine from.

Instance Types | **Template catalog**

Template project: All projects

All templates

Default templates

User templates

☐ Boot source available

Operating system

☐ CentOS

☐ Fedora

☐ Other

☐ RHEL

☐ Windows

Workload









☐ Desktop

☐ High performance

☐ Server

Filter by keyword...

12 items

 <b>CentOS Stream 8 VM</b> centos-stream8-server-small Project openshift Boot source PVC Workload Server CPU 1 Memory 2 GiB	 <b>CentOS Stream 9 VM</b> centos-stream9-server-small Project openshift Boot source PVC Workload Server CPU 1 Memory 2 GiB	 <b>CentOS 7 VM</b> centos7-server-small Project openshift Boot source PVC Workload Server CPU 1 Memory 2 GiB	 <b>Fedora VM</b> fedora-server-small Project openshift Boot source PVC Workload Server CPU 1 Memory 2 GiB
 <b>Red Hat Enterprise Linux 7 VM</b> rhel7-server-small Project openshift Boot source PVC Workload Server CPU 1	 <b>Red Hat Enterprise Linux 8 VM</b> rhel8-server-small Project openshift Boot source PVC Workload Server CPU 1	 <b>Red Hat Enterprise Linux 9 VM</b> rhel9-server-small Project openshift Boot source PVC Workload Server CPU 1	 <b>Microsoft Windows 10 VM</b> windows10-desktop-medium Project openshift Boot source PVC Workload Desktop CPU 1

Exchange Password Required  
Enter your password for "jane.sundhar" in Internet Accounts.

admin



## Fedora VM

fedora-server-small



### Template info

#### Operating system

Fedora VM

#### Workload type

Server (default)

#### Description

Template for Fedora Linux 39 VM or newer. A PVC with the Fedora disk image must be available.

#### Documentation

[Refer to documentation](#)

#### CPU | Memory

1 CPU | 2 GiB Memory

#### Network interfaces (1)

Name	Network	Type
default	Pod networking	Masquerade

#### Disks (2)

Name	Drive	Size
rootdisk	Disk	30 GiB
cloudinitdisk	Disk	-

### Storage

☐ Boot from CD

Disk source

Template default

Disk size



30



GiB

#### Drivers

☐ Mount Windows drivers disk

[Optional parameters](#)

### Quick create VirtualMachine

VirtualMachine name \*

fedora-vm1

Project Public SSH key

default Not configured

☒ Start this VirtualMachine after creation

Quick create VirtualMachine

Customize VirtualMachine

Activate Windows

Go to Settings to activate Windows.

Cancel

[Catalog](#)

# Customize and create VirtualMachine

☐YAML

Template: Fedora VM

[Overview](#)[YAML](#)[Scheduling](#)[Environment](#)[Network interfaces](#)[Disks](#)[Scripts](#)[Metadata](#)

Add disk

Filter

Search by name...

☐Mount Windows drivers disk

Name	Source	Size	Drive	Interface	Storage class	
cloudinitdisk	Other	-	Disk	virtio	-	
rootdisk	<span>bootable</span> Other	30 GiB	Disk	virtio	-	

## Add disk



☐ Use this disk as a boot source

Name \*

fedora-vm1-disk1

Source \*

Empty disk (blank)

PersistentVolumeClaim size \*

-

30

+

GiB



Type

Disk

Hot plug is enabled only for "Disk" type

Interface \*

VirtIO

Hot plug is enabled only for "SCSI" interface

StorageClass

trident-csi

Save

Cancel



Project: virtual-machines

VirtualMachines > VirtualMachine details

VM

fedora-vm1

Running

Actions

Overview
Metrics
YAML
Configuration
Events
Console
Snapshots
Diagnostics

Details

Name

fedora-vm1

Status

Running

Created

Oct 11, 2024, 1:46 PM (4 minutes ago)

Operating system

Fedora Linux 40 (Cloud Edition)

CPU | Memory

1 CPU | 2 GiB Memory

Time zone

UTC

Template

fedora-server-small

Hostname

fedora-vm1

Machine type

pc-q35-rhel9.4.0

VNC console

Open web console

Alerts (0)

General

Namespace

virtual-machi...

Node

ip-10-10-3-191...

VirtualMachineInstance

fedora-vm1

Pod

virt-launcher-f...

Owner

No owner

Snapshots (0)

Take snapshot

Activate Windows

No snapshots found

Go to Settings to activate Windows.

Review all the objects created for the VM

The storage disks.

Storage (3)			
Name	Drive	Size	Interface
rootdisk	Disk	31.75 GiB	virtio
cloudinitdisk	Disk	-	virtio
fedora-vm1-disk1	Disk	31.75 GiB	virtio

The file systems of the VM will show the Partitions, File system type and the Mount points.

7

Name ↑	File system type ⓘ	Mount point ⓘ	Total bytes ⓘ	Used bytes ⓘ
vda2	vfat	/boot/efi	99.76 MiB	16.01 MiB
vda3	ext4	/boot	899.85 MiB	73.12 MiB
vda4	btrfs	/var	28.47 GiB	406.83 MiB
vda4	btrfs	/home	28.47 GiB	406.83 MiB
vda4	btrfs	/	28.47 GiB	406.83 MiB

2 PVCs are created for the VM, one from the boot disk and one for the hot plug disk.

PersistentVolumeClaims					Create PersistentVolumeClaim ▾
Filter ▾	Name ▾	Search by name...			
Name ⓘ	Status ⓘ	PersistentVolumes ⓘ	Capacity ⓘ		
<a href="#">PVC</a> fedora-vm1	Bound	<a href="#">PV</a> pvc-7d60a3cf-d4cc-47d5-8053-efbb6ae1135f	31.75 GiB		⋮
<a href="#">PVC</a> fedora-vm1-fedora-vm1-disk1	Bound	<a href="#">PV</a> pvc-a769e022-2ae5-43fb-b8a1-a40f4447c6c2	31.75 GiB		⋮

The PVC for the boot disk shows that the Access mode is ReadWriteMany, and the Storage Class is trident-csi.

Project: virtual-machines

PersistentVolumeClaims > PersistentVolumeClaim details

**PVC fedora-vm1** Bound

Details | YAML | Events | VolumeSnapshots

### PersistentVolumeClaim details

6.1 GiB Available

**Name**  
fedora-vm1

**Namespace**  
 virtual-machines

**Labels** [Edit](#)

app=containerized-data-importer
app.kubernetes.io/part-of=hyperconverged-cluster
instancetype.kubevirt.io/default-preference=fedora
app.kubernetes.io/version=4.16.3
app.kubernetes.io/component=storage
alerts.k8s.io/VolumePersistentVolumeFillingUp=disabled
app.kubernetes.io/managed-by=cdi-controller
instancetype.kubevirt.io/default-instancetype=ul-medium
kubevirt.io/created-by=39537934-9ba5-47b8-8caa-63c0c9de5b7f

**Annotations**  
20 annotations [Edit](#)

**Label selector**  
No selector

**Created at**  
 Oct 11, 2024, 1:46 PM

**Status**  
 Bound

**Requested capacity**  
31.75 GiB

**Capacity**  
31.75 GiB

**Used**  
25.09 GiB

**Access modes**  
ReadWriteMany

**Volume mode**  
Filesystem

**StorageClasses**  
 trident-csi

**PersistentVolumes**  
 pvc-7d00a3cf-d4cc-47d5-8053-efbb6ae035f

Activate Windows  
Go to Settings to activate Windows

Similarly, the PVC for the hot-plug disk shows that the Access mode is ReadWriteMany, and the Storage Class is trident-csi.

Project: virtual-machines

PersistentVolumeClaims > PersistentVolumeClaim details

**PVC** fedora-vm1-fedora-vm1-disk1 Bound

Details | YAML | Events | VolumeSnapshots

### PersistentVolumeClaim details

**Name**  
fedora-vm1-fedora-vm1-disk1

**Namespace**  
 virtual-machines

**Labels**  

alerts.k8s.io/KubePersistentVolumeFillingUp=disabled

app=containerized-data-importer

app.kubernetes.io/component=storage

app.kubernetes.io/managed-by=cdi-controller

app.kubernetes.io/part-of=hyperconverged-cluster

app.kubernetes.io/version=4.10.3

kubevirt.io/created-by=89537594-9ba5-47b8-8caa-03c0c96e5b7f

**Annotations**  
 annotations

**Label selector**  
No selector

**Created at**  
 Oct 11, 2024, 1:46 PM

**Status**  
 Bound

**Requested capacity**  
31.75 GiB

**Capacity**  
31.75 GiB

**Used**  
320 KiB

**Access modes**  
ReadWriteMany

**Volume mode**  
Filesystem

**StorageClasses**  
 trident-csi

**PersistentVolumes**  
 pvc-a769e022-2ae5-43fb-b8a1-a40f4447c6c2

In the screenshot below we can see that the pod for the VM has a Status of Running.

Pods Create Pod

Filter Name Search by name

Name	Status	Ready	Restarts	Owner	Memory	CPU	Created
virt-launcher-fedora-vm1-8fp2k	Running	1/1	0	fedora-vm1	515.5 MiB	0.010 cores	Oct 11, 2024, 2:37 PM
virt-launcher-fedora-vm1-ic2k9	Completed	0/1	0	fedora-vm1	-	-	Oct 11, 2024, 2:21 PM

Here we can see the two Volumes associated with the VM pod and the 2 PVCs associated with them.

Name	Mount path	SubPath	Type	Permissions	Utilized by
private	/var/run/kubevirt-private	No subpath		Read/Write	compute
public	/var/run/kubevirt	No subpath		Read/Write	compute
ephemeral-disks	/var/run/kubevirt-ephemeral-disks	No subpath		Read/Write	compute
container-disks	/var/run/kubevirt/container-disks	No subpath		Read/Write	compute
libvirt-runtime	/var/run/libvirt	No subpath		Read/Write	compute
sockets	/var/run/kubevirt/sockets	No subpath		Read/Write	compute
rootdisk	/var/run/kubevirt-private/vmi-disks/rootdisk	No subpath	PVC fedora-vm1	Read/Write	compute
fedora-vm1-disk1	/var/run/kubevirt-private/vmi-disks/fedora-vm1-disk1	No subpath	PVC fedora-vm1-fedora-vm1-disk1	Read/Write	compute
hotplug-disks	/var/run/kubevirt/hotplug-disks	No subpath		Read/Write	compute

## Connect to the VM

Click on 'Open web console' button, and login using Guest Credentials

Project: virtual-machines

VirtualMachines > VirtualMachine details

**VM fedora-vm1** Running

Overview Metrics YAML Configuration Events Console Snapshots Diagnostics

Details

Name
fedora-vm1

Status
Running

Created
Oct 11, 2024, 1:46 PM (12 minutes ago)

Operating system
Fedora Linux 40 (Cloud Edition)

CPU | Memory
1 CPU | 2 GiB Memory

Time zone
UTC

Template
fedora-server-small

Hostname
fedora-vm1

Machine type
pc-q35-rhel9.4.0

VNC console

Open web console



Issue the following commands

```
$ df (to display information about the disk space usage on a file system).
```

```
$ dd if=/dev/urandom of=random.dat bs=1M count=10240 (to create a file called random.dat in the home dir and fill it with random data).
```

The disk is filled with 11 GB of data.

```
[fedora@fedora-vm1 ~]$  
[fedora@fedora-vm1 ~]$ df .  
Filesystem      1K-blocks    Used Available Use% Mounted on  
/dev/vda4        30327788 10939828  18943548  37% /home  
[fedora@fedora-vm1 ~]$ dd if=/dev/urandom of=random.dat bs=1M count=10240  
10240+0 records in  
10240+0 records out  
10737418240 bytes (11 GB, 10 GiB) copied, 35.8159 s, 300 MB/s  
[fedora@fedora-vm1 ~]$ df  
Filesystem      1K-blocks    Used Available Use% Mounted on  
/dev/vda4        30327788 9699188  20190780  33% /home  
[fedora@fedora-vm1 ~]$ ls  
random.dat  
[fedora@fedora-vm1 ~]$
```

Use vi to create a sample text file that we will use to test.

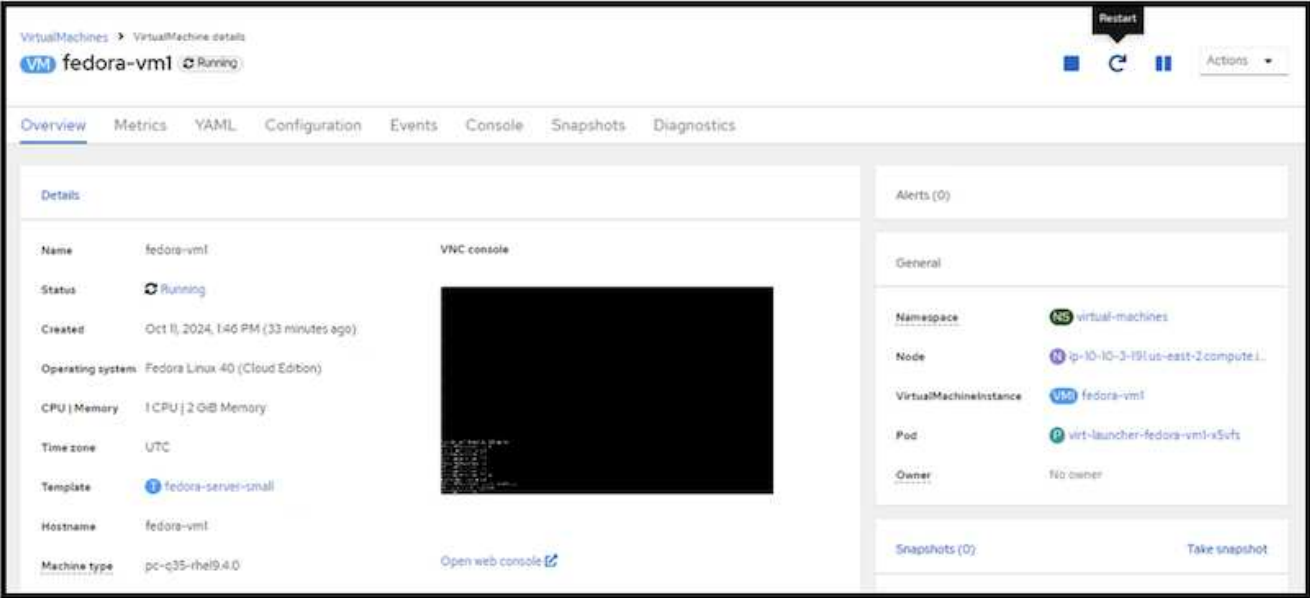
```
[fedora@fedora-vm1 ~]$ ls  
random.dat sample.txt  
[fedora@fedora-vm1 ~]$ cat sample.txt  
This is a sample text file.  
[fedora@fedora-vm1 ~]$
```

# Workflows

## VM Restart

In this sections we will perform a VM restart and then examine the contents of the disks.

Click on the restart button.



The VM comes back to the running state with the exact same filesystems, PVCs and files in the filesystems

File systems				
Name	File system type	Mount point	Total bytes	Used bytes
vda2	vfat	/boot/efi	99.76 MiB	16.01 MiB
vda3	ext4	/boot	899.85 MiB	73.12 MiB
vda4	btrfs	/var	28.50 GiB	10.43 GiB
vda4	btrfs	/home	28.50 GiB	10.43 GiB
vda4	btrfs	/	28.50 GiB	10.43 GiB

```
[fedora@fedora-vm1 ~]$ ls
random.dat  sample.txt
[fedora@fedora-vm1 ~]$ df .
Filesystem      1K-blocks    Used Available Use% Mounted on
/dev/vda4      30327788 10948176  18935632  37% /home
[fedora@fedora-vm1 ~]$ _
```

```
[fedora@fedora-vm1 ~]$ ls
random.dat  sample.txt
[fedora@fedora-vm1 ~]$ cat sample.txt
This is a sample text file.
[fedora@fedora-vm1 ~]$
```

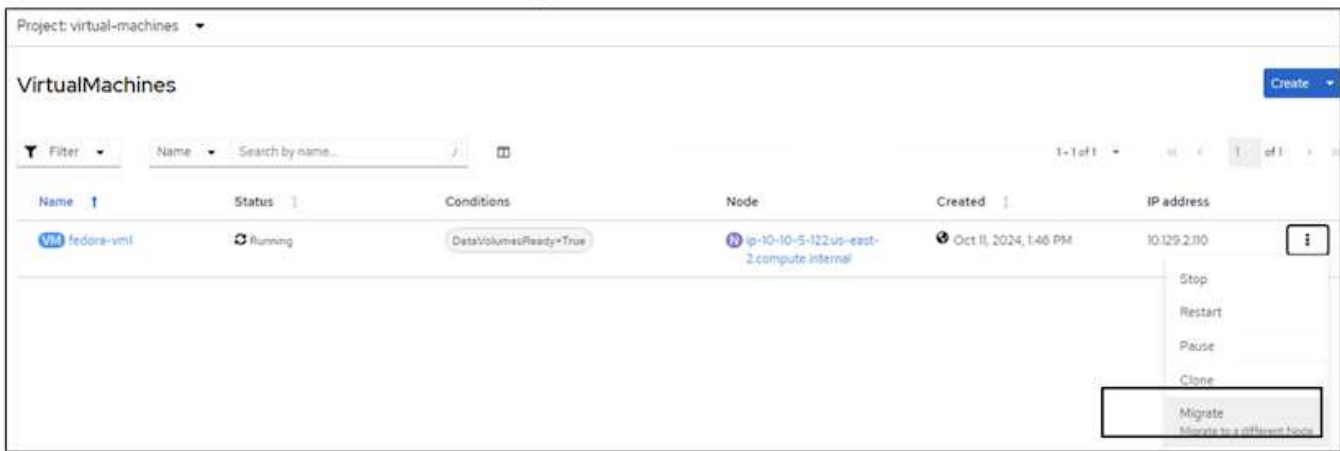
## VM live migration

In this sections we will perform a VM live migration and then examine the contents of the disks. Live migration refers to the process of moving a running Virtual Machine (VM) from one physical host to another host without disrupting normal operations or causing any downtime, or other adverse effects for the end user. Live migration is considered a major step in Virtualization. It allows an entire VM to be moved with a running operating system (OS), Memory, storage, and network connectivity from their current node to the destination. Below we will see how to perform a Live Migration of the VM from the current node to a new node.

Note the node on which the VM is running

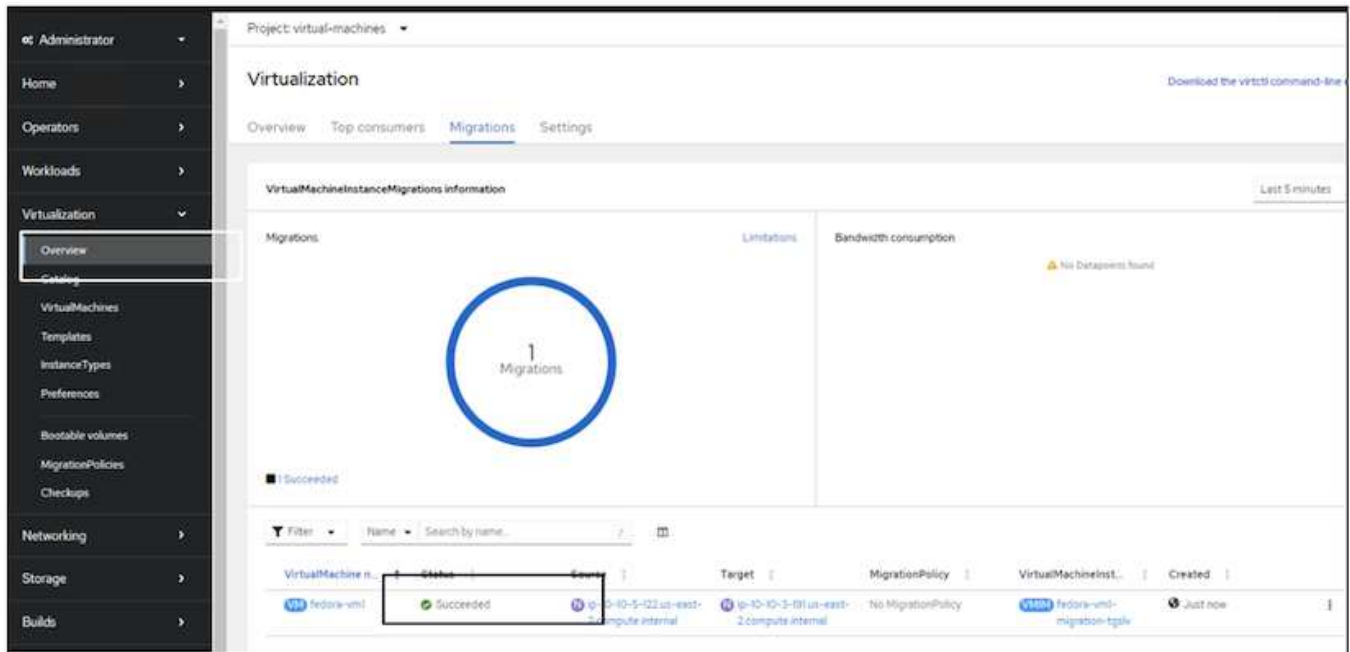


Click on the 3 dots and select Migrate

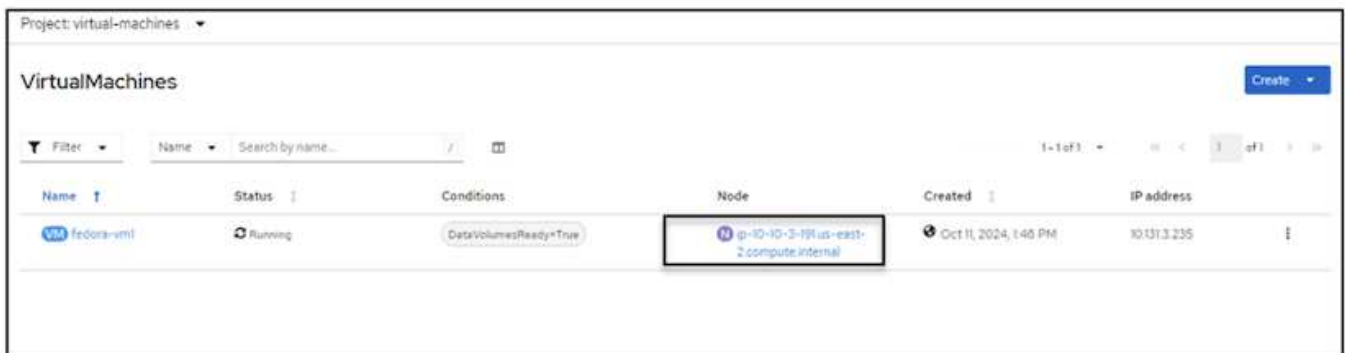


On the Overview page, you can see that the migration has succeeded, and the Status has changed to Succeeded.





After the completion of the Live Migration, the VM is now on a different node.



Open the web console and view the contents of the disks. It still has the same 2 files that we previously created before the Live Migration.

```
[fedora@fedora-vm1 ~]$ df .
Filesystem      1K-blocks    Used Available Use% Mounted on
/dev/vda1       30327788 10956768  18927040  37% /home
[fedora@fedora-vm1 ~]$
[fedora@fedora-vm1 ~]$ ls
random.dat  sample.txt
[fedora@fedora-vm1 ~]$
```

```
[fedora@fedora-vm1 ~]$ ls
random.dat  sample.txt
[fedora@fedora-vm1 ~]$ cat sample.txt
This is a sample text file.
[fedora@fedora-vm1 ~]$
```

The storage for the VM on the new node still shows the same disks

Storage (3)			
Name	Drive	Size	Interface
rootdisk	Disk	31.75 GiB	virtio
cloudinitdisk	Disk	-	virtio
fedora-vm1-disk1	Disk	31.75 GiB	virtio

Also, the PVCs are the same.

Project: virtual-machines						
PersistentVolumeClaims						Create PersistentVolumeClaim
Filter	Name	Search by name...				
Name	Status	PersistentVolumes	Capacity	Used	StorageClass	
 fedora-vm1	 Bound	 pvc-7d00a3cf-d4cc-47d5-8053-efb0d6e133f	31.75 GiB	28.12 GiB	 trident-csi	
 fedora-vm1-fedora-vm1-disk1	 Bound	 pvc-a709e022-2ae5-43fb-b8a1-a40f4447c6c2	31.75 GiB	320 KiB	 trident-csi	

Volumes associated with the VM pod are also the same (2 PVCs) as before.

Volumes					
Name	Mount path	SubPath	Type	Permissions	Utilized by
private	/var/run/kubevirt-private	No subpath		Read/Write	compute
public	/var/run/kubevirt	No subpath		Read/Write	compute
ephemeral-disks	/var/run/kubevirt-ephemeral-disks	No subpath		Read/Write	compute
container-disks	/var/run/kubevirt/container-disks	No subpath		Read/Write	compute
libvirt-runtime	/var/run/libvirt	No subpath		Read/Write	compute
sockets	/var/run/kubevirt/sockets	No subpath		Read/Write	compute
rootdisk	/var/run/kubevirt-private/vmi-disks/rootdisk	No subpath	PVC fedora-vm1	Read/Write	compute
fedora-vm1-disk1	/var/run/kubevirt-private/vmi-disks/fedora-vm1-disk1	No subpath	PVC fedora-vm1-fedora-vm1-disk1	Read/Write	compute
hotplug-disks	/var/run/kubevirt/hotplug-disks	No subpath		Read/Write	compute

## Demo video

[Live migration of virtual machines in OpenShift Virtualization on ROSA with Amazon FSx for NetApp ONTAP](#)

More videos on Red Hat OpenShift and OpenShift Virtualization solutions can be found [here](#).

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