

OpenShift Virtualization API / CLI Management

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Command line tools

`virtctl`

Virtualization Control

Perform virtual machine related operations on command line or in scripts.

`oc`

OpenShift Client

Interact with OpenShift and resource APIs known as "kinds"

List Available APIs

```
oc api-resources
```

NAME	SHORTNAMES	APIVERSION	NAMESPACED	KIND
kubevirt	kv,kvs	kubevirt.io/v1	true	KubeVirt
virtualmachineinstancemigrations	vmim,vmims	kubevirt.io/v1	true	VirtualMachineInstanceMigration
virtualmachineinstancepresets	vmipreset,vmipresets	kubevirt.io/v1	true	VirtualMachineInstancePreset
virtualmachineinstancereplicasets	vmirs,vmirss	kubevirt.io/v1	true	VirtualMachineInstanceReplicaSet
virtualmachineinstances	vmi,vmis	kubevirt.io/v1	true	VirtualMachineInstance
virtualmachines	vm,vms	kubevirt.io/v1	true	VirtualMachine

View API Specification

```
oc explain
```

```
$ oc explain virtualmachine
GROUP:      kubevirt.io
KIND:       VirtualMachine
VERSION:    v1
```

DESCRIPTION:

VirtualMachine handles the VirtualMachines that are not running or are **in** a stopped state

The VirtualMachine contains the template to create the VirtualMachineInstance. It also mirrors the running state of the created VirtualMachineInstance **in** its status.

...

View API Specification

```
$ oc explain virtualmachine.spec.template.spec.domain
GROUP:      kubevirt.io
KIND:       VirtualMachine
VERSION:    v1

FIELD: domain <Object>

DESCRIPTION:
  Specification of the desired behavior of the VirtualMachineInstance on the
  host.

FIELDS:
  chassis      <Object>
    Chassis specifies the chassis info passed to the domain.

  clock <Object>
    Clock sets the clock and timers of the vmi.

  cpu    <Object>
    CPU allow specified the detailed CPU topology inside the vmi.

  devices     <Object> -required-
    Devices allows adding disks, network interfaces, and others
  ...
```

Create Resources from YAML

```
oc apply
```

Create Resources from Template

```
oc process
```

Modifying Resources

```
oc edit  
oc patch
```

Available `virtctl` Commands:

`virtctl` controls virtual machine related operations on your kubernetes cluster.

<code>addvolume</code>	add a volume to a running VM
<code>adm</code>	Administrat KubeVirt configuration.
<code>completion</code>	Generate the autocompletion script for the specified shell
<code>console</code>	Connect to a console of a virtual machine instance.
<code>create</code>	Create a manifest for the specified Kind.
<code>credentials</code>	Manipulate credentials on a virtual machine.
<code>expand</code>	Return the VirtualMachine object with expandedinstancetype and preference.
<code>expose</code>	Expose a virtual machine instance, virtual machine, or virtual machine instance replica set as a new service.
<code>fslist</code>	Return full list of filesystems available on the guest machine.
<code>guestfs</code>	Start a shell into the libguestfs pod
<code>guestosinfo</code>	Return guest agent info about operating system.
<code>help</code>	Help about any command
<code>image-upload</code>	Upload a VM image to a DataVolume/PersistentVolumeClaim.
<code>memory-dump</code>	Dump the memory of a running VM to a pvc
<code>migrate</code>	Migrate a virtual machine.
<code>migrate-cancel</code>	Cancel migration of a virtual machine.
<code>pause</code>	Pause a virtual machine
<code>permitted-devices</code>	List the permitted devices for vmis.
<code>port-forward</code>	Forward local ports to a virtualmachine or virtualmachineinstance.
<code>removevolume</code>	remove a volume from a running VM
<code>restart</code>	Restart a virtual machine.
<code>scp</code>	SCP files from/to a virtual machine instance.
<code>soft-reboot</code>	Soft reboot a virtual machine instance
<code>ssh</code>	Open a SSH connection to a virtual machine instance.
<code>start</code>	Start a virtual machine.
<code>stop</code>	Stop a virtual machine.
<code>unpause</code>	Unpause a virtual machine
<code>usbredir</code>	Redirect an USB device to a virtual machine instance.
<code>userlist</code>	Return full list of logged in users on the guest machine.
<code>version</code>	Print the client and server version information.
<code>vmexport</code>	Export a VM volume.
<code>vnc</code>	Open a vnc connection to a virtual machine instance.



Creating VMs

Instance Types

VirtualMachineInstancetype

Details of VM instance type which can be namespaced

VirtualMachineClusterInstancetype

Cluster wide instance types administered by admin.

u1.medium

```
$ oc get vmclusterinstancetype u1.medium -o jsonpath='{.spec}'  
{"cpu":{"guest":1}, "memory":{"guest":"4Gi"}%}
```

Datasources

- DataSources provide a reference to a source of data to provision a volume from.
- Eg. a PVC or a snapshot.
- Metadata like labels can influence their default use.

```
$ oc get datasources -n openshift-virtualization-os-images
NAME          AGE
centos-stream10 43d
centos-stream9  43d
fedora         43d
rhel10-beta    43d
rhel7          43d
rhel8          43d
rhel9          43d
win10          43d
...
```

rhel9 Datasource

```
$ oc get datasource -n openshift-virtualization-os-images rhel9 -o yaml
apiVersion: cdi.kubevirt.io/v1beta1
kind: DataSource
metadata:
  annotations:
    operator-sdk/primary-resource: openshift-cnv/ssp-kubevirt-hyperconverged
    operator-sdk/primary-resource-type: SSP.ssp.kubevirt.io
  labels:
    app.kubernetes.io/component: storage
    app.kubernetes.io/managed-by: cdi-controller
    app.kubernetes.io/part-of: hyperconverged-cluster
    app.kubernetes.io/version: 4.18.2
    cdi.kubevirt.io/dataImportCron: rhel9-image-cron
   instancetype.kubevirt.io/default-instanceType: u1.medium # <-----
   instancetype.kubevirt.io/default-preference: rhel.9
    kubevirt.io/dynamic-credentials-support: "true"
  name: rhel9
  namespace: openshift-virtualization-os-images
spec:
  source:
    snapshot:
      name: rhel9-dd6a5c9fb09e
      namespace: openshift-virtualization-os-images
...

```

Create a VM with virtctl

Create VM with default instance type for the datasource (`u1.medium`):

```
$ virtctl create vm \
--name rhel-9-minimal \
--volume-import "type:ds,src:openshift-virtualization-os-images/rhel9" \
| tee vm.yaml | oc create -f -
```

Create VM with specific instance type (`u1.large`):

```
$ virtctl create vm \
--name rhel-9-minimal \
--instancetype u1.large \
--volume-import "type:ds,src:openshift-virtualization-os-images/rhel9" \
```



Controlling VMs



Controlling VMs

Available `virtctl` Commands:

<code>image-upload</code>	Upload a VM image to a <code>DataVolume/PersistentVolumeClaim</code> .
<code>migrate</code>	Migrate a virtual machine.
<code>migrate-cancel</code>	Cancel migration of a virtual machine.
<code>pause</code>	Pause a virtual machine
<code>restart</code>	Restart a virtual machine.
<code>soft-reboot</code>	Soft reboot a virtual machine instance
<code>start</code>	Start a virtual machine.
<code>stop</code>	Stop a virtual machine.
<code>unpause</code>	Unpause a virtual machine
<code>usbredir</code>	Redirect an USB device to a virtual machine instance.
<code>vmexport</code>	Export a VM volume.
<code>vnc</code>	Open a vnc connection to a virtual machine instance.



Investigating VMs



Investigating VMs

Available `virtctl` Commands:

<code>completion</code>	Generate the autocompletion script for the specified shell
<code>console</code>	Connect to a console of a virtual machine instance.
<code>fslist</code>	Return full list of filesystems available on the guest machine.
<code>guestfs</code>	Start a shell into the libguestfs pod
<code>guestosinfo</code>	Return guest agent info about operating system.
<code>memory-dump</code>	Dump the memory of a running VM to a pvc
<code>permitted-devices</code>	List the permitted devices for vmis.
<code>scp</code>	SCP files from/to a virtual machine instance.
<code>ssh</code>	Open a SSH connection to a virtual machine instance.
<code>userlist</code>	Return full list of logged in users on the guest machine.
<code>vnc</code>	Open a vnc connection to a virtual machine instance.

OS Info

```
virtctl guestosinfo rhel-9-minimal | jq .os
{
  "name": "Red Hat Enterprise Linux",
  "kernelRelease": "5.14.0-503.11.1.el9_5.x86_64",
  "version": "9.5 (Plow)",
  "prettyName": "Red Hat Enterprise Linux 9.5 (Plow)",
  "versionId": "9.5",
  "kernelVersion": "#1 SMP PREEMPT_DYNAMIC Mon Sep 30 11:54:45 EDT 2024",
  "machine": "x86_64",
  "id": "rhel"
}
```

Filesystems

List filesystems in a VM

```
$ virtctl fslist rhel-9-minimal
{
    "metadata": {},
    "items": [
        {
            "diskName": "vda2",
            "mountPoint": "/boot/efi",
            "fileSystemType": "vfat",
            "usedBytes": 7368704,
            "totalBytes": 209489920,
            "disk": [
                {
                    "busType": "virtio"
                }
            ]
        },
        ...
    ]
}
```



Modifying VMs

🛠️ Modifying VMs

Available `virtctl` Commands:

<code>addvolume</code>	add a volume to a running VM
<code>create</code>	Create a manifest for the specified Kind.
<code>credentials</code>	Manipulate credentials on a virtual machine.
<code>expose</code>	Expose a virtual machine instance, virtual machine, or virtual machine instance replica set as a new service.
<code>port-forward</code>	Forward local ports to a virtualmachine or virtualmachineinstance.
<code>removevolume</code>	remove a volume from a running VM

Change VM CPU and Memory

Options:

- Change the VirtualMachine spec with `oc edit` or `oc patch`

Destroy VM

```
virtctl stop vm rhel-server -n namespace  
oc delete vm rhel-server -n namespace
```

Managing VM Storage

VirtualMachineSnapshot Resource

```
apiVersion: snapshot.kubevirt.io/v1beta1
kind: VirtualMachineSnapshot
metadata:
  name: <snapshot_name>
spec:
  source:
    apiGroup: kubevirt.io
    kind: VirtualMachine
    name: <vm_name>
```

Managing VM Storage

Expanding VM Disk Size

Use `oc edit` or `oc patch` command to modify the PVC request size

```
apiVersion: v1
kind: PersistentVolumeClaim
metadata:
  name: imported-volume-8w4mq
spec:
  accessModes:
    - ReadWriteMany
  resources:
    requests:
      storage: 30Gi # <----
# ...
```

Expanding VM Disk Size

```
$ oc patch pvc imported-volume-8w4mq --type=json \
  -p='[{"op": "replace", "path": "/spec/resources/requests/storage", "value": "31Gi"}]'
```

persistentvolumeclaim/imported-volume-8w4mq patched

Expanding VM Disk Size

```
$ oc describe pvc imported-volume-8w4mq
...
Events:
  Type    Reason          Age   From                               Message
  ----  -----          ----
  Normal  Resizing        27s   external-resizer openshift-storage.rbd.csi.ceph.com
  Warning ExternalExpanding 27s   volume_expand
  Normal  VolumeResizeSuccessful 27s   external-resizer openshift-storage.rbd.csi.ceph.com
  Normal  FileSystemResizeSuccessful 1s    kubelet
                                                 External resizer is resizing volume pvc-c9172b7f-1184-4b41-9f5c-d24c8dec8d11
                                                 waiting for an external controller to expand this PVC
                                                 Resize volume succeeded
                                                 MountVolume.NodeExpandVolume succeeded for volume "pvc-c9172b7f-1184-4b41-9f5c-d24c8dec8d11" worker-5
```



Resource Quotas



Resource Quotas

Example Storage Quotas on a Project

```
apiVersion: v1
kind: ResourceQuota
metadata:
  name: storage-consumption
spec:
  hard:
    persistentvolumeclaims: "10"
    requests.storage: "50Gi"
    gold.storageclass.storage.k8s.io/requests.storage: "10Gi"
    silver.storageclass.storage.k8s.io/requests.storage: "20Gi"
    silver.storageclass.storage.k8s.io/persistentvolumeclaims: "5"
    bronze.storageclass.storage.k8s.io/requests.storage: "0"
    bronze.storageclass.storage.k8s.io/persistentvolumeclaims: "0"
    requests.ephemeral-storage: 2Gi
    limits.ephemeral-storage: 4Gi
```

Thank you

Resources

- API References
- Creating VMs on CLI
- Resource Quotas
- Expanding Disks
- VM Snapshots

