ACM install platform none clusters

[Is it supported to have mixed environment (VMware+Baremetal) setup for RHOCP 4.x cluster?]

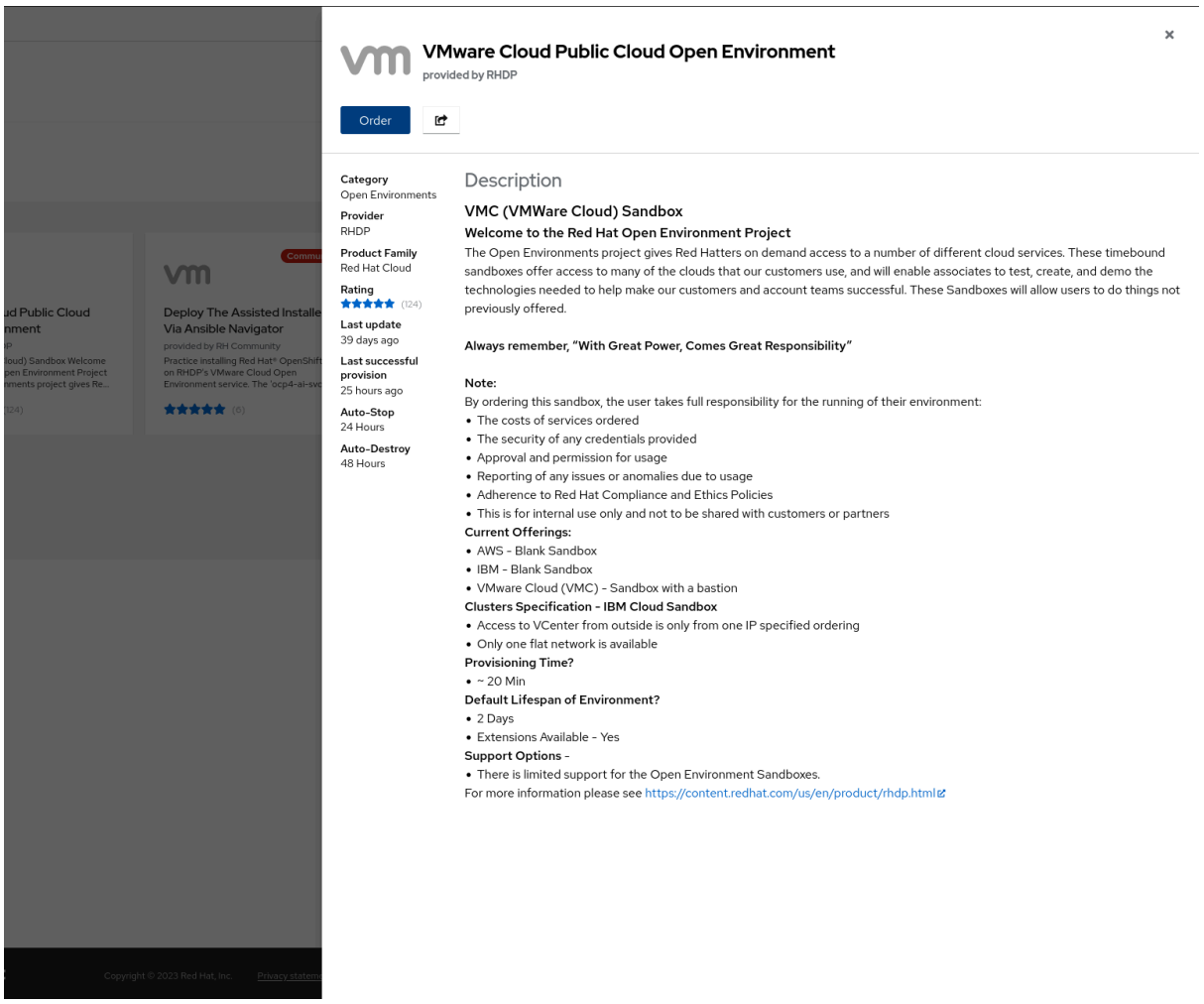
The next link could be outdated because the support is supposed to be available in 4.14, according to the Epic. But the docs still state that platform:none is only supported on SNO.
https://access.redhat.com/solutions/7008469

There is a documentation bug opened for that
https://issues.redhat.com/browse/OCPBUGS-29306

The final response is that YES, it is supported

Installing a hybrid cluster

Create 2 **VMware Cloud Public Cloud Open Environment** in demo.redhat.com.



One will be used to deploy an IPI OCP 4.14 cluster hub cluster, the other will be used to create the managed cluster.

IPI cluster installation

Deploy an IPI cluster on vsphere.
Make sure to enable DNS records creation for OCP.

It takes about 20 minutes for the environment to be provisioned and ready.
When the environment is ready an email is received with important information.
Ssh into the bastion node.
Verify the DNS records for the cluster:

```
Unset
$ dig +short api.glnm2.dynamic.opentlc.com
3.223.59.140
$ dig +short *.apps.glnm2.dynamic.opentlc.com
34.198.235.139
```

Get the installer, oc client and pull secret from here and copy them to the bastion host. Uncompress the tar files and put them in the running path:

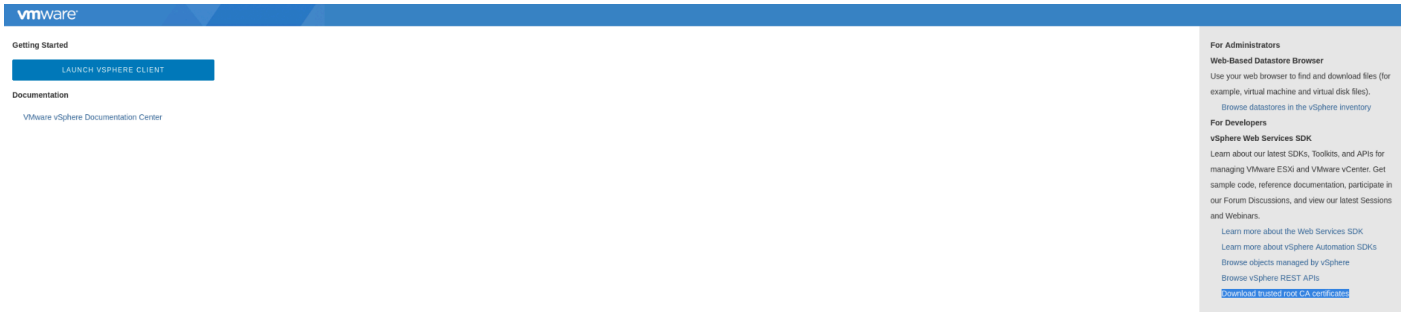
```
Unset
$ scp ~/Descargas/openshift-* /home/jjerezro/Descargas/pull-secret.txt  \
 lab-user@bastion-glnm2.glnm2.dynamic.opentlc.com

$ tar xvf openshift-client-linux.tar.gz
README.md
oc
kubectl

$ tar xvf openshift-install-linux.tar.gz
README.md
openshift-install

$ sudo cp -vi openshift-install oc /usr/local/bin
'openshift-install' -> '/usr/local/bin/openshift-install'
'oc' -> '/usr/local/bin/oc'
```

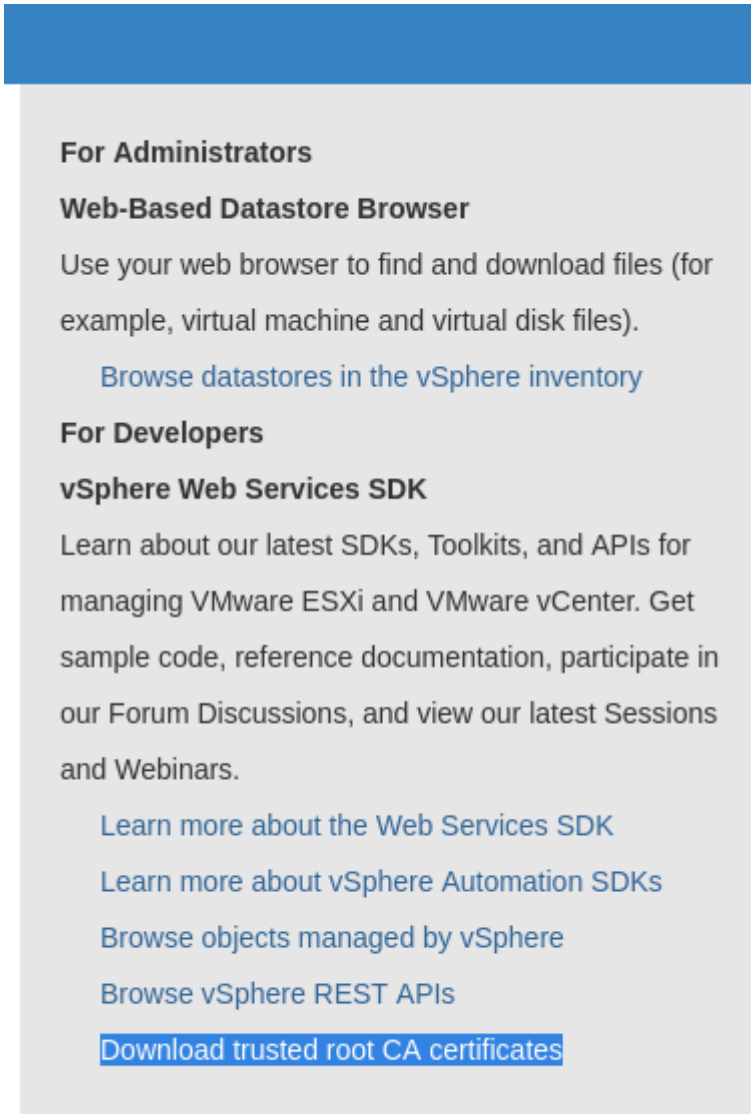
Create an ssh key pair

```
Unset
$ ssh localhost
The authenticity of host 'localhost (::1)' can't be established.
ECDSA key fingerprint is SHA256:AIOgCA9BvbsRJN9NSt0jqJ6xEd4pjlcqyHPwF9aLr3Q.
Are you sure you want to continue connecting (yes/no/[fingerprint])? yes
Warning: Permanently added 'localhost' (ECDSA) to the list of known hosts.
lab-user@localhost's password:

$ ssh-keygen -t ed25519 -N '' -f ~/.ssh/ocp
Generating public/private ed25519 key pair.
Your identification has been saved in /home/lab-user/.ssh/ocp.
Your public key has been saved in /home/lab-user/.ssh/ocp.pub.
The key fingerprint is:
...
```

Download the vCenter's root CA certificates. Go to the base URL of the vCenter, for example https://portal.vc.opentlc.com/

Click on the link Download trusted root CA certificates on the right side of the web page





The copy the downloaded file to the bastion host
Extract the file in the bastion host

```
Unset
$ unzip download.zip
Archive: download.zip
 inflating: certs/lin/7255df92.0
 inflating: certs/mac/7255df92.0
 inflating: certs/win/7255df92.0.crt
 inflating: certs/lin/75c43eb5.r0
 inflating: certs/mac/75c43eb5.r0
 inflating: certs/win/75c43eb5.r0.crl
...
```

Update your system trust

```
Unset
$ sudo cp -vi certs/lin/* /etc/pki/ca-trust/source/anchors
'certs/lin/02265526.0' -> '/etc/pki/ca-trust/source/anchors/02265526.0'
'certs/lin/2835d715.0' -> '/etc/pki/ca-trust/source/anchors/2835d715.0'
...

$ sudo update-ca-trust extract
```

Create the install-config.yaml file. To get the initial configuration that later needs to be modified use the command.
The information required is in the email from RHDP. For the VIP for API and Ingress use the NAT IP described in the email.

```
Unset
$ openshift-install create install-config
? SSH Public Key /home/lab-user/.ssh/ocp.pub
? Platform vsphere
? vCenter vcenter.sddc-44-197-86-61.vmwarevmc.com
? Username sandbox-glnm2@vc.opentlc.com
? Password [? for help] ************
INFO Connecting to vCenter vcenter.sddc-44-197-86-61.vmwarevmc.com
INFO Defaulting to only available datacenter: SDDC-Datacenter
INFO Defaulting to only available cluster: /SDDC-Datacenter/host/Cluster-1
INFO Defaulting to only available datastore: /SDDC-Datacenter/datastore/WorkloadDatastore
INFO Defaulting to only available network: segment-sandbox-glnm2
? Virtual IP Address for API 192.168.95.201
? Virtual IP Address for Ingress 192.168.95.202
? Base Domain dynamic.opentlc.com
? Cluster Name glnm2
? Pull Secret [? for help] ***************************...
INFO Install-Config created in: .
```

Edit the install-config.yaml file and add the vcenter folder where the VMs will be created

```
Unset
...
platform:
  vsphere:
      apiVIPs:
      - 192.168.95.201
      failureDomains:
      - name: generated-failure-domain
      region: generated-region
      server: vcenter.sddc-44-197-86-61.vmwarevmc.com
      topology:
      computeCluster: /SDDC-Datacenter/host/Cluster-1
      datacenter: SDDC-Datacenter
      datastore: /SDDC-Datacenter/datastore/WorkloadDatastore
      networks:
      - segment-sandbox-glnm2
      resourcePool: /SDDC-Datacenter/host/Cluster-1//Resources
      folder: /SDDC-Datacenter/vm/Workloads/sandbox-glnm2
      zone: generated-zone
...
```

If this is a disconnected installation, follow the instructions in section Mirror Registry to install the local registry and mirror the installation images.

Create a directory with the name of the cluster in the bastion host and copy the install-config.yaml file there:

```
Unset
$ mkdir glnm2
$ cp install-config.yaml glnm2/
```

Run the installer

```
Unset
$ openshift-install create cluster --dir glnm2/
INFO Consuming Install Config from target directory
INFO Creating infrastructure resources...
INFO Waiting up to 20m0s (until 3:21AM EST) for the Kubernetes API at
https://api.glnm2.dynamic.opentlc.com:6443...
INFO API v1.28.6+6216ea1 up
INFO Waiting up to 1h0m0s (until 4:04AM EST) for bootstrapping to complete...
INFO Destroying the bootstrap resources...
```

```
INFO Waiting up to 40m0s (until 3:58AM EST) for the cluster at
https://api.glnm2.dynamic.opentlc.com:6443 to initialize...
INFO Waiting up to 30m0s (until 4:03AM EST) to ensure each cluster operator has finished
progressing...
INFO All cluster operators have completed progressing
INFO Checking to see if there is a route at openshift-console/console...
INFO Install complete!
INFO To access the cluster as the system:admin user when using 'oc', run 'export
KUBECONFIG=/home/lab-user/glnm2/auth/kubeconfig'
INFO Access the OpenShift web-console here:
https://console-openshift-console.apps.glnm2.dynamic.opentlc.com
INFO Login to the console with user: "kubeadmin", and password: "7azGi-RUI6u-HR8ph-PuRyH"
INFO Time elapsed: 36m40s
```

Infra nodes

https://access.redhat.com/solutions/5034771

To have infra nodes created at installation time (day 1 configuration) start by creating the manifests from the install-config.yaml file

```
Unset
$ openshift-install create manifests --dir glnm2/
INFO Consuming Install Config from target directory
INFO Manifests created in: glnm2/manifests and glnm2/openshift
```

One of the manifests defines the worker machineset

```
Unset
$ ls glnm2/openshift/*machineset*
glnm2/openshift/99_openshift-cluster-api_worker-machineset-0.yaml
```

In this example a new machineset for infra nodes is created, resulting in 2 machinesets: one for workers and one for infra. See later for an example in which the worker machineset is replaced by an infra machineset
Copy the worker machineset as the infra machineset

```
Unset
$ cd glnm2/openshift/
```

```
$ cp 99_openshift-cluster-api_worker-machineset-0.yaml \
  99_openshift-cluster-api_infra-machineset-0.yaml
```

Modify the infra machineset according to the [documentation](#).
The amount of disk, CPU, and memory resources can be specified in the machineset. Keep the reference for the worker user data
The final result looks like this:

```
Unset
apiVersion: machine.openshift.io/v1beta1
kind: MachineSet
metadata:
 creationTimestamp: null
 labels:
  machine.openshift.io/cluster-api-cluster: glnm2-7jvd8
 name: glnm2-7jvd8-infra-0
 namespace: openshift-machine-api
spec:
 replicas: 2
 selector:
  matchLabels:
   machine.openshift.io/cluster-api-cluster: glnm2-7jvd8
   machine.openshift.io/cluster-api-machineset: glnm2-7jvd8-infra-0
 template:
  metadata:
   labels:
    machine.openshift.io/cluster-api-cluster: glnm2-7jvd8
    machine.openshift.io/cluster-api-machine-role: infra
    machine.openshift.io/cluster-api-machine-type: infra
    machine.openshift.io/cluster-api-machineset: glnm2-7jvd8-infra-0
  spec:
   lifecycleHooks: {}
   metadata:
    labels:
     node-role.kubernetes.io/infra: ""
   taints:
   - key: node-role.kubernetes.io/infra
    effect: NoSchedule
   providerSpec:
    value:
     apiVersion: machine.openshift.io/v1beta1
     credentialsSecret:
      name: vsphere-cloud-credentials
     diskGiB: 120
     kind: VSphereMachineProviderSpec
     memoryMiB: 8192
```

```
      metadata:
       creationTimestamp: null
      network:
       devices:
       - networkName: segment-sandbox-glnm2
      numCPUs: 4
      numCoresPerSocket: 4
      snapshot: ""
      template: glnm2-7jvd8-rhcos-generated-region-generated-zone
      userDataSecret:
       name: worker-user-data
      workspace:
       datacenter: SDDC-Datacenter
       datastore: /SDDC-Datacenter/datastore/WorkloadDatastore
       folder: /SDDC-Datacenter/vm/Workloads/sandbox-glnm2
       resourcePool: /SDDC-Datacenter/host/Cluster-1//Resources
       server: vcenter.sddc-44-197-86-61.vmwarevmc.com
```

In case of a cluster with no worker nodes, in wich only infra workloads are going to be run, replace the worker machineset by an infra machineset and leva the taint out of the infra nodes.

After creating the manifests edit the manifest defining the machineset for workers like this. In the example below the **taint** is not present. Keep the reference for the worker user data:

```
Unset
$ mv 99_openshift-cluster-api_worker-machineset-0.yaml \
  99_openshift-cluster-api_infra-machineset-0.yaml

$ vim 99_openshift-cluster-api_infra-machineset-0.yaml
apiVersion: machine.openshift.io/v1beta1
kind: MachineSet
metadata:
  creationTimestamp: null
  labels:
    machine.openshift.io/cluster-api-cluster: glnm2-ln65x
  name: glnm2-ln65x-infra-0
  namespace: openshift-machine-api
spec:
  replicas: 3
  selector:
    matchLabels:
      machine.openshift.io/cluster-api-cluster: glnm2-ln65x
      machine.openshift.io/cluster-api-machineset: glnm2-ln65x-infra-0
  template:
    metadata:
```

```
    labels:
      machine.openshift.io/cluster-api-cluster: glnm2-ln65x
      machine.openshift.io/cluster-api-machine-role: infra
      machine.openshift.io/cluster-api-machine-type: infra
      machine.openshift.io/cluster-api-machineset: glnm2-ln65x-infra-0
  spec:
    lifecycleHooks: {}
    metadata:
      labels:
        node-role.kubernetes.io/infra: ""
    providerSpec:
      value:
        apiVersion: machine.openshift.io/v1beta1
        credentialsSecret:
          name: vsphere-cloud-credentials
        diskGiB: 120
        kind: VSphereMachineProviderSpec
        memoryMiB: 16384
        metadata:
          creationTimestamp: null
        network:
          devices:
          - networkName: segment-sandbox-glnm2
        numCPUs: 4
        numCoresPerSocket: 4
        snapshot: ""
        template: glnm2-ln65x-rhcos-generated-region-generated-zone
        userDataSecret:
          name: worker-user-data
        workspace:
          datacenter: SDDC-Datacenter
          datastore: /SDDC-Datacenter/datastore/WorkloadDatastore
          folder: /SDDC-Datacenter/vm/Workloads/sandbox-glnm2
          resourcePool: /SDDC-Datacenter/host/Cluster-1//Resources
          server: vcenter.sddc-44-197-86-61.vmwarevmc.com
```

Run the installer again.

```
Unset
$ openshift-install create cluster --dir glnm2/
INFO Consuming OpenShift Install (Manifests) from target directory
INFO Consuming Master Machines from target directory
INFO Consuming Common Manifests from target directory
```

```
INFO Consuming Worker Machines from target directory
INFO Consuming Openshift Manifests from target directory
INFO Creating infrastructure resources...
INFO Waiting up to 20m0s (until 4:49AM EST) for the Kubernetes API at
https://api.glnm2.dynamic.opentlc.com:6443...
INFO API v1.28.6+6216ea1 up
INFO Waiting up to 1h0m0s (until 5:32AM EST) for bootstrapping to complete...
INFO Destroying the bootstrap resources...
INFO Waiting up to 40m0s (until 5:29AM EST) for the cluster at
https://api.glnm2.dynamic.opentlc.com:6443 to initialize...
INFO Waiting up to 30m0s (until 5:32AM EST) to ensure each cluster operator has finished
progressing...
INFO All cluster operators have completed progressing
INFO Checking to see if there is a route at openshift-console/console...
INFO Install complete!
INFO To access the cluster as the system:admin user when using 'oc', run 'export
KUBECONFIG=/home/lab-user/glnm2/auth/kubeconfig'
INFO Access the OpenShift web-console here:
https://console-openshift-console.apps.glnm2.dynamic.opentlc.com
INFO Login to the console with user: "kubeadmin", and password: "RLAiW-c83BZ-9SiAU-89pWa"
INFO Time elapsed: 38m14s
```

The resulting cluster has 3 worker and 2 infra nodes, but the infra services are running on the worker nodes because they don't have the matching tolerations to run on the infra nodes. This must be taken into account if the cluster does not have any worker nodes.

Moving the router pods to the infra nodes

Edit the default ingress controller and add a nodePlacement section that matches the infra label, and add the toleration for the infra taint

```
Unset
$ oc edit  ingresscontroller default -n openshift-ingress-operator
apiVersion: operator.openshift.io/v1
kind: IngressController
metadata:
  name: default
 namespace: openshift-ingress-operator
spec:
...
 nodePlacement:
  nodeSelector:
   matchLabels:
    node-role.kubernetes.io/infra: ""
  tolerations:
  - effect: NoSchedule
```

```
    key: node-role.kubernetes.io/infra
  replicas: 2
  tuningOptions:
   reloadInterval: 0s
```

After this, the router pods are redeployed to the infra nodes.

Moving the registry pods to the infra nodes

In the case of vsphere IPI installation, the registry is is a removed state because no object storage is readily available:

```
Unset
$ oc get config cluster -o yaml
apiVersion: imageregistry.operator.openshift.io/v1
kind: Config
metadata:
  creationTimestamp: "2024-03-02T09:49:10Z"
  finalizers:
  - imageregistry.operator.openshift.io/finalizer
  generation: 1
  name: cluster
  resourceVersion: "825739"
  uid: 53953d91-929f-40a6-93bb-f6ff25b0cb3f
spec:
  logLevel: Normal
  managementState: Removed
...
```

This has the effect of not having any registry pods running in the cluster

```
Unset
$ oc get pod -n openshift-image-registry -l docker-registry=default
No resources found in openshift-image-registry namespace.
```

So I would have to assing storage to the registry and the add the nodePlacement section

Moving the monitoring stack to the infra nodes

You need to create a configmap with the nodePlacement section and toleratoins for all the monitoring components:

```
Unset
$ cat cluster-monitoring-config
apiVersion: v1
kind: ConfigMap
metadata:
 name: cluster-monitoring-config
 namespace: openshift-monitoring
data:
 config.yaml: |+
  alertmanagerMain:
   nodeSelector:
    node-role.kubernetes.io/infra: ""
   tolerations:
   - key: node-role.kubernetes.io/infra
    effect: NoSchedule
  prometheusK8s:
   nodeSelector:
    node-role.kubernetes.io/infra: ""
   tolerations:
   - key: node-role.kubernetes.io/infra
    effect: NoSchedule
  prometheusOperator:
   nodeSelector:
    node-role.kubernetes.io/infra: ""
   tolerations:
   - key: node-role.kubernetes.io/infra
    effect: NoSchedule
  k8sPrometheusAdapter:
   nodeSelector:
    node-role.kubernetes.io/infra: ""
   tolerations:
   - key: node-role.kubernetes.io/infra
    effect: NoSchedule
  kubeStateMetrics:
   nodeSelector:
    node-role.kubernetes.io/infra: ""
   tolerations:
   - key: node-role.kubernetes.io/infra
    effect: NoSchedule
  telemeterClient:
   nodeSelector:
    node-role.kubernetes.io/infra: ""
   tolerations:
   - key: node-role.kubernetes.io/infra
    effect: NoSchedule
  openshiftStateMetrics:
   nodeSelector:
    node-role.kubernetes.io/infra: ""
   tolerations:
```

```
    - key: node-role.kubernetes.io/infra
      effect: NoSchedule
  thanosQuerier:
    nodeSelector:
      node-role.kubernetes.io/infra: ""
    tolerations:
    - key: node-role.kubernetes.io/infra
      effect: NoSchedule
```

Apply the config map definition

```
Unset
$ oc create -f cluster-monitoring-config

$ watch -n4 "oc get pods -n openshift-monitoring -o wide"
```

Monitoring-plugin pods are still running on worker nodes

Other elements that need to be moved to infra nodes

Cronjobs for image-prunner and openshift-operator-lifecycle-manager may need to be modified so that the pods can run on infra nodes.

The network-check-source pod

```
Unset
$ oc get po -n openshift-network-diagnostics network-check-source-c9468c84c-4q9cn -o
yaml|less

$ oc get deployment -n openshift-network-diagnostics network-check-source -o yaml|less

$ oc get network cluster -o yaml|less
```

RHACM Operator Deployment

https://access.redhat.com/documentation/en-us/red_hat_advanced_cluster_management_for_kubernetes/2.9/html/install/installing#installing-from-the-cli

RHACM is installed on infra nodes and therefore the OCP web console cannot be used, so the installation instructions are based on the following chapters in the RHACM documentation:

- Installing from the OpenShift Container Platform CLI
- Installing the Red Hat Advanced Cluster Management hub cluster on infrastructure nodes

Create the recommended namespace to hold ACM components:

```
Unset
$ oc create namespace open-cluster-management
namespace/open-cluster-management created

$ oc project open-cluster-management
Now using project "open-cluster-management"
```

Create the operator group based on the following yaml file

```
Unset
$ cat og.yaml
apiVersion: operators.coreos.com/v1
kind: OperatorGroup
metadata:
 name: rhacm-og
 namespace: open-cluster-management
spec:
 targetNamespaces:
 - open-cluster-management

$ oc create -f og.yaml
operatorgroup.operators.coreos.com/rhacm-og created
```

Create the operator subscription based on the following yaml file
There is no **tolerations** section because the infra nodes don't have a taint section, because the cluster has only infra nodes:

```
Unset
$ cat subs.yaml
apiVersion: operators.coreos.com/v1alpha1
kind: Subscription
metadata:
 name: acm-operator-subscription
spec:
 sourceNamespace: openshift-marketplace
 source: redhat-operators
 channel: release-2.9
 installPlanApproval: Automatic
 name: advanced-cluster-management
```

```
 config:
  nodeSelector:
   node-role.kubernetes.io/infra: ""

$ oc apply -f subs.yaml
subscription.operators.coreos.com/acm-operator-subscription created

$ oc get pod
NAME                                          READY   STATUS      RESTARTS   AGE
multiclusterhub-operator-7bbd6b66bc-699hz   1/1       Running   0          32s

$ oc get csv
NAME                                ...  VERSION  ... PHASE
advanced-cluster-management.v2.9.2  ... 2.9.2    ... Succeeded
```

Create the multiclusterhub custom resource based on the following yaml file:

```
Unset
$ cat multiclusterhub.yaml
apiVersion: operator.open-cluster-management.io/v1
kind: MultiClusterHub
metadata:
 name: multiclusterhub
 namespace: open-cluster-management
spec:
 nodeSelector:
  node-role.kubernetes.io/infra: ""
```

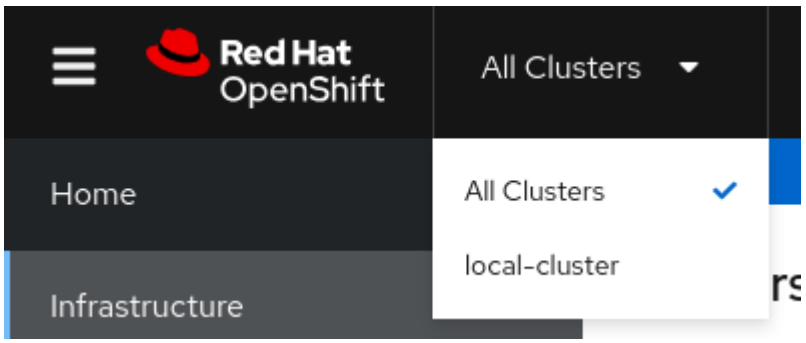
If RHACM is being installed on a disconnected environment an special annotation needs to be added to the multiclusterhub definition with the name of the catalogsource for the redat operators

```
Unset
$ oc get catalogsource -n openshift-marketplace
NAME          DISPLAY  TYPE  PUBLISHER  AGE
cs-redhat-operator-index         grpc         4h16m

$ cat multiclusterhub.yaml
apiVersion: operator.open-cluster-management.io/v1
kind: MultiClusterHub
metadata:
 name: multiclusterhub
 namespace: open-cluster-management
 annotations:
```

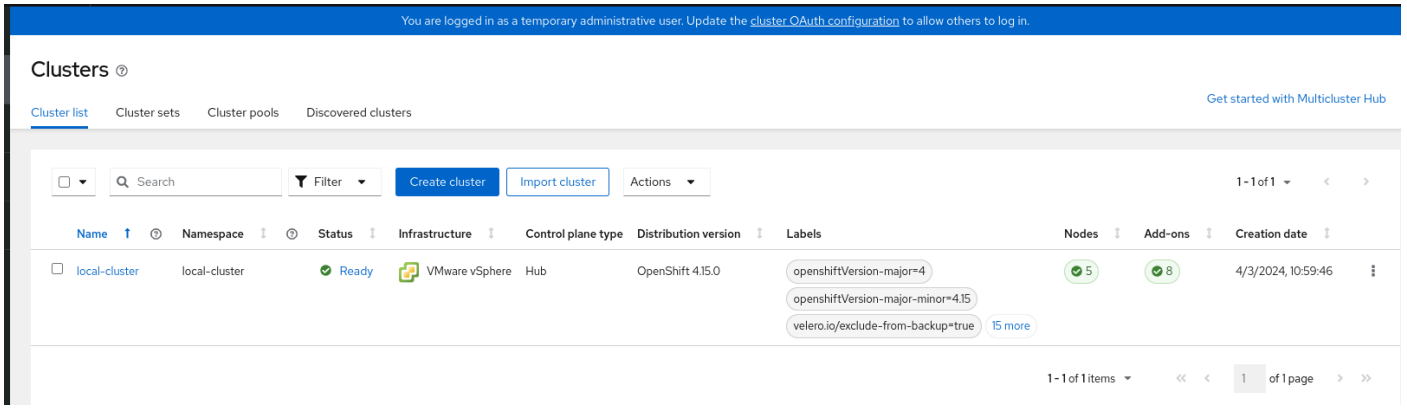
```
    installer.open-cluster-management.io/mce-subscription-spec: '{"source":
"cs-redhat-operator-index"}'
spec: {}
```

```
Unset

$ oc apply -f multiclusterhub.yaml
multiclusterhub.operator.open-cluster-management.io/multiclusterhub created

$ oc get pods -n open-cluster-management
NAME                                                              READY   STATUS   ...
cluster-permission-8595fb4db-wrgjw                                1/1     Running
console-chart-console-v2-865d774dff-76jhq                         1/1     Running
console-chart-console-v2-865d774dff-9hnfh                         1/1     Running
grc-policy-addon-controller-7db8c447bd-5xs8p                      1/1     Running
grc-policy-addon-controller-7db8c447bd-fjtzs                      1/1     Running
grc-policy-propagator-6975744dbd-h8tfp                            2/2     Running
grc-policy-propagator-6975744dbd-tlnvs                            2/2     Running
insights-client-b9c7995b7-r2nnh                                   1/1     Running
insights-metrics-5c947cd6d6-qnrgw                                 2/2     Running
klusterlet-addon-controller-v2-589566fd7f-fl7dv                   1/1     Running
klusterlet-addon-controller-v2-589566fd7f-lfrf5                   1/1     Running
multicluster-integrations-74d4b8d46f-42xxh                        3/3     Running
multicluster-observability-operator-659cf79d5f-zxqx4              1/1     Running
multicluster-operators-application-cfb6bb778-jbbnz                3/3     Running
multicluster-operators-channel-c5c98b697-m8f46                    1/1     Running
multicluster-operators-hub-subscription-6c565cb64b-j6gjn          1/1     Running
multicluster-operators-standalone-subscription-69d95c6f5-npqnv    1/1     Running
multicluster-operators-subscription-report-69d7675479-499g8       1/1     Running
multiclusterhub-operator-7bbd6b66bc-699hz                         1/1     Running
search-api-7bc68d4785-nbxwm                                       1/1     Running
search-collector-6b499ffdbf-whxxp                                 1/1     Running
search-indexer-dcf75d665-pnx2m                                    1/1     Running
search-postgres-5d96ccd86b-qbnpn                                  1/1     Running
search-v2-operator-controller-manager-5b6fdd4b6f-tnmgt            2/2     Running
submariner-addon-98b6fff65-kk92v                                  1/1     Running
volsync-addon-controller-8cfbd5d5f-h6dqn                          1/1     Running
```

A new dropdown menu should appear in the Openshift web site.



The local cluster should go into status Ready after a couple minutes:



Mirror Registry

https://github.com/quay/mirror-registry

https://docs.openshift.com/container-platform/4.15/installing/disconnected_install/installing-mirroring-creating-registry.html#mirror-registry-localhost_installing-mirroring-creating-registry

How to use the oc-mirror plug-in to mirror operators

The mirror registry service needs to be resolvable by DNS, so we are going to deploy it remotely from one **VMware Cloud Public Cloud Open Environment** onto another so the bastion on the second environment can be used for as the mirror registry for the first one, and the bastion public DNS name can be used.

Create a new **VMware Cloud Public Cloud Open Environment**

On the second VMware Cloud Public Cloud Open Environment
The bastion host does not have enough resources to run the mirror registry.
Shutdown the bastion host and add:

- One additional vCPU, 2 in total
- Increase the memory to 8GB
- Add a disk of 50GB.

Boot up the bastion
Show the available disks, a new **sdb** disk of 50G should appear

```
Unset
$ lsblk
NAME  MAJ:MIN RM  SIZE RO TYPE MOUNTPOINT
sda    8:0    0  30G  0 disk
├─sda1  8:1   0      1M  0 part
├─sda2  8:2   0  100M  0 part /boot/efi
└─sda3  8:3   0 29.9G  0 part /
sdb    8:16  0  50G  0 disk
```

Format the new disk

```
Unset
$ sudo mkfs.xfs /dev/sdb
```

Create the mount point

```
Unset
$ sudo mkdir /var/mirror-registry
```

Get the UUID for the /dev/sdb disk

```
Unset
$ sudo blkid
...
/dev/sdb: UUID="d327e61d-8372-435..." BLOCK_SIZE="512" TYPE="xfs"
```

Add an entry like the following to the **/etc/fstab** file

```
Unset
UUID=d327e61d-8372-435...  /var/mirror-registry  xfs defaults 0 0
```

Mount the partition

```
Unset
$ sudo mount -a
$ df -Ph
```

On the first VMware Cloud Public Cloud Open Environment

The mirror registry installer needs to be run from the first environment, but it needs to run an ansible playbook against the second environment with root privileges so that the registry service can listen on privileged port 443.

Copy the existing ssh key for the root user in the second environment to the first environment

```
Unset
<second env>$ sudo cat /root/.ssh/bastion_995pv
-----BEGIN OPENSSH PRIVATE KEY-----
b3BlbnNzaC1rZXktdjEAAAAABG5vbmUAAAAEbm9uZQAAAAAAAAABAAABlwAAAAdzc2gtcn
NhAAAAAwEAAQAAAYEA1QlqAIineSlrxIyEgOQ1A78uD36e1p32sTtpqCV/O0ZUWng1LBhz
...
9yijev/D9OldJLAAAAEnJvb3RAYmFzdGlvbi05OTVwdg==
-----END OPENSSH PRIVATE KEY-----

<first env>$ vim ~/.ssh/mirror-root
<first env>$ chmod 0400 ~/.ssh/mirror-root
<first env>$ ssh -i ~/.ssh/mirror-root root@bastion-995pv.995pv.dynamic.opentlc.com
Last failed login: Fri Mar  8 04:31:40 EST 2024 from 79.138.85.216 on ssh:notty
There were 17 failed login attempts since the last successful login.
Last login: Thu Dec  7 05:08:51 2023
<first env># whoami
root
```

If a non privileged port like the default 843 is used the ansible playbook can run as a normal user in the second environment and an ssh key for the lab user can be created and copied over

```
Unset
$ ssh-keygen -N '' -f ~/.ssh/mirror
$ ssh-copy-id -i ~/.ssh/mirror.pub lab-user@bastion-995pv.995pv.dynamic.opentlc.com

$ ssh -i ~/.ssh/mirror lab-user@bastion-995pv.995pv.dynamic.opentlc.com
```

Download the **mirror-registry.tar.gz** package for the latest version of the mirror registry found on the OpenShift console **Downloads** page.

Uncompress the tar file

```
Unset
$ mkdir mirror
$ mv mirror-registry.tar.gz mirror
$ cd mirror/
$ tar xvf mirror-registry.tar.gz
image-archive.tar
execution-environment.tar
mirror-registry
```

Run the installer on the first env to install the mirror registry remotely on the second env.

The resolvable hostname for the mirror registry service is the public hostname for the bastion host on the second environment and the port it uses is the standard for https 443

```
--quayHostname bastion-995pv.995pv.dynamic.opentlc.com:443
```

The partition where the images will be storage is the one associated with the disk added earlier

```
--quayStorage /var/mirror-registry
```

Because this is a remote installation from the first environment into the second environment, the connection parameters for the second environment are needed

```
--targetHostname bastion-995pv.995pv.dynamic.opentlc.com
--targetUsername lab-user
-k ~/.ssh/mirror-root
```

Unset

```
$ ./mirror-registry install --quayHostname bastion-995pv.995pv.dynamic.opentlc.com:443
--quayStorage /var/mirror-registry --targetHostname bastion-995pv.995pv.dynamic.opentlc.com
--targetUsername lab-user -k ~/.ssh/mirror-root
```

The final message contains the URL to access the registry and the user credentials.

Unset

```
....
INFO[2024-03-07 02:22:58] Quay is available at https://bastion-sjmzk:8443 with credentials
(init, j4HPx6Gu18O52I70zlknDQw9do3thqKF)
```

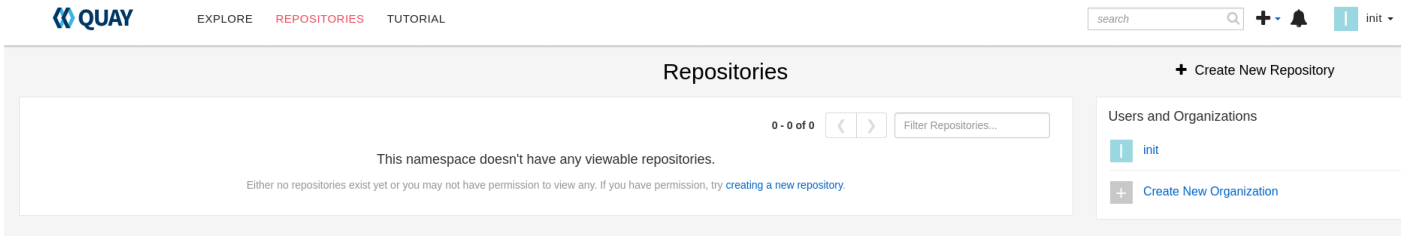
Save the credentials for later use.

Test the access to the registry. The option --tls-verify=false is used so that podman does not reject the unknown root CA in the mirror registry:

Unset

```
$ podman login --tls-verify=false -u init -p j4HPx... bastion-sjmzk.sjmzk.dynamic.opentlc.com
Login Succeeded!
```

Access the web interface using the bastion external name (i.e. bastion-sjmzk.sjmzk.dynamic.opentlc.com)



Download the **mirror-plugin** and the oc CLI packages from the [OpenShift console **Downloads**]() page.

Install the oc CLI and the oc-mirror plugin

```
Unset
$ tar xvf oc-mirror.tar.gz
oc-mirror
$ chmod +x oc-mirror

$ tar xvf openshift-client-linux.tar.gz
README.md
oc
kubectl
$ sudo cp oc oc-mirror /usr/local/bin/
```

Download your registry.redhat.io [pull secret from Red Hat OpenShift Cluster Manager](#).

Make a copy of your pull secret in JSON format:

```
Unset
$ cat pull-secret.txt |jq . > pull-secret_json.txt
```

Generate the base64-encoded username and password or token for your mirror registry:

```
Unset
$ echo -n 'init:j4HPx6Gu18O52I70zlknDQw9do3thqKF'| base64 -w0
aW5pdDpqNEhQeDZHdTE4TzUySTcwemxrbkRRdzlkbzN0aHFLRg==
```

Edit the JSON file and add a section that describes your registry to it:
Make sure to add the port where the mirror registry is listening on

```
Unset
{
 "auths": {
       "cloud.openshift.com": {
       "auth": "b3BlbnNoaWZ0LXJlbGVhc2...
       "email": "jjerezro@redhat.com"
       },
       "quay.io": {
       "auth": "b3BlbnNoaWZ0LXJlbGVhc...
       "email": "jjerezro@redhat.com"
       },
```

```
        "registry.connect.redhat.com": {
        "auth": "NTIzMjU0MDB8dWhjLTFIaW...
        "email": "jjerezro@redhat.com"
        },
        "registry.redhat.io": {
        "auth": "NTIzMjU0MDB8dWhjLTFIaWRhWDBvbHZ0Wnl...
        "email": "jjerezro@redhat.com"
        },
       "bastion-sjmzk.sjmzk.dynamic.opentlc.com:443": {
         "auth": "aW5pdDpwa1pFUDhzNjl2Q25lSDcyVk9mMzFkeEpRTTBsWDRvNQ==",
         "email": "jjerezro@redhat.com"
        }
  }
}
```

Install the merged pull secret so that it can be used by the oc CLI.
Verify the pull secret and create the image set configuration file template.
The “oc mirror” command can take a couple minutes to complete

```
Unset
$ jq . pull-secret_json.txt

$ cp  pull-secret_json.txt ~/.docker/config.json

$ oc mirror init --registry bastion-sjmzk.sjmzk.dynamic.opentlc.com/mirror/oc-mirror-metadata \
 > imageset-config.yaml
```

Edit the imageset-config.yaml file and include the required content to be mirrored to the local registry. Examples and further details can be found [here]

To mirror a particular version of Openshift use a configuration like. This configuration file only mirrors one particular OCP version and does not include any operators:

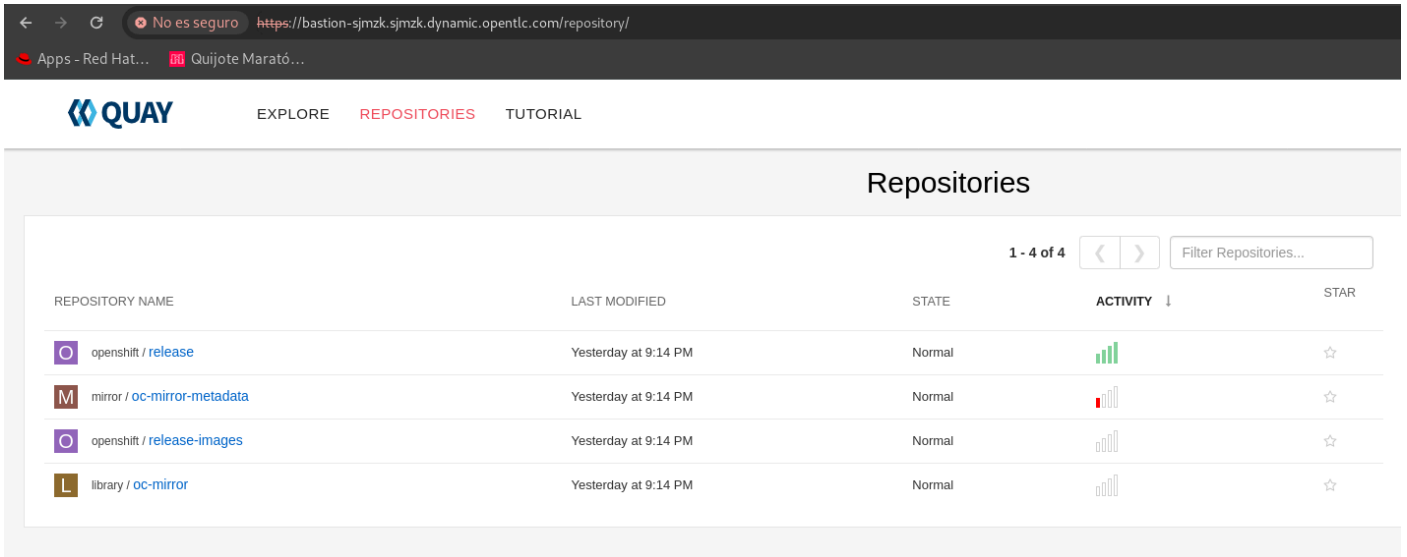
```
Unset
kind: ImageSetConfiguration
apiVersion: mirror.openshift.io/v1alpha2
storageConfig:
  registry:
    imageURL: bastion-995pv.995pv.dynamic.opentlc.com:443/mirror/oc-mirror-metadata
    skipTLS: true
mirror:
  platform:
    architectures:
```

```
    - amd64
    channels:
    - name: stable-4.15
      minVersion: 4.15.0
      maxVersion: 4.15.0
      type: ocp
```

If the ImageSetConfiguration contains an operators section you need to apply the catalog source obtained after the content is mirrored into the registry, see [here]
Execute the images mirroring:

```
Unset
$ oc mirror --config=./2imageset-config.yaml \
  docker://bastion-995pv.995pv.dynamic.opentlc.com:443 --dest-skip-tls
Checking push permissions for bastion-sjmzk.localdomain:443
Found: oc-mirror-workspace/src/publish
Found: oc-mirror-workspace/src/v2
Found: oc-mirror-workspace/src/charts
Found: oc-mirror-workspace/src/release-signatures
No metadata detected, creating new workspace
...
info: Mirroring completed in 7m43.76s (42.41MB/s)
Writing image mapping to oc-mirror-workspace/results-1709842466/mapping.txt
Writing ICSP manifests to oc-mirror-workspace/results-1709842466
```

When the mirroring is finished go to the quay web site to verify that the images are there



On the second VMware Cloud Public Cloud Open Environment
Download the RHCOS image to install OpenShift on a restricted network vSphere environment.

The installer needs to load the installation ova image into vSphere, so we need to download the image "Red Hat Enterprise Linux CoreOS - vSphere" from the [Product Downloads page](#).
This ova image is more that 1GB in size, keep that in mind.

Copy the image to the bastion host in the second environment:

```
Unset
$ scp /home/jjerezro/Descargas/rhcos-vmware.x86_64.ova \
  lab-user@bastion-995pv.995pv.dynamic.opentlc.com:
```

On the bastion in the second environment verify the RHCOS image and move to a directory

```
Unset
$ mkdir images
$ mv rhcos-vmware.x86_64.ova images

$ sha256sum images/rhcos-vmware.x86_64.ova
9b3d5a598928ec52b0d32092d0a9a41f0ec8a238eb9fff8563266b9351919e20  ...
```

The image must be published in a web server, in this case an apache container image is used for such purpose since the server only has to be available during installation of the cluster.
The container has to be run as root because the pod binds to port 80, because other ports are not accessible from other environments.

```
Unset
$ sudo podman run -p 80:8080 --name httpd -d \
  --volume ~/images:/var/www/html:Z registry.access.redhat.com/ubi8/httpd-24
```

Test the access from the first environment

```
Unset
$ wget  http://bastion-995pv.995pv.dynamic.opentlc.com/rhcos-vmware.x86_64.ova
--2024-03-08 09:57:29--
http://bastion-995pv.995pv.dynamic.opentlc.com/rhcos-vmware.x86_64.ova
Resolving bastion-995pv.995pv.dynamic.opentlc.com
(bastion-995pv.995pv.dynamic.opentlc.com)... 52.23.56.147
Connecting to bastion-995pv.995pv.dynamic.opentlc.com
(bastion-995pv.995pv.dynamic.opentlc.com)|52.23.56.147|:80... connected.
HTTP request sent, awaiting response... 200 OK
Length: 1261096960 (1.2G) [application/x-tar]
Saving to: 'rhcos-vmware.x86_64.ova'
```

```
rhcos-vmware.x86_64.ova                        23%[=======================>
       ] 280.19M   156MB/s
```

The **install-config.yaml** file needs to include additional configurations for the disconnected installation:

- The **clusterOSImage** with the URL to get the ova image, and the sha256 sum obtained from the downloads page or computed using the sha256sum command
- The pull secret for the mirror registry
  Use the same definition that you used in the json pull-secret for the mirror registry, including the port number. If they differ the nodes will not be able to pull the images from the registry.
- The CA certificate for the mirror registry
  This is obtained from the file **quay-install/quay-rootCA/rootCA.pem** in the home of the user who installed the mirror registry in the target host. In this case because the installer was run with sudo, the file is in the root's home directory of the 2nd environment.
  It is important that the certificate itself is properly indented
- The image content resources obtained from the file
  oc-mirror-workspace/results-1709896183/imageContentSourcePolicy.yaml
  This file is found in the host where the installer was run (bastion in 1st environment)

The resulting file looks like this:

```
Unset
additionalTrustBundlePolicy: Proxyonly
apiVersion: v1
baseDomain: dynamic.opentlc.com
compute:
- architecture: amd64
  hyperthreading: Enabled
  name: worker
  platform: {}
  replicas: 3
controlPlane:
  architecture: amd64
  hyperthreading: Enabled
  name: master
  platform: {}
  replicas: 3
metadata:
  creationTimestamp: null
  name: sjmzk
networking:
  clusterNetwork:
  - cidr: 10.128.0.0/14
    hostPrefix: 23
```

```
  machineNetwork:
  - cidr: 10.0.0.0/16
  networkType: OVNKubernetes
  serviceNetwork:
  - 172.30.0.0/16
platform:
  vsphere:
    apiVIPs:
    - 192.168.95.201
    failureDomains:
    - name: generated-failure-domain
      region: generated-region
      server: vcenter.sddc-44-197-86-61.vmwarevmc.com
      topology:
        computeCluster: /SDDC-Datacenter/host/Cluster-1
        datacenter: SDDC-Datacenter
        datastore: /SDDC-Datacenter/datastore/WorkloadDatastore
        networks:
        - segment-sandbox-sjmzk
        resourcePool: /SDDC-Datacenter/host/Cluster-1//Resources
        folder: /SDDC-Datacenter/vm/Workloads/sandbox-sjmzk
      zone: generated-zone
    ingressVIPs:
    - 192.168.95.202
    vcenters:
    - datacenters:
      - SDDC-Datacenter
      password: t4uy8zoGPJQ7
      port: 443
      server: vcenter.sddc-44-197-86-61.vmwarevmc.com
      user: sandbox-sjmzk@vc.opentlc.com
    clusterOSImage: http://bastion-995pv.995pv.dynamic.opentlc.com/rhcos-vmware.x86_64.ova?sha256=9b3d...
imageContentSources:
 - mirrors:
   - bastion-995pv.995pv.dynamic.opentlc.com:443/openshift/release-images
   source: quay.io/openshift-release-dev/ocp-release
 - mirrors:
   - bastion-995pv.995pv.dynamic.opentlc.com:443/openshift/release
   source: quay.io/openshift-release-dev/ocp-v4.0-art-dev
pullSecret: '{"auths":{"bastion-995pv.995pv.dynamic.opentlc.com:443":{"auth":"aW5pd..."}}}'
sshKey: |
  ssh-rsa AAAAB3NzaC1y...
additionalTrustBundle: |
  -----BEGIN CERTIFICATE-----
  MIID0jCCArqgAwIBAgIULG+VTl7hJhwC+1H9hHg0cAQAWQEwDQYJKoZIhvcNAQEL
  ...
  X2d/YiJ23sGBtDxKuQpdTSS1iG9wag==
  -----END CERTIFICATE-----
```

Add the vCenter root CA certificates as described [above]
Run the installer

```
Unset
$ mkdir sjmzk
$ cp install-config.yaml sjmzk/
$ openshift-install create cluster --dir sjmzk/
```

Operator Catalog Content

The Operator Lifecycle Manager (OLM) applies the original catalogSources to the cluster, but the pods associated with them don't exist in the mirror registry and therefore cannot be started.
Listing the pods in the openshift-marketplace project shows that some pods are not starting.

```
Unset
$ oc get pods -n openshift-marketplace
NAME                                  READY  STATUS        RESTARTS      AGE
certified-operators-9rtn5             0/1    Init:ImagePullBackOff  0          21h
certified-operators-wshfs             0/1    Init:ImagePullBackOff  0          21h
community-operators-5h5hc             0/1    Init:ImagePullBackOff  0          21h
community-operators-wpb48             0/1    Init:ImagePullBackOff  0          21h
cs-redhat-operator-index-4jdk6        1/1    Running       0      4h7m
marketplace-operator-5fc5bc69d8-gd7zr  1/1      Running       5 (21h ago)  21h
redhat-marketplace-d2tm8              0/1    Init:ImagePullBackOff  0          21h
redhat-marketplace-srs5v              0/1    Init:ImagePullBackOff  0          21h
redhat-operators-m679s                0/1    Init:ImagePullBackOff  0          21h
redhat-operators-pzlkf                0/1    Init:ImagePullBackOff  0          21h
```

For some reason this situation blocks the installation of any operator that has been loaded to the mirror registry.

The logs of the catalog operator show constant connection errors

```
Unset
I0309 17:41:44.746653       1 event.go:298] Event(v1.ObjectReference{Kind:"Namespace",
Namespace:"", Name:"open-cluster-management", UID:"21e8b0a3-78ff-4374-90bf-820ad49ce97b",
APIVersion:"v1", ResourceVersion:"491216", FieldPath:""}): type: 'Warning' reason:
'ResolutionFailed' [failed to populate resolver cache from source
redhat-operators/openshift-marketplace: failed to list bundles: rpc error: code = Unavailable
desc = connection error: desc = "transport: Error while dialing dial tcp 172.30.192.30:50051:
connect: connection refused", failed to populate resolver cache from source
community-operators/openshift-marketplace: failed to list bundles: rpc error: code =
```

```
Unavailable desc = connection error: desc = "transport: Error while dialing dial tcp
172.30.238.156:50051: connect: connection refused", failed to populate resolver cache from
source certified-operators/openshift-marketplace: failed to list bundles: rpc error: code =
Unavailable desc = connection error: desc = "transport: Error while dialing dial tcp
172.30.65.26:50051: connect: connection refused", failed to populate resolver cache from source
redhat-marketplace/openshift-marketplace: failed to list bundles: rpc error: code = Unavailable
desc = connection error: desc = "transport: Error while dialing dial tcp 172.30.142.8:50051:
connect: connection refused"]
```

To fix this situation, Disable the default OperatorHub sources.

```
Unset
$ oc patch OperatorHub cluster --type json \
  -p '[{"op": "add", "path": "/spec/disableAllDefaultSources", "value": true}]'

$ oc get operatorhub cluster -o yaml
apiVersion: config.openshift.io/v1
kind: OperatorHub
metadata:
 annotations:
  capability.openshift.io/name: marketplace
  include.release.openshift.io/ibm-cloud-managed: "true"
  include.release.openshift.io/self-managed-high-availability: "true"
  include.release.openshift.io/single-node-developer: "true"
  release.openshift.io/create-only: "true"
 name: cluster
spec:
 disableAllDefaultSources: true
status:
 sources:
 - disabled: true
  name: redhat-operators
  status: Success
 - disabled: true
  name: certified-operators
  status: Success
 - disabled: true
  name: community-operators
  status: Success
 - disabled: true
  name: redhat-marketplace
  status: Success
```

To include operator images in the mirror registry we need to collect some additional information.

All these commands take up to a couple of minutes to execute. Faster alternatives may exist using **opm** or **grpcurl**

Get the catalogs

```
Unset
$ oc-mirror list operators --catalogs --version=4.15 > catalogs_4.15

$ cat catalogs_4.15
Available OpenShift OperatorHub catalogs:
OpenShift 4.15:
registry.redhat.io/redhat/redhat-operator-index:v4.15
registry.redhat.io/redhat/certified-operator-index:v4.15
registry.redhat.io/redhat/community-operator-index:v4.15
registry.redhat.io/redhat/redhat-marketplace-index:v4.15
```

Find the available packages in each catalog

```
Unset
$ oc-mirror list operators \
  --catalog=registry.redhat.io/redhat/redhat-operator-index:v4.15 \
  > redhat_package_4.15

$ oc-mirror list operators \
  --catalog=registry.redhat.io/redhat/certified-operator-index:v4.15 \
  > certified_package_4.15

$ oc-mirror list operators \
  --catalog=registry.redhat.io/redhat/community-operator-index:v4.15 \
  > community_package_4.15

$ oc-mirror list operators \
  --catalog=registry.redhat.io/redhat/redhat-marketplace-index:v4.15 \
  > marketplace_package_4.15
```

Find the available channels for the selected packages. This command is very slow, if you are requesting information about several operators, it can take a long time to complete.

```
Unset
$ oc-mirror list operators \
 --catalog=registry.redhat.io/redhat/redhat-operator-index:v4.15 \
 --package=advanced-cluster-management
NAME                          DISPLAY NAME                                  DEFAULT CHANNEL
advanced-cluster-management   Advanced Cluster Management for Kubernetes   release-2.9
```

```
PACKAGE                       CHANNEL       HEAD
advanced-cluster-management   release-2.9   advanced-cluster-management.v2.9.2
```

Find the package versions within the selected channel

```Unset
$ oc-mirror list operators \
  --catalog=registry.redhat.io/redhat/redhat-operator-index:v4.15 \
  --package=advanced-cluster-management --channel=release-2.9
VERSIONS
2.9.0
2.9.1
2.9.2
```

With this information add a new section for the operators to the **ImageSetConfiguration** file

```Unset
kind: ImageSetConfiguration
apiVersion: mirror.openshift.io/v1alpha2
storageConfig:
  registry:
    imageURL: bastion-995pv.995pv.dynamic.opentlc.com:443/mirror/oc-mirror-metadata
    skipTLS: true
mirror:
  platform:
    architectures:
    - amd64
    channels:
    - name: stable-4.15
      minVersion: 4.15.0
      maxVersion: 4.15.0
      type: ocp
  operators:
    - catalog: registry.redhat.io/redhat/redhat-operator-index:v4.15
      packages:
      - name: advanced-cluster-management
        channels:
        - name: release-2.9
          minVersion: '2.9.1'
          maxVersion: '2.9.2'
      - name: multicluster-engine
        channels: stable-2.4
        - name:
```

```
        minVersion: '2.4.2'
        maxVersion: '2.4.3'
```

Mirror the content, in this example the packages are downloaded to the local filesystem (/var/mirror-registry/operator_catalog) instead of uploading them directly to the mirror registry. The directory is created if it does not exist.

This command takes quite some time to complete, to the point where it looks like it is hung.

```
Unset
$ oc mirror --config=./imageset-config.yaml \
  file:///var/mirror-registry/operator_catalog --dest-skip-tls
Creating directory: /var/mirror-registry/operator_catalog/oc-mirror-workspace/src/publish
Creating directory: /var/mirror-registry/operator_catalog/oc-mirror-workspace/src/v2
Creating directory: /var/mirror-registry/operator_catalog/oc-mirror-workspace/src/charts
Creating directory: /var/mirror-registry/operator_catalog/oc-mirror-workspace/src/release-signatures

wrote mirroring manifests to
/var/mirror-registry/operator_catalog/oc-mirror-workspace/operators.1709985535/manifests-r
edhat-operator-index
...
info: Mirroring completed in 1m47.59s (133MB/s)
Creating archive /var/mirror-registry/operator_catalog/mirror_seq2_000000.tar
```

One reason it takes so long is because it compares the contents of the mirror registry with the packages to be downloaded so that it only downloads the packages that are not already in the mirror registry. Running the same command a second time renders the following result:

```
Unset
$ oc mirror --config=./2imageset-config.yaml file:///var/mirror-registry/operator_catalog
--dest-skip-tls
Creating directory: /var/mirror-registry/operator_catalog/oc-mirror-workspace/src/publish
Creating directory: /var/mirror-registry/operator_catalog/oc-mirror-workspace/src/v2
Creating directory: /var/mirror-registry/operator_catalog/oc-mirror-workspace/src/charts
Creating directory:
/var/mirror-registry/operator_catalog/oc-mirror-workspace/src/release-signatures
wrote mirroring manifests to
/var/mirror-registry/operator_catalog/oc-mirror-workspace/operators.1709994990/manifests-r
edhat-operator-index

To upload local images to a registry, run:

       oc adm catalog mirror file://redhat/redhat-operator-index:v4.15 REGISTRY/REPOSITORY
```

```
No new images detected, process stopping
```

The file needs to be uploaded to the mirror registry from the first bastion where the public DNS name can be used to access the mirror registry, so the tar file will not be transferred to the second bastion and will not be loaded from there as would be the case in another less stringent situation.

Load the file from the first bastion into the second bastion

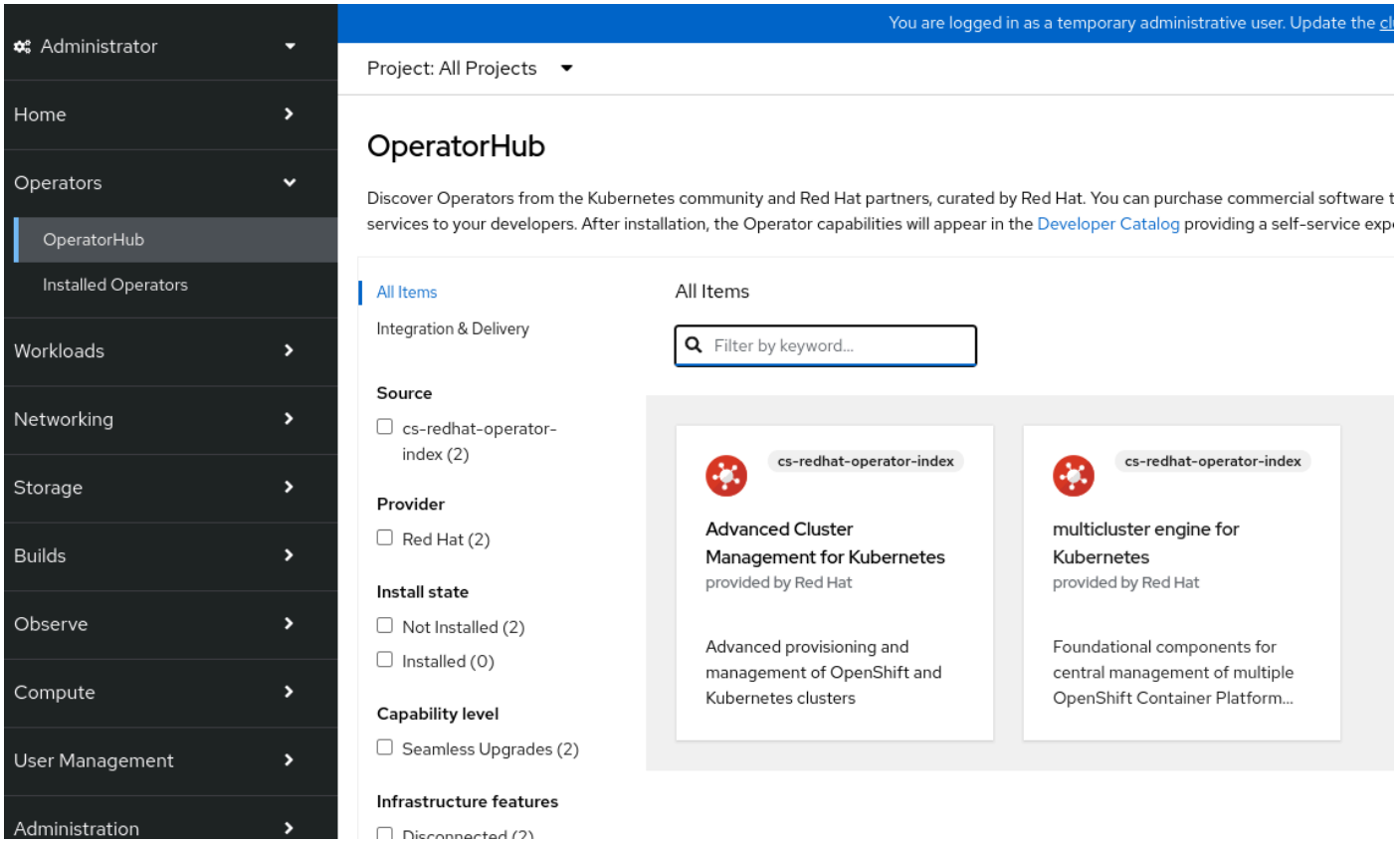
```
Unset
$ oc mirror --from=/var/mirror-registry/operator_catalog/mirror_seq2_000000.tar \
  docker://bastion-995pv.995pv.dynamic.opentlc.com:443 --dest-skip-tls
Checking push permissions for bastion-995pv.995pv.dynamic.opentlc.com:443

Publishing image set from archive
"/var/mirror-registry/operator_catalog/mirror_seq2_000000.tar" to registry
"bastion-995pv.995pv.dynamic.opentlc.com:443"
...
Rendering catalog image
"bastion-995pv.995pv.dynamic.opentlc.com:443/redhat/redhat-operator-index:v4.15" with
file-based catalog
Writing image mapping to oc-mirror-workspace/results-1709989778/mapping.txt
Writing CatalogSource manifests to oc-mirror-workspace/results-1709989778
Writing ICSP manifests to oc-mirror-workspace/results-1709989778
```

Link the new content uploaded to the mirror registry with the OCP cluster by applying the imageContentSourcePolicy and catalogSource files generated by the oc mirror command in the first bastion host

```
Unset
$ ls -1 oc-mirror-workspace/results-1709989778/
catalogSource-cs-redhat-operator-index.yaml
charts
imageContentSourcePolicy.yaml
mapping.txt
release-signatures

$ oc apply -f oc-mirror-workspace/results-1709989778/imageContentSourcePolicy.yaml
imagecontentsourcepolicy.operator.openshift.io/operator-0 created

$ oc apply -f
oc-mirror-workspace/results-1709989778/catalogSource-cs-redhat-operator-index.yaml
catalogsource.operators.coreos.com/cs-redhat-operator-index created
```

Verify that the cluster sees the new operator. It takes a few minutes for the catalog operator to process the information and make the packagemanifests and the operators available.

```
Unset
$ oc get catalogsource -n openshift-marketplace cs-redhat-operator-index
NAME                        DISPLAY   TYPE   PUBLISHER   AGE
cs-redhat-operator-index          grpc                   7m4s

$ oc logs -f catalog-operator-674487f7b5-w4bmb -n openshift-operator-lifecycle-manager

$ oc get packagemanifests -n openshift-marketplace
NAME                        CATALOG   AGE
advanced-cluster-management              7m29s
```

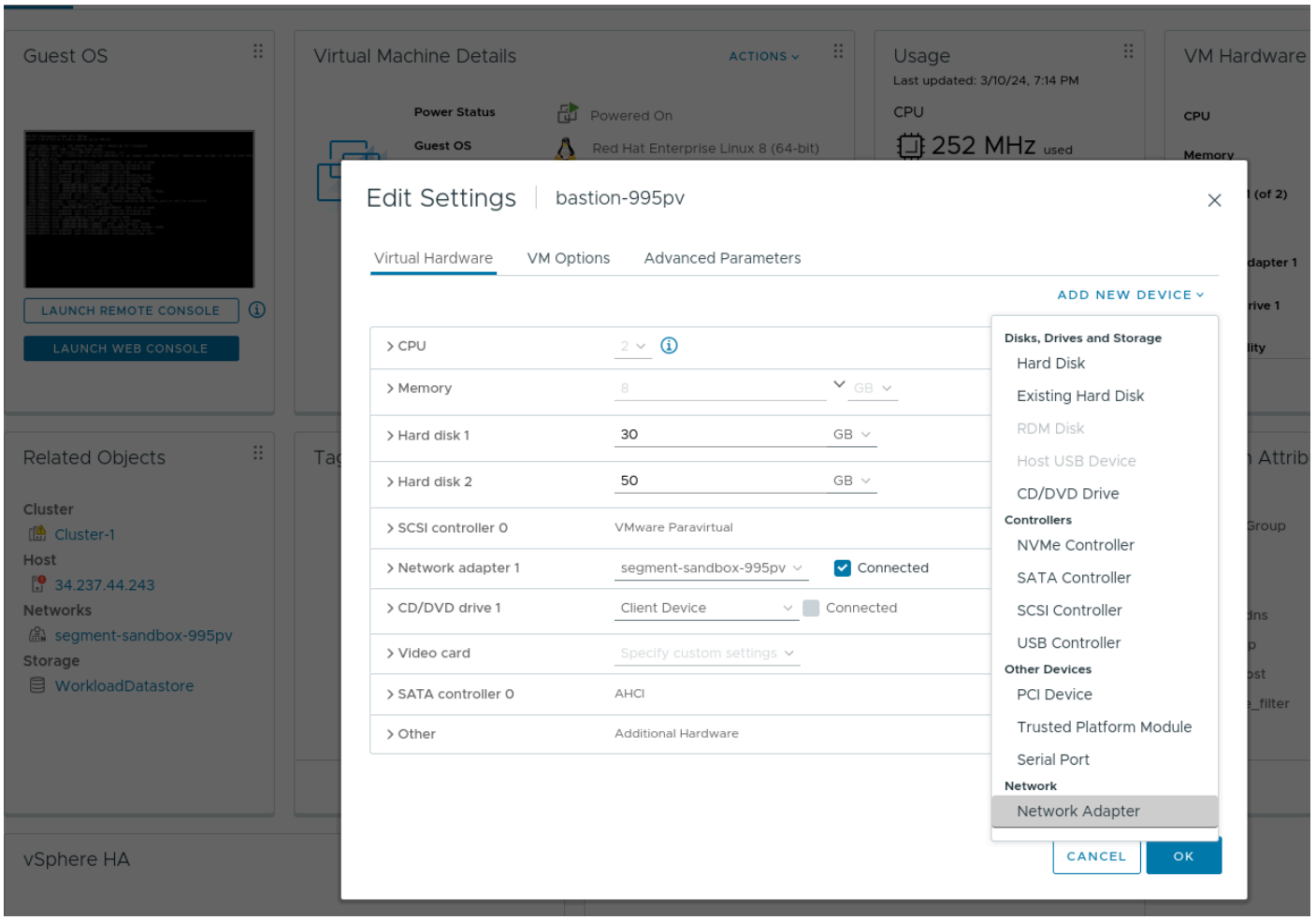


Managed cluster environment configuration

This section applies mostly to the additional **VMware Cloud Public Cloud Open Environments** where the managed OCP clusters are being installed.

The goal here is to assign the IP addresses for api and *.apps DNS records to the bastion host, and install haproxy in the bastion to redirect requests to the OCP 4 managed cluster.

On the second **VMware Cloud Public Cloud Open Environment** add a new network interface to the bastion host.



Configure the network interface to have the IP addresses assigned to the api and *.apps DNS records

API DNS api.rscp4.dynamic.opentlc.com points to NAT IP to 192.168.188.201
Wildcard DNS *.apps.rscp4.dynamic.opentlc.com points to NAT IP to 192.168.188.202

The new NIC is eth1

```
Unset
$ nmcli con show
NAME                UUID                                  TYPE   DEVICE
System eth0         5fb06bd0-0bb0-7ffb-45f1-d6edd65f3e03  ethernet  eth0
cni-podman0         9529674c-0f4d-4738-8736-1e589df0afc4  bridge   cni-podman0
Wired connection 1  1c6cb2f2-78a7-3a1a-a7ef-4d18be5d80cd  ethernet  eth1

$ sudo nmcli con down "Wired connection 1"
$ sudo nmcli con mod "Wired connection 1" ipv4.method manual ipv4.addr "192.168.188.201,
192.168.188.202"
$ sudo nmcli con up "Wired connection 1"
```

```
$ ip -4 a
...
3: eth1: <BROADCAST,MULTICAST,UP,LOWER_UP> mtu 1500 qdisc fq_codel state UP group default
qlen 1000
       inet 192.168.188.201/32 scope global noprefixroute eth1
       valid_lft forever preferred_lft forever
       inet 192.168.188.202/32 scope global noprefixroute eth1
```

Clone the following git repository:

```
Unset
$ git clone https://github.com/naps-product-sa/vmc-openshift-install-lab.git
$ cd vmc-openshift-install-lab
```

Install ansible:

```
Unset
$ sudo python3 -m pip install ansible
```

Update the vars file. Add some properties to ansible/vars.yml. We're interested in this section:

```
Unset
###### YOUR PROPERTIES HERE ######
api_ip: 192.168.188.201
apps_ip: 192.168.188.202
guid: 'rscp4'
ocp_version: 4.14.13
ocp4_pull_secret: '{"auths":{"cloud.opensh...
##################################
```

The ansible playbook is simplified so that only the tasks related to installing and enabling haproxy, and the task that downloads the oc client are run.

Run the playbook

```
Unset
$ ansible-playbook -vvv ansible/main.yml
```

Verify that haproxy is listening on the expected ports

```
Unset
$ ss -tlnp
State                       Local Address:Port                 Peer Address:Port
...
LISTEN                      192.168.188.202:443                       0.0.0.0:*

LISTEN                      192.168.188.201:22623                     0.0.0.0:*

LISTEN                      192.168.188.201:6443                      0.0.0.0:*

LISTEN                      192.168.188.202:80                        0.0.0.0:*
```

Create a Host inventory

https://access.redhat.com/documentation/en-us/red_hat_advanced_cluster_management_for_kubernetes/2.9/html/clusters/cluster_mce_overview#create-host-inventory-console-steps

Before creating the first host inventory, the host inventory settings must be set.
From the All cluster web console -> Host inventory -> Configure host inventory settings
This creates the following pods in the project **multicluster-engine**

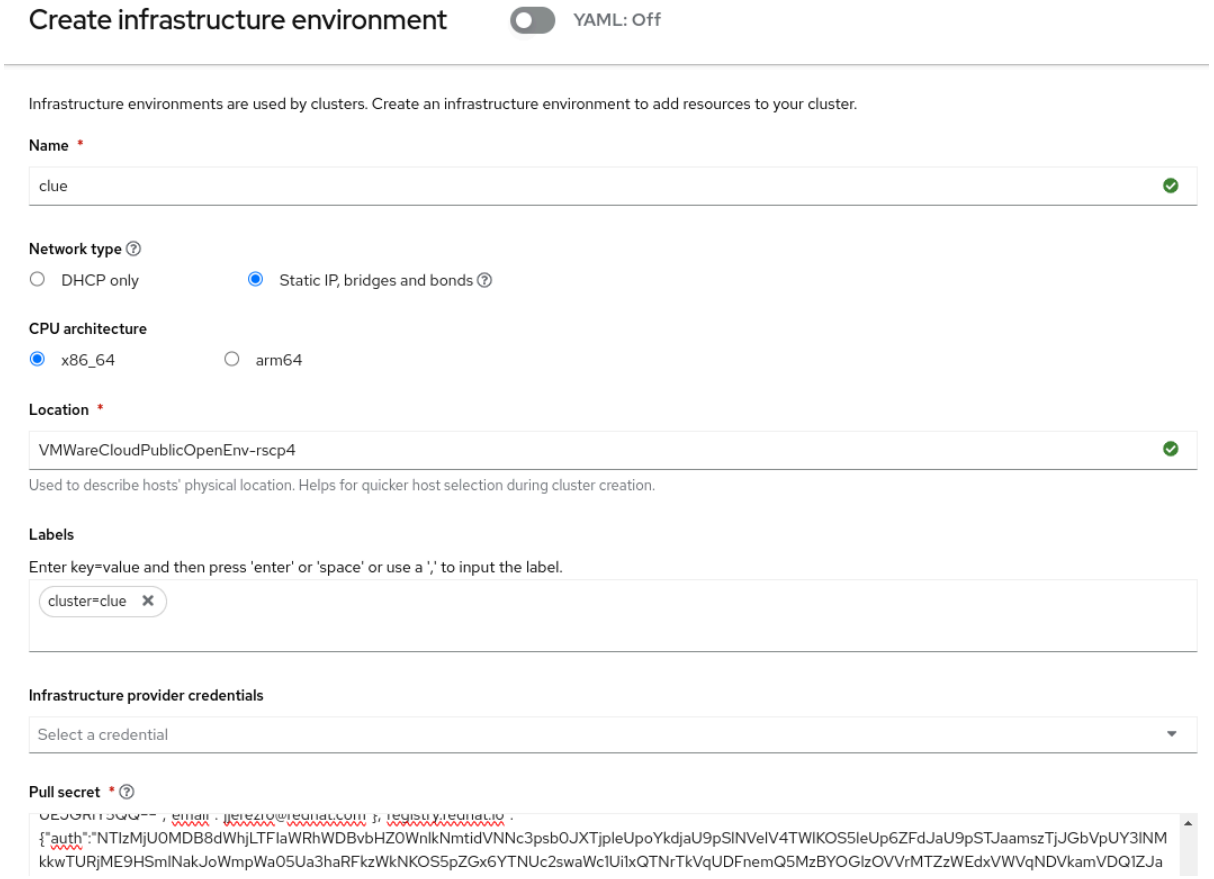
```
Unset
$ oc get pods -n multicluster-engine
agentinstalladmission-6bdf8c65d4-8pszw         1/1    Running  0    8m15s
agentinstalladmission-6bdf8c65d4-ltjnp         1/1    Running  0    8m15s
assisted-image-service-0                       1/1    Running  0    8m15s
assisted-service-5c84fc8bf9-rj5dj              2/2    Running  0    8m15s
```

And the following PVCs

```
Unset
$ oc get pvc -n multicluster-engine
NAME                        STATUS  VOLUME                    CAPACITY  ACCESS MODES
STORAGECLASS  AGE
```

```
assisted-service                  Bound  pvc-c3802bb2-bb29-4d34-b90d-6e318cf6a660  50Gi
       RWO           thin-csi      9m53s
image-service-data-assisted-image-service-0  Bound
pvc-dd039e55-d750-4d62-936a-b7447e26750e  30Gi        RWO           thin-csi      9m52s
postgres                   Bound  pvc-5de1ba28-41e1-4c7d-bad1-9d55cd2a5f9a  10Gi        RWO
       thin-csi      9m53s
```

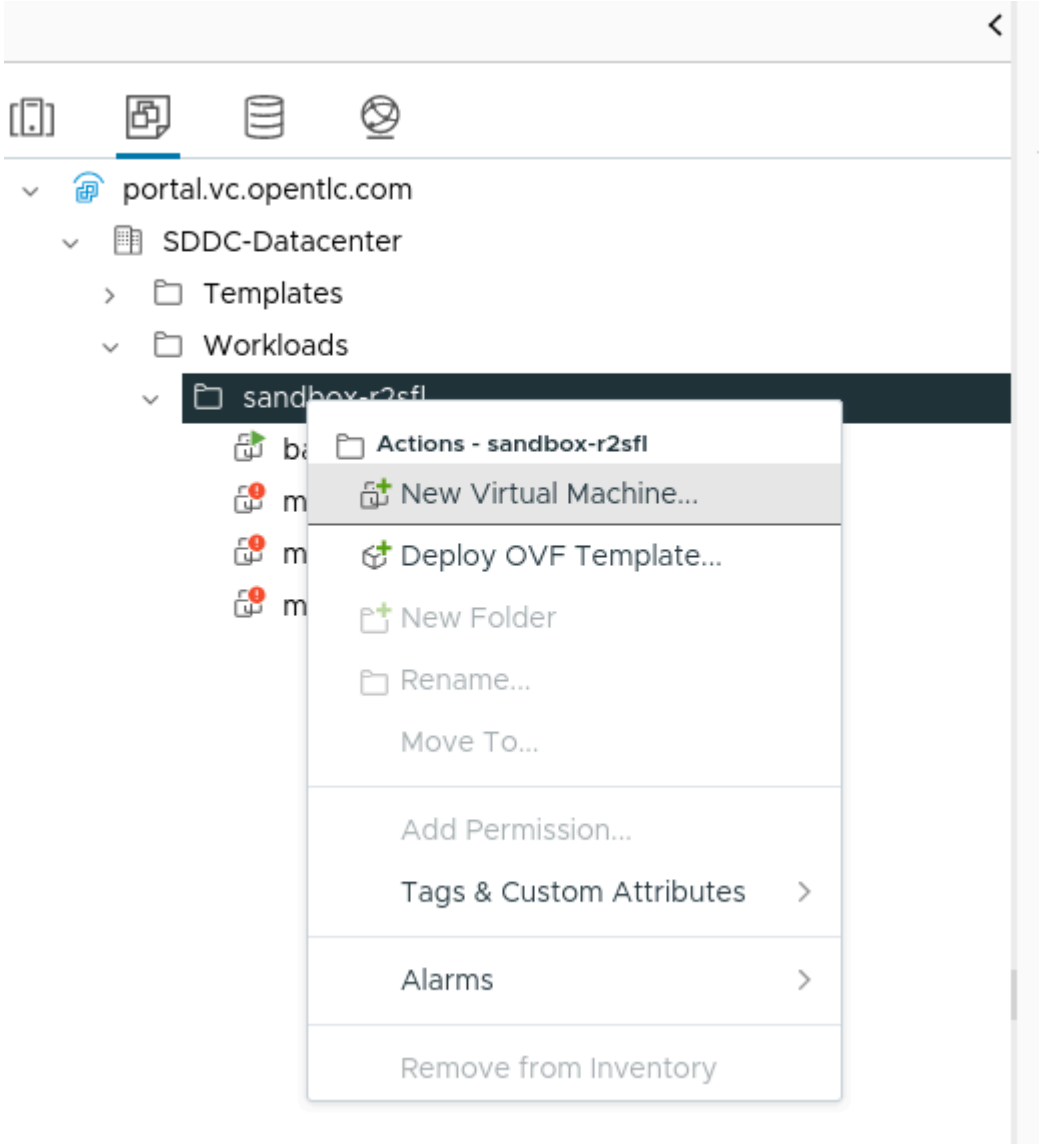
Create the infrastructure environment by clicking on the blue button on the middle of the Host inventory page.

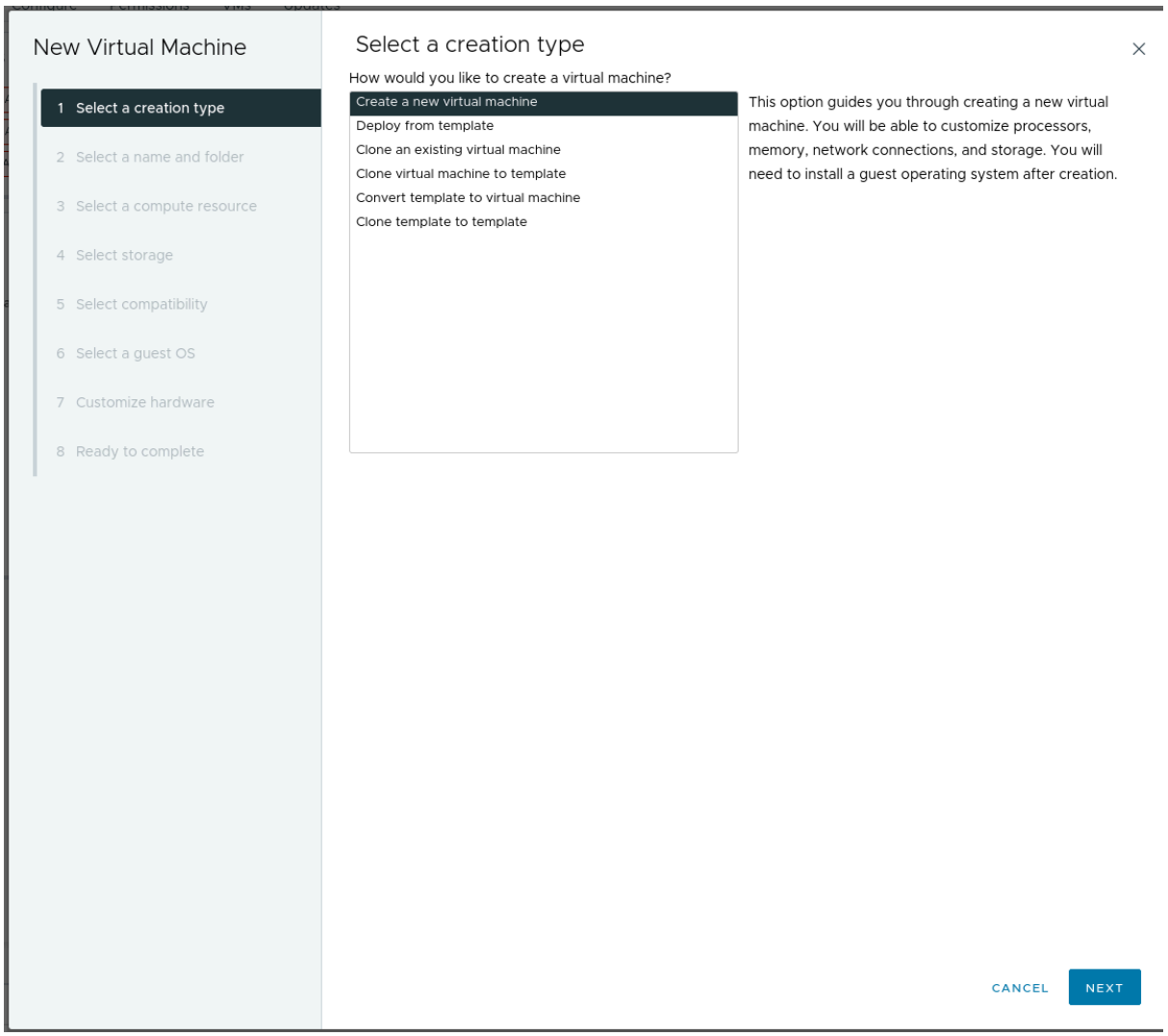


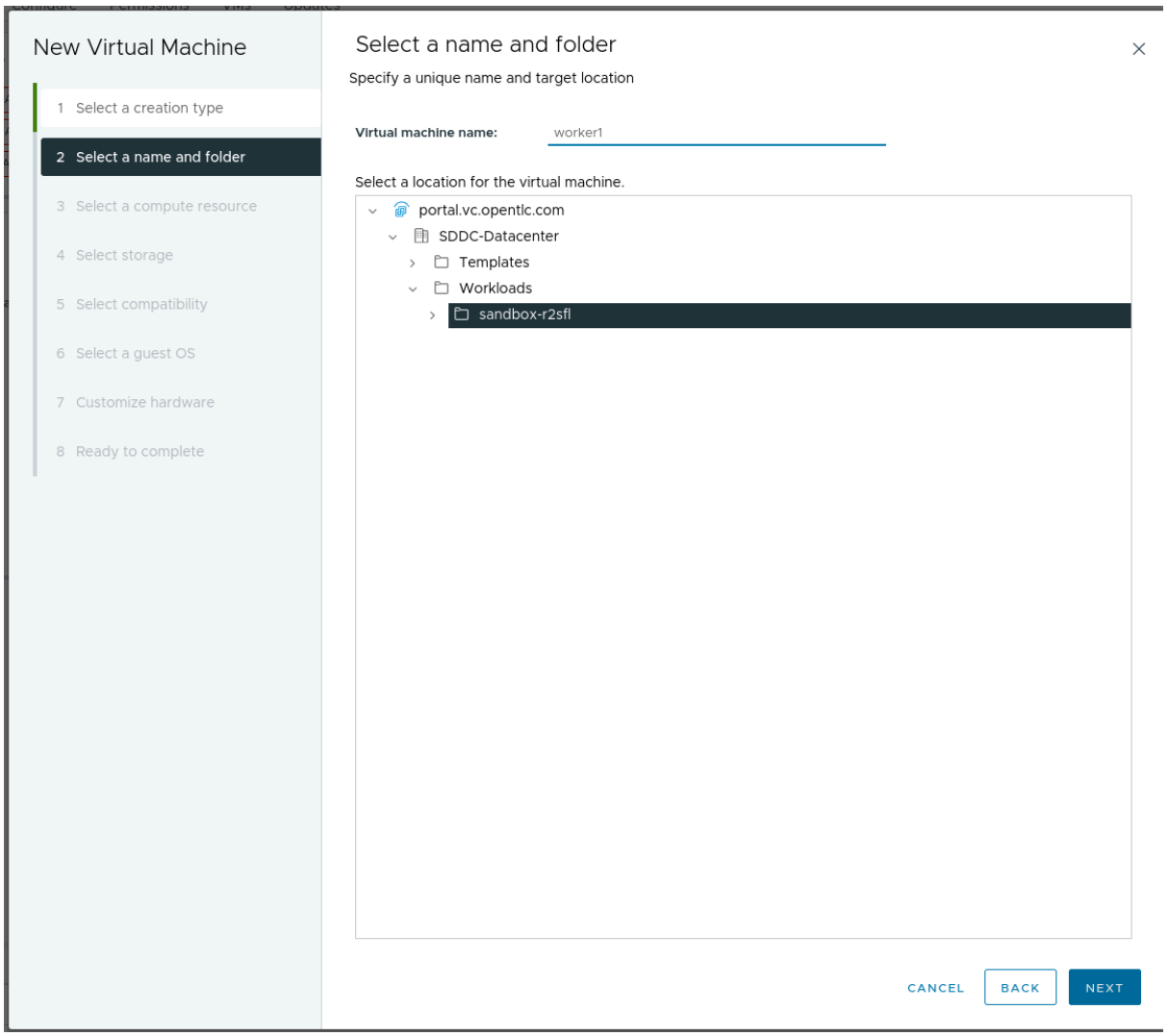
Create new VMs

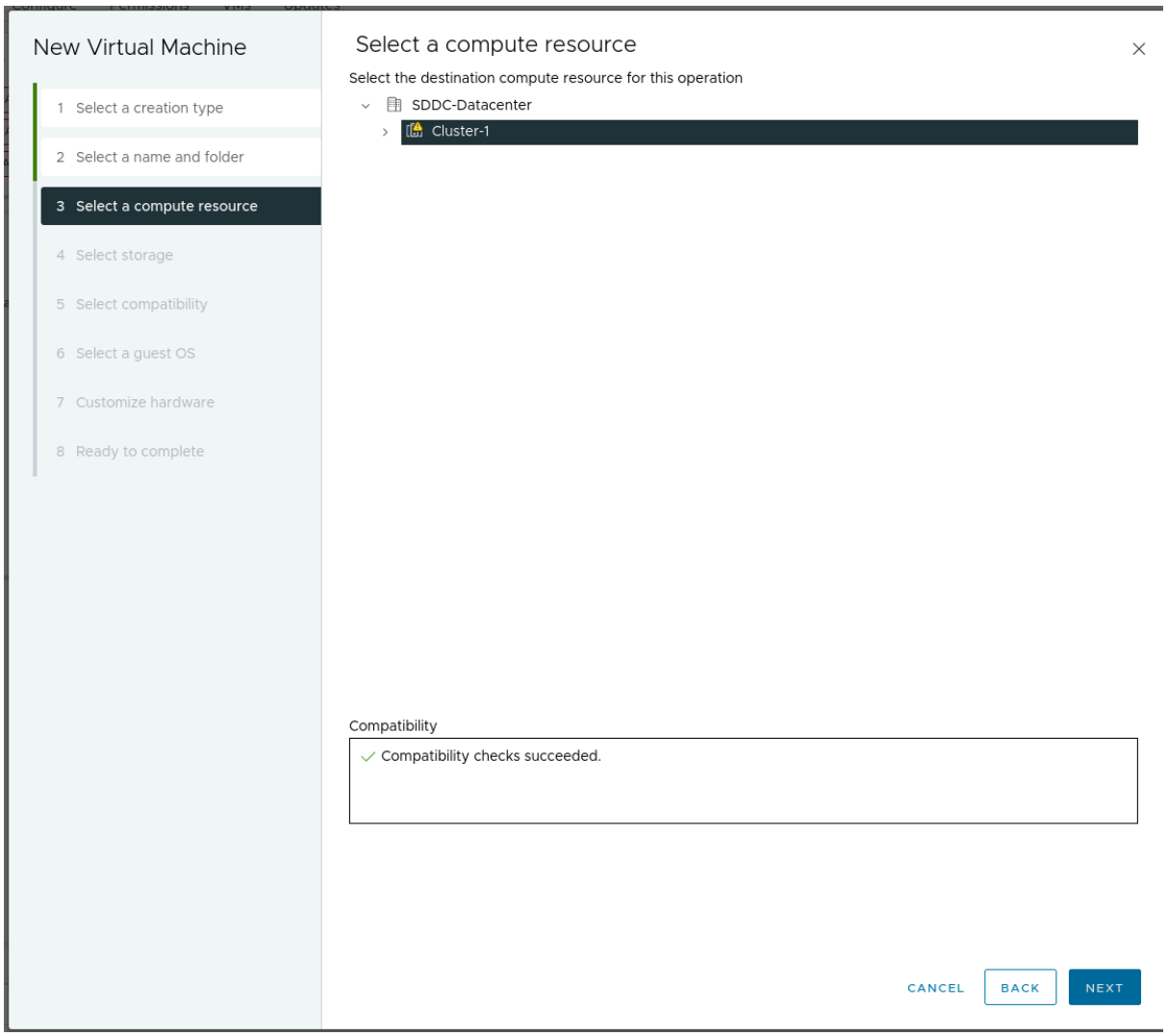
Create new virtual machines in vsphere.
Most of the information is left as default, exceptions are:

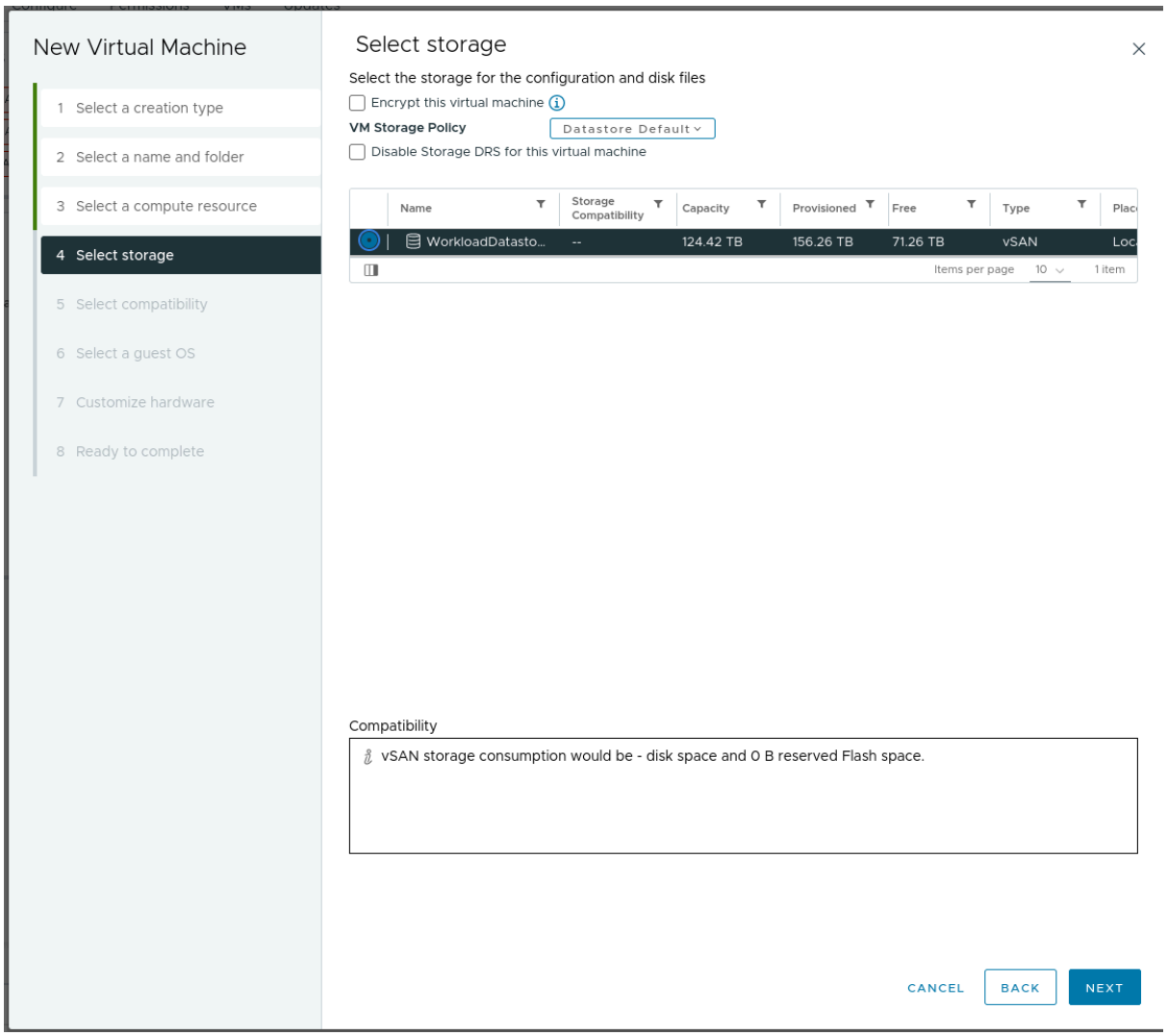
- The guest OS is changed to Linux - RHEL 8
- Hardware resources are updated to 4 CPU; 16GB RAM; 120GB disk
- In advance parameters tab, the diskEnableUUID=TRUE is added

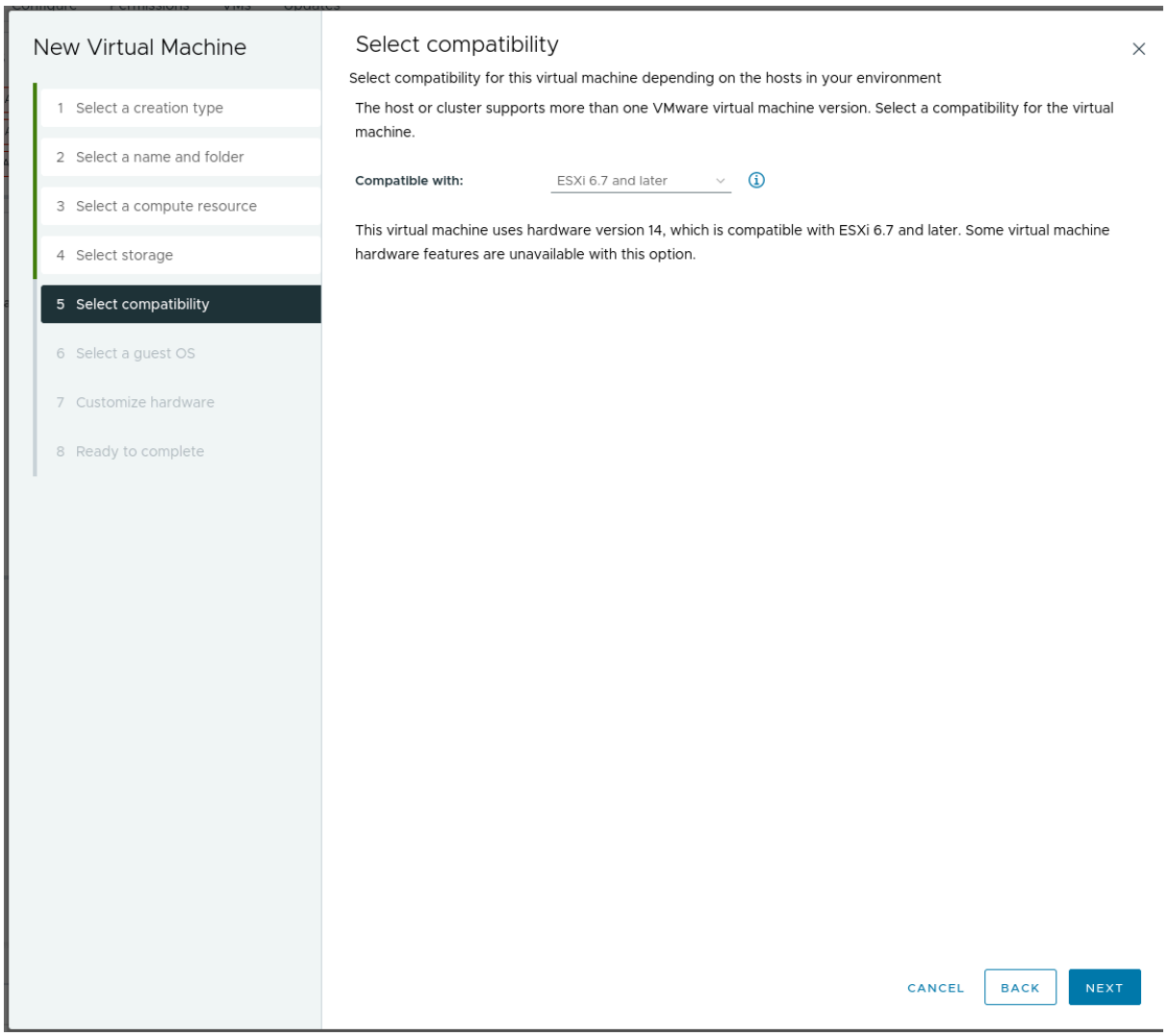

portal.vc.opentlc.com
SDDC-Datacenter
Templates
Workloads
Actions - sandbox-r2sfl
New Virtual Machine...
Deploy OVF Template...
New Folder
Rename...
Move To...
Add Permission...
Tags & Custom Attributes
Alarms
Remove from Inventory

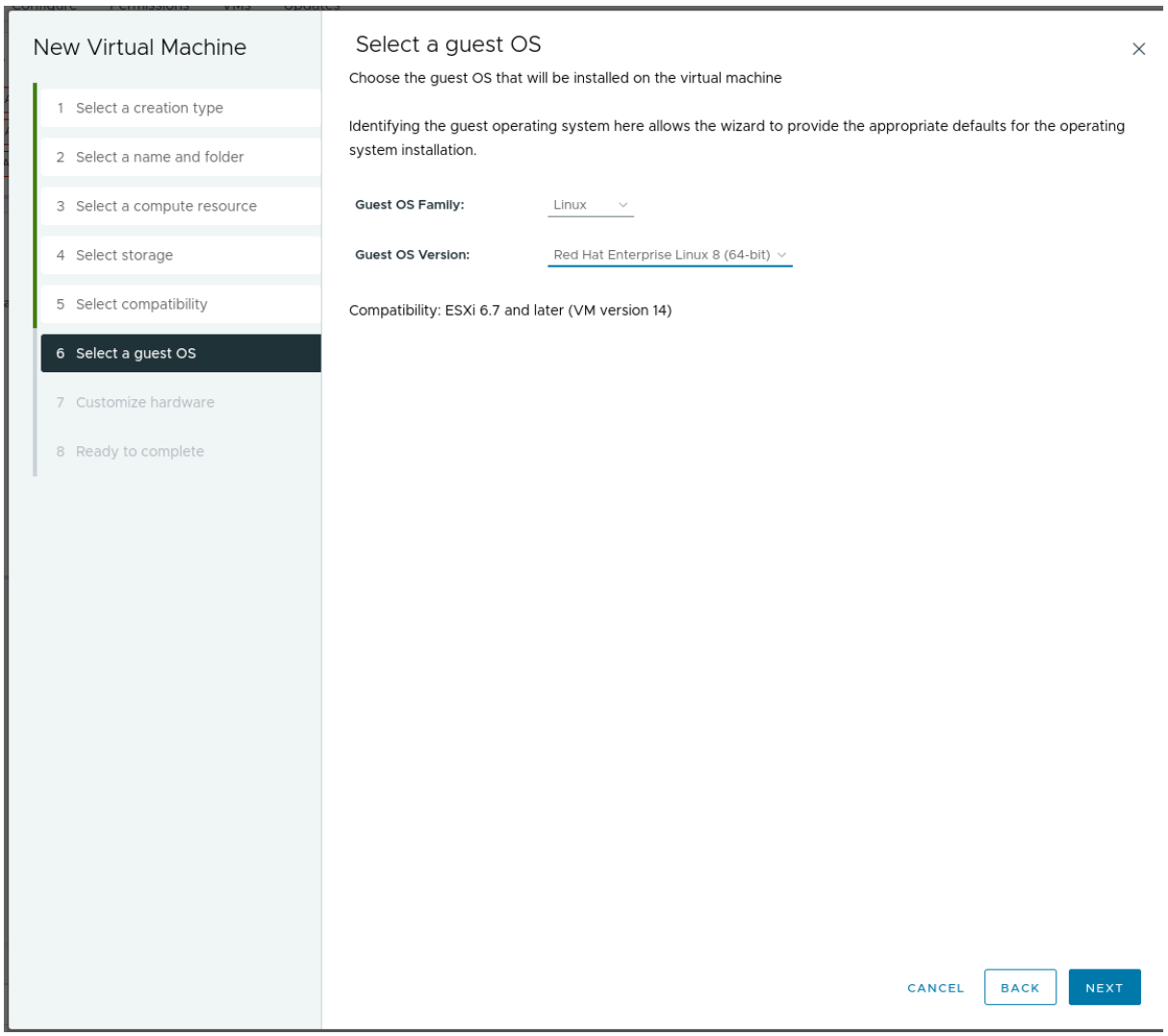

New Virtual Machine
1 Select a creation type
2 Select a name and folder
3 Select a compute resource
4 Select storage
5 Select compatibility
6 Select a guest OS
7 Customize hardware
8 Ready to complete
Select a creation type
How would you like to create a virtual machine?
Create a new virtual machine
Deploy from template
Clone an existing virtual machine
Clone virtual machine to template
Convert template to virtual machine
Clone template to template
This option guides you through creating a new virtual machine. You will be able to customize processors, memory, network connections, and storage. You will need to install a guest operating system after creation.
CANCEL
NEXT

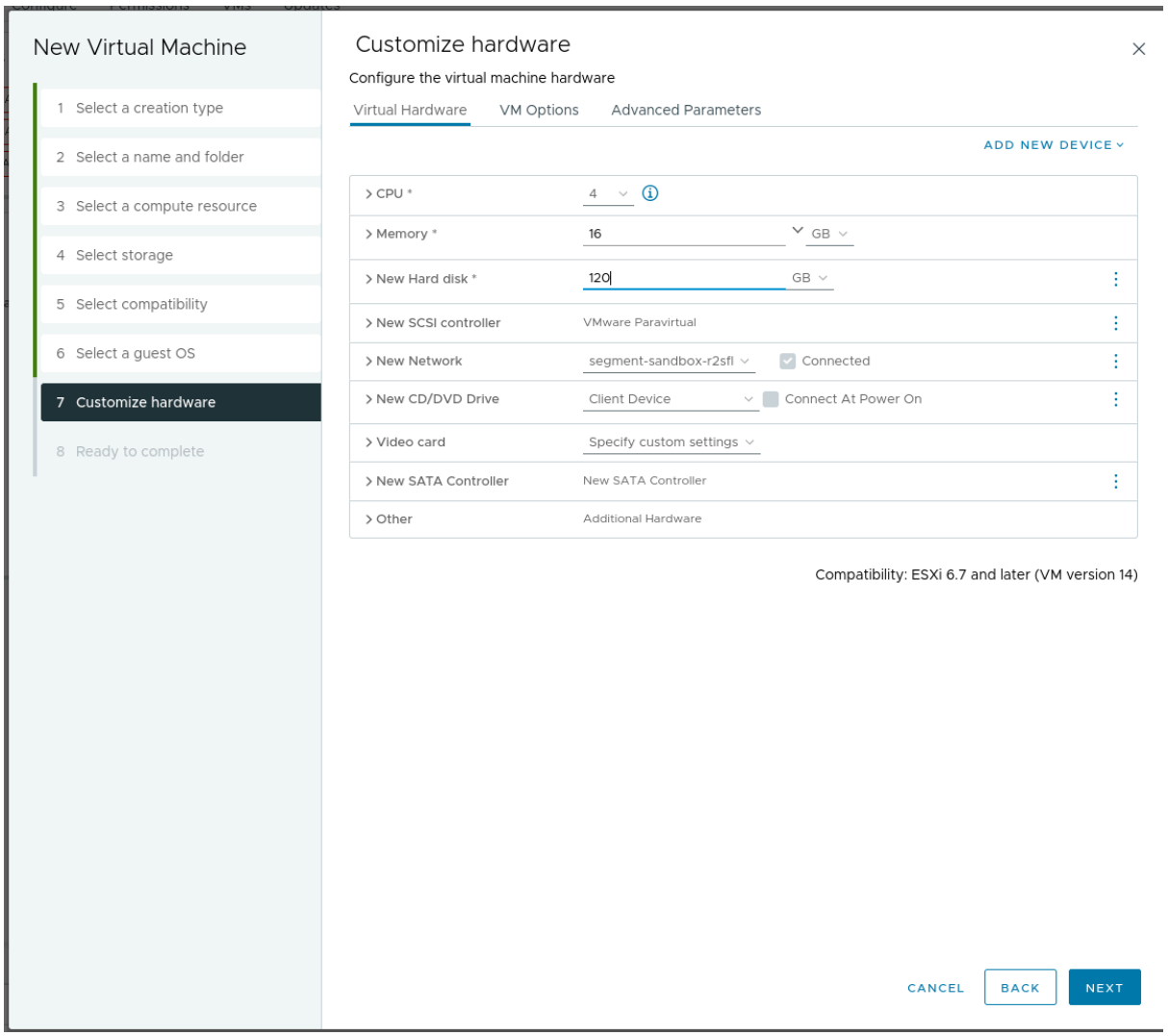

New Virtual Machine
1 Select a creation type
2 Select a name and folder
3 Select a compute resource
4 Select storage
5 Select compatibility
6 Select a guest OS
7 Customize hardware
8 Ready to complete
Select a name and folder
Specify a unique name and target location
Virtual machine name:
worker1
Select a location for the virtual machine.
portal.vc.opentlc.com
SDDC-Datacenter
Templates
Workloads
sandbox-r2sfl
CANCEL
BACK
NEXT

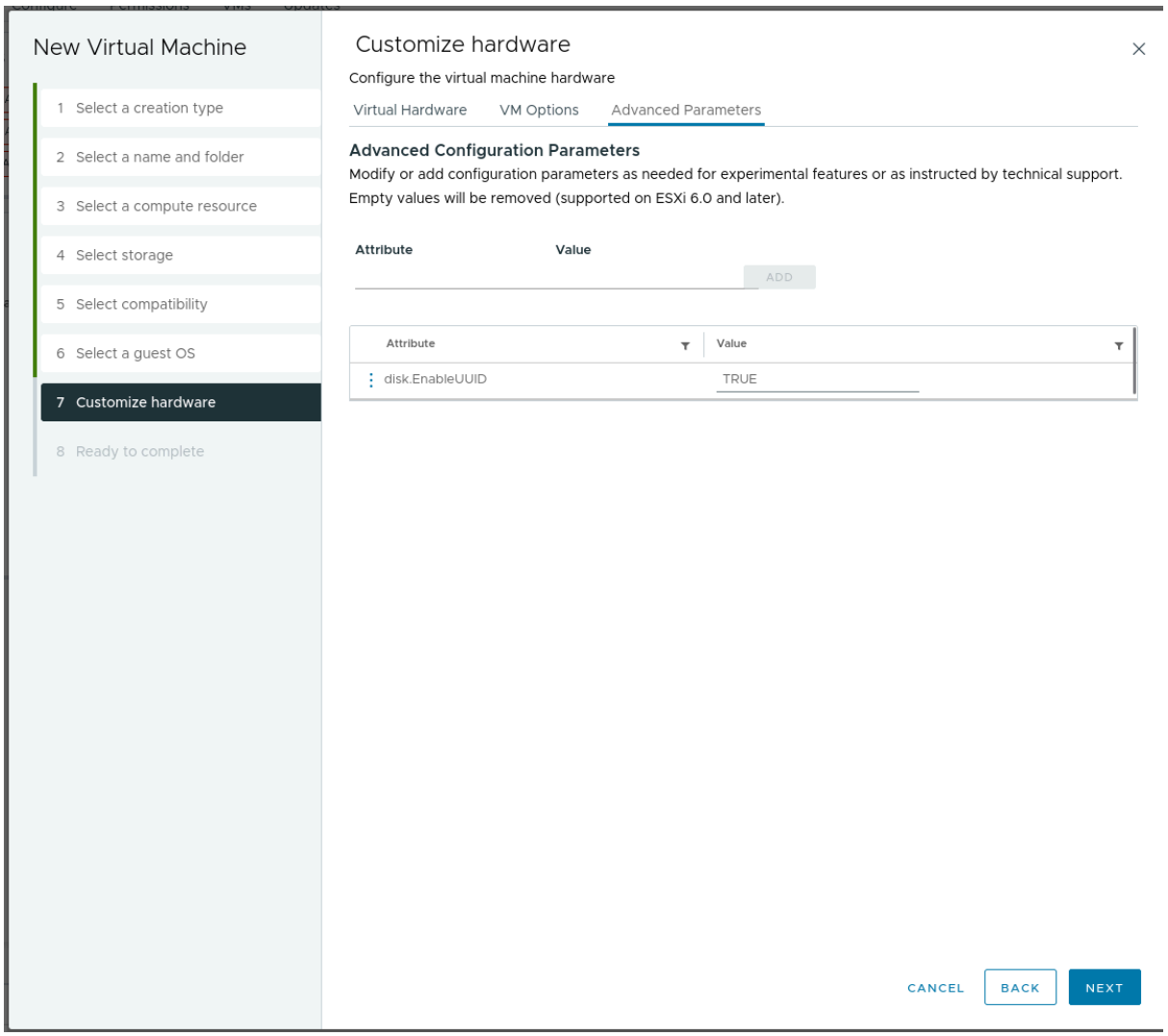

New Virtual Machine
1 Select a creation type
2 Select a name and folder
3 Select a compute resource
4 Select storage
5 Select compatibility
6 Select a guest OS
7 Customize hardware
8 Ready to complete
Select a compute resource
Select the destination compute resource for this operation
SDDC-Datacenter
Cluster-1
Compatibility
Compatibility checks succeeded.
CANCEL
BACK
NEXT

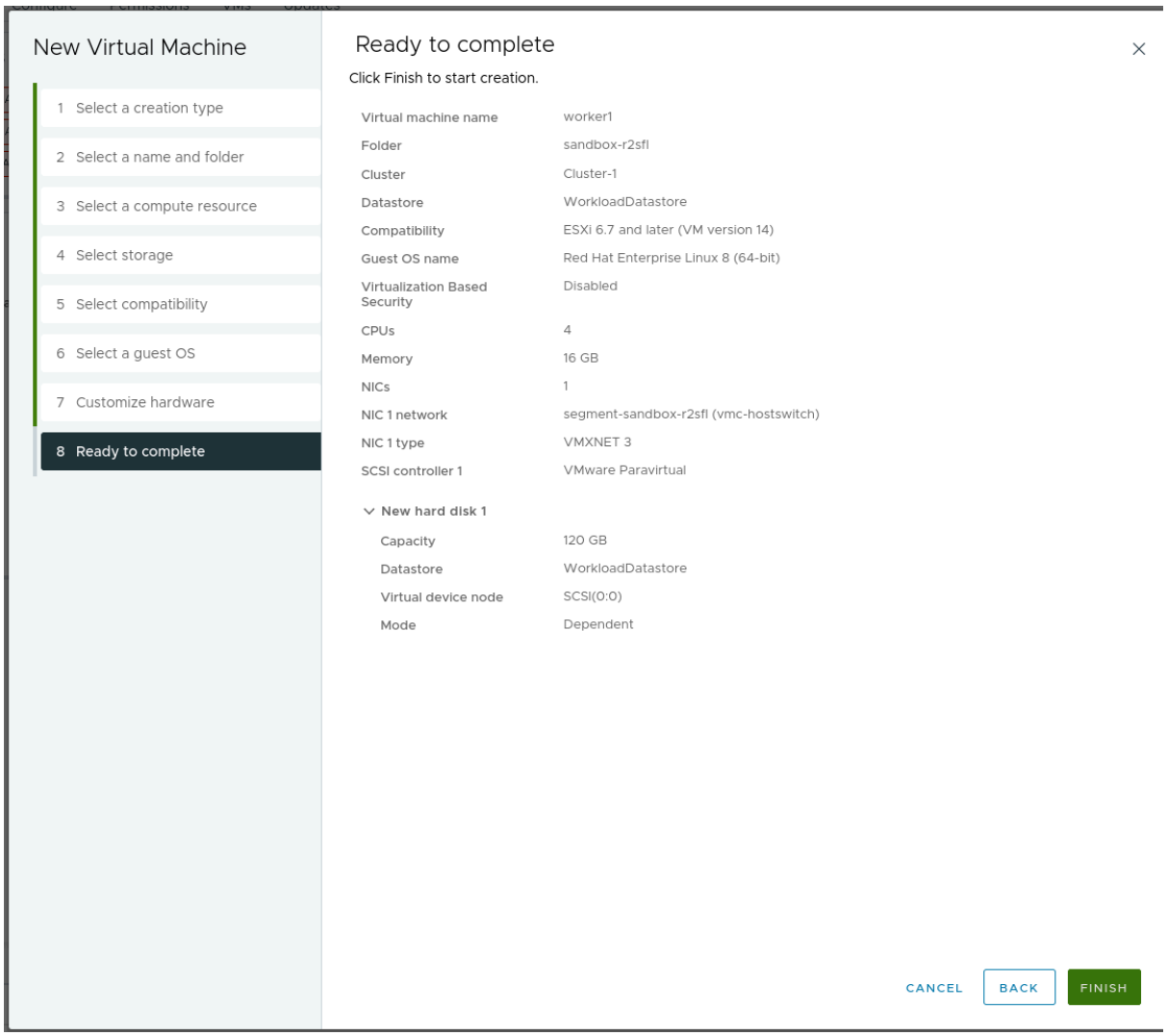

New Virtual Machine
1 Select a creation type
2 Select a name and folder
3 Select a compute resource
4 Select storage
5 Select compatibility
6 Select a guest OS
7 Customize hardware
8 Ready to complete
Select storage
Select the storage for the configuration and disk files
Encrypt this virtual machine
VM Storage Policy
Datastore Default
Disable Storage DRS for this virtual machine
Name
Storage Compatibility
Capacity
Provisioned
Free
Type
WorkloadDatasto...
--
124.42 TB
156.26 TB
71.26 TB
vSAN
Items per page
10
1 item
Compatibility
vSAN storage consumption would be - disk space and 0 B reserved Flash space.
CANCEL
BACK
NEXT


New Virtual Machine
1 Select a creation type
2 Select a name and folder
3 Select a compute resource
4 Select storage
5 Select compatibility
6 Select a guest OS
7 Customize hardware
8 Ready to complete
Select compatibility
Select compatibility for this virtual machine depending on the hosts in your environment
The host or cluster supports more than one VMware virtual machine version. Select a compatibility for the virtual machine.
Compatible with:
ESXi 6.7 and later
This virtual machine uses hardware version 14, which is compatible with ESXi 6.7 and later. Some virtual machine hardware features are unavailable with this option.
CANCEL
BACK
NEXT


New Virtual Machine
1 Select a creation type
2 Select a name and folder
3 Select a compute resource
4 Select storage
5 Select compatibility
6 Select a guest OS
7 Customize hardware
8 Ready to complete
Select a guest OS
Choose the guest OS that will be installed on the virtual machine
Identifying the guest operating system here allows the wizard to provide the appropriate defaults for the operating system installation.
Guest OS Family:
Linux
Guest OS Version:
Red Hat Enterprise Linux 8 (64-bit)
Compatibility: ESXi 6.7 and later (VM version 14)
CANCEL
BACK
NEXT


New Virtual Machine
1 Select a creation type
2 Select a name and folder
3 Select a compute resource
4 Select storage
5 Select compatibility
6 Select a guest OS
7 Customize hardware
8 Ready to complete
Customize hardware
Configure the virtual machine hardware
Virtual Hardware
VM Options
Advanced Parameters
ADD NEW DEVICE
CPU *
4
Memory *
16
GB
New Hard disk *
120
GB
New SCSI controller
VMware Paravirtual
New Network
segment-sandbox-r2sfl
Connected
New CD/DVD Drive
Client Device
Connect At Power On
Video card
Specify custom settings
New SATA Controller
New SATA Controller
Other
Additional Hardware
Compatibility: ESXi 6.7 and later (VM version 14)
CANCEL
BACK
NEXT


New Virtual Machine
1 Select a creation type
2 Select a name and folder
3 Select a compute resource
4 Select storage
5 Select compatibility
6 Select a guest OS
7 Customize hardware
8 Ready to complete
Customize hardware
Configure the virtual machine hardware
Virtual Hardware
VM Options
Advanced Parameters
Advanced Configuration Parameters
Modify or add configuration parameters as needed for experimental features or as instructed by technical support.
Empty values will be removed (supported on ESXi 6.0 and later).
Attribute
Value
ADD
Attribute
Value
disk.EnableUUID
TRUE
CANCEL
BACK
NEXT



Advance network configuration

If the hosts need to get advanced network configuration, like is the case in the demo.redhat.com environment, where DHCP is available but the IP is unpredictable, so static IPs must be assigned to the nodes so they can be used in the DNS and LB configurations, then add a nmstateconfig object for each of the nodes that are going to be added to the cluster.
https://access.redhat.com/documentation/en-us/red_hat_advanced_cluster_management_for_kubernetes/2.9/html/clusters/cluster_mce_overview#cim-network-steps

https://access.redhat.com/documentation/es-es/openshift_container_platform/4.12/html/installing/installing-an-on-premise-cluster-with-the-agent-based-installer#sample-ztp-custom-resources_installing-with-agent-based-installer

The nmstateconfig definitions are similar to the following, one for each node in the cluster.
The MACs are obtained from the vsphere VMs, the IPs are obtained from the haproxy configuration, the label from the infraenv object in ACM, the DNS IP is obtained from the /etc/resolv.conf file, the default route IP is obtained from the command “ip route”

```
Unset
apiVersion: agent-install.openshift.io/v1beta1
kind: NMStateConfig
metadata:
 name: master-1
 namespace: hybridcluster
 labels:
       infraenvs.agent-install.openshift.io: hybridcluster
spec:
 config:
  interfaces:
   - name: eth0
     type: ethernet
     state: up
     mac-address: 00:50:56:a2:5d:4d
     ipv4:
      enabled: true
      address:
       - ip: 192.168.64.101
         prefix-length: 24
      dhcp: false
  dns-resolver:
   config:
    server:
     - 192.168.64.10
  routes:
   config:
    - destination: 0.0.0.0/0
      next-hop-address: 192.168.64.1
      next-hop-interface: eth0
      table-id: 254
 interfaces:
  - name: "eth0"
    macAddress: 00:50:56:a2:5d:4d
---
apiVersion: agent-install.openshift.io/v1beta1
kind: NMStateConfig
metadata:
  name: master-2
  namespace: hybridcluster
  labels:
       infraenvs.agent-install.openshift.io: hybridcluster
spec:
  config:
       interfaces:
       - name: eth0
       type: ethernet
       state: up
       mac-address: 00:50:56:a2:e9:43
```

```
      ipv4:
      enabled: true
      address:
            - ip: 192.168.64.102
            prefix-length: 24
      dhcp: false
      dns-resolver:
      config:
      server:
      - 192.168.64.10
      routes:
      config:
      - destination: 0.0.0.0/0
      next-hop-address: 192.168.64.1
      next-hop-interface: eth0
      table-id: 254
  interfaces:
      - name: "eth0"
      macAddress: 00:50:56:a2:e9:43
---
apiVersion: agent-install.openshift.io/v1beta1
kind: NMStateConfig
metadata:
  name: master-3
  namespace: hybridcluster
  labels:
      infraenvs.agent-install.openshift.io: hybridcluster
spec:
  config:
      interfaces:
      - name: eth0
      type: ethernet
      state: up
      mac-address: 00:50:56:a2:4a:1d
      ipv4:
      enabled: true
      address:
            - ip: 192.168.64.103
            prefix-length: 24
      dhcp: false
      dns-resolver:
      config:
      server:
      - 192.168.64.10
      routes:
      config:
      - destination: 0.0.0.0/0
      next-hop-address: 192.168.64.1
```

```
      next-hop-interface: eth0
      table-id: 254
  interfaces:
      - name: "eth0"
      macAddress: 00:50:56:a2:4a:1d
```

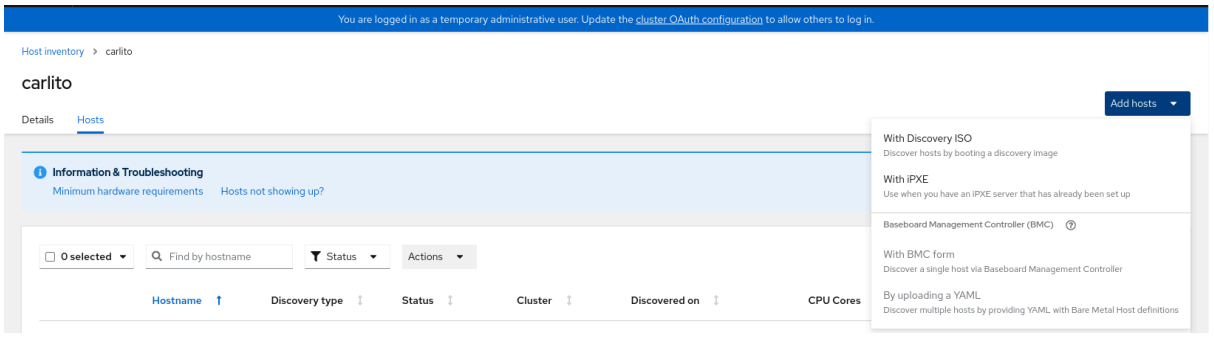
Apply the objects to the cluster:

```
Unset
$ oc apply -f nmstate-master-1.yaml
$ oc apply -f nmstate-master-2.yaml
$ oc apply -f nmstate-master-3.yaml

$ oc get nmstateconfig -n hybridcluster
NAME          AGE
master-1    6m25s
master-2    5m40s
master-3    5m35s
```

After applying the nmstateconfig objects, a new discovery ISO Image is created

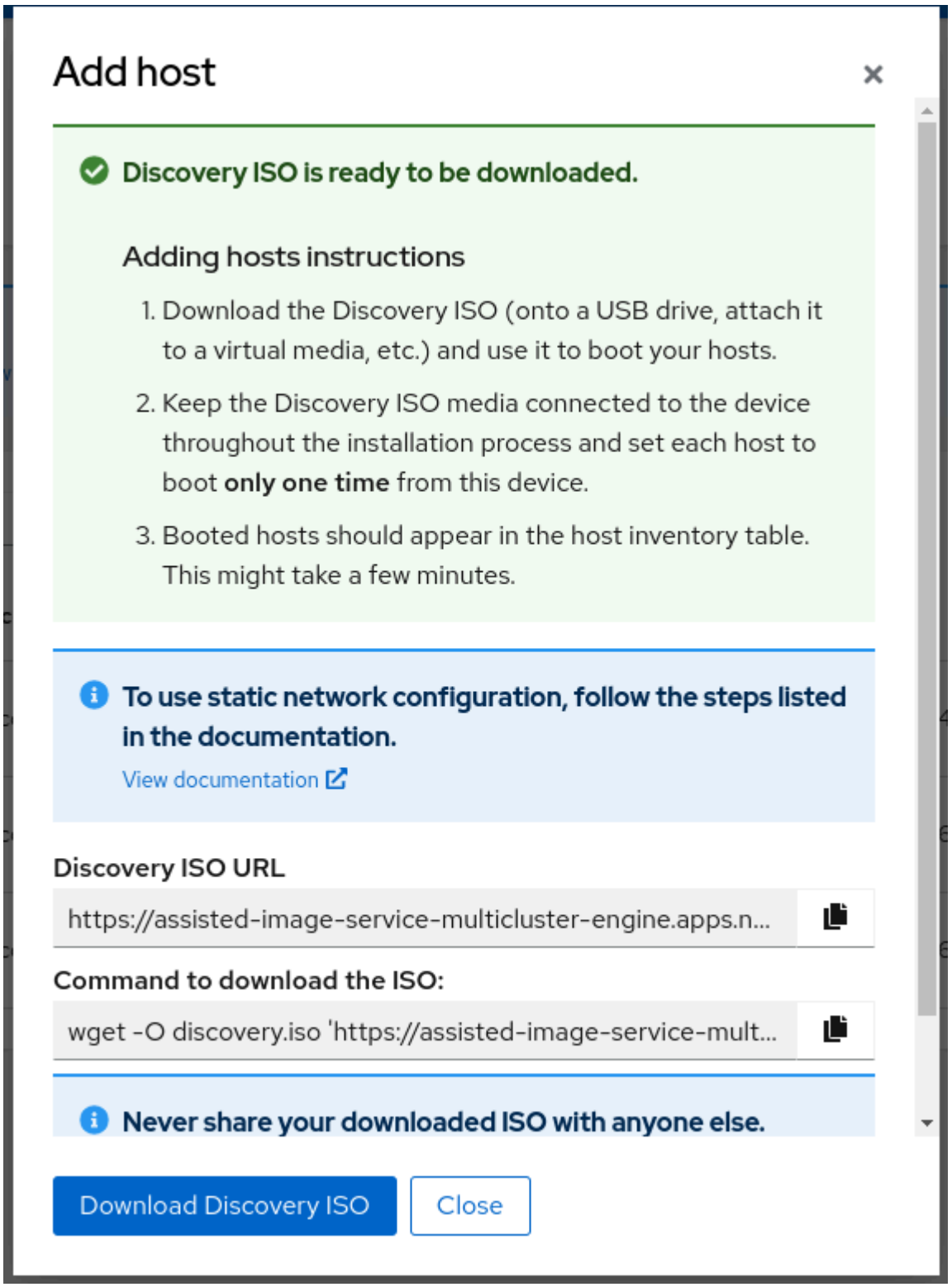
Download the discovery ISO

From Host inventory -> Add hosts -> With Discovery ISO



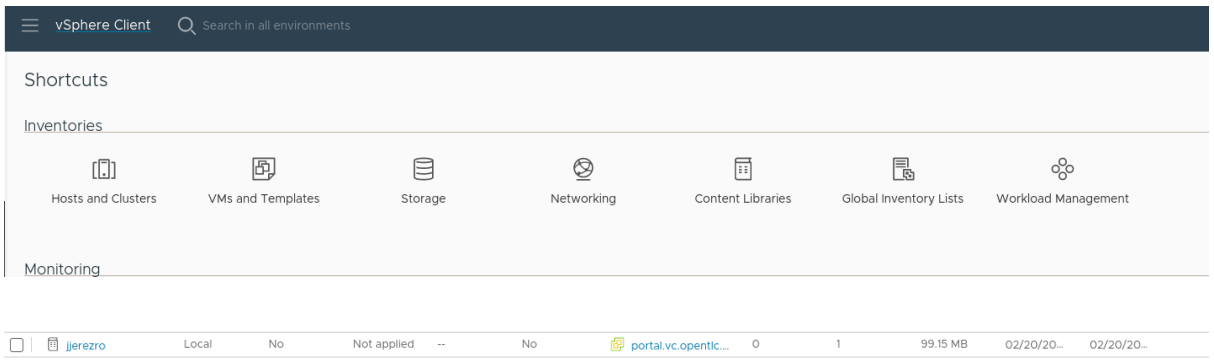
D

Download Discovery ISO

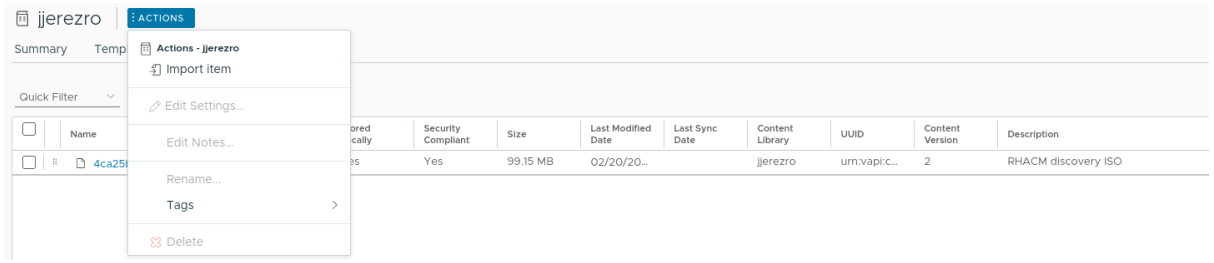


Upload the discovery ISO to vsphere

Create a content library by going to Content Libraries -> Create

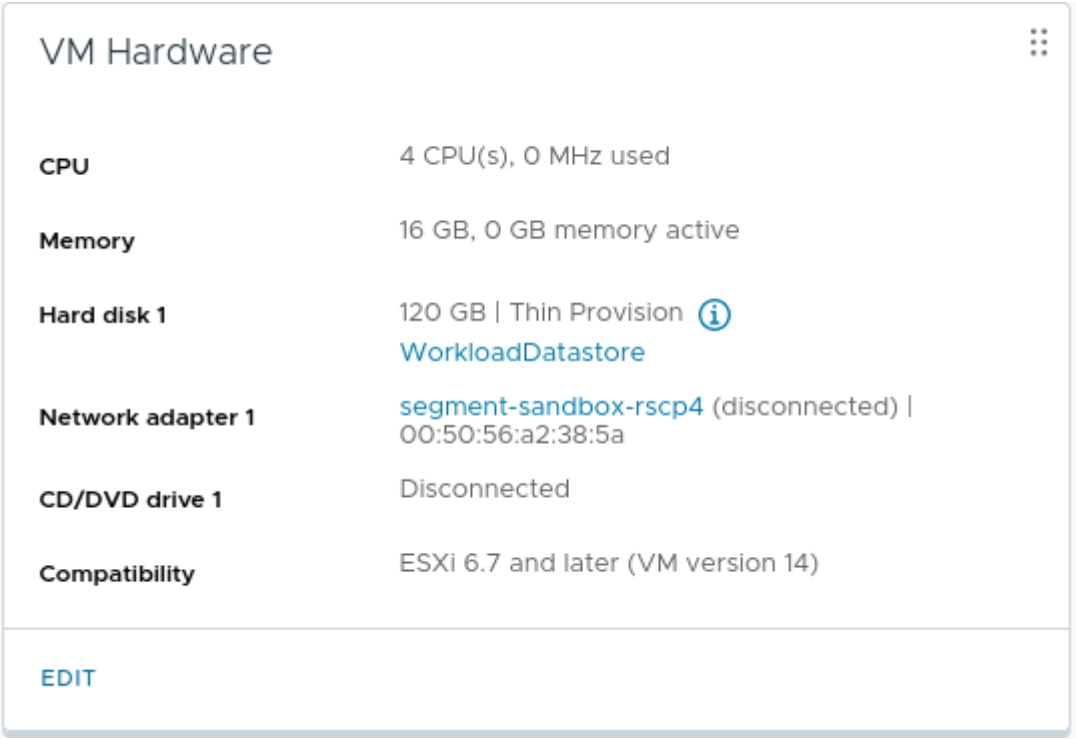


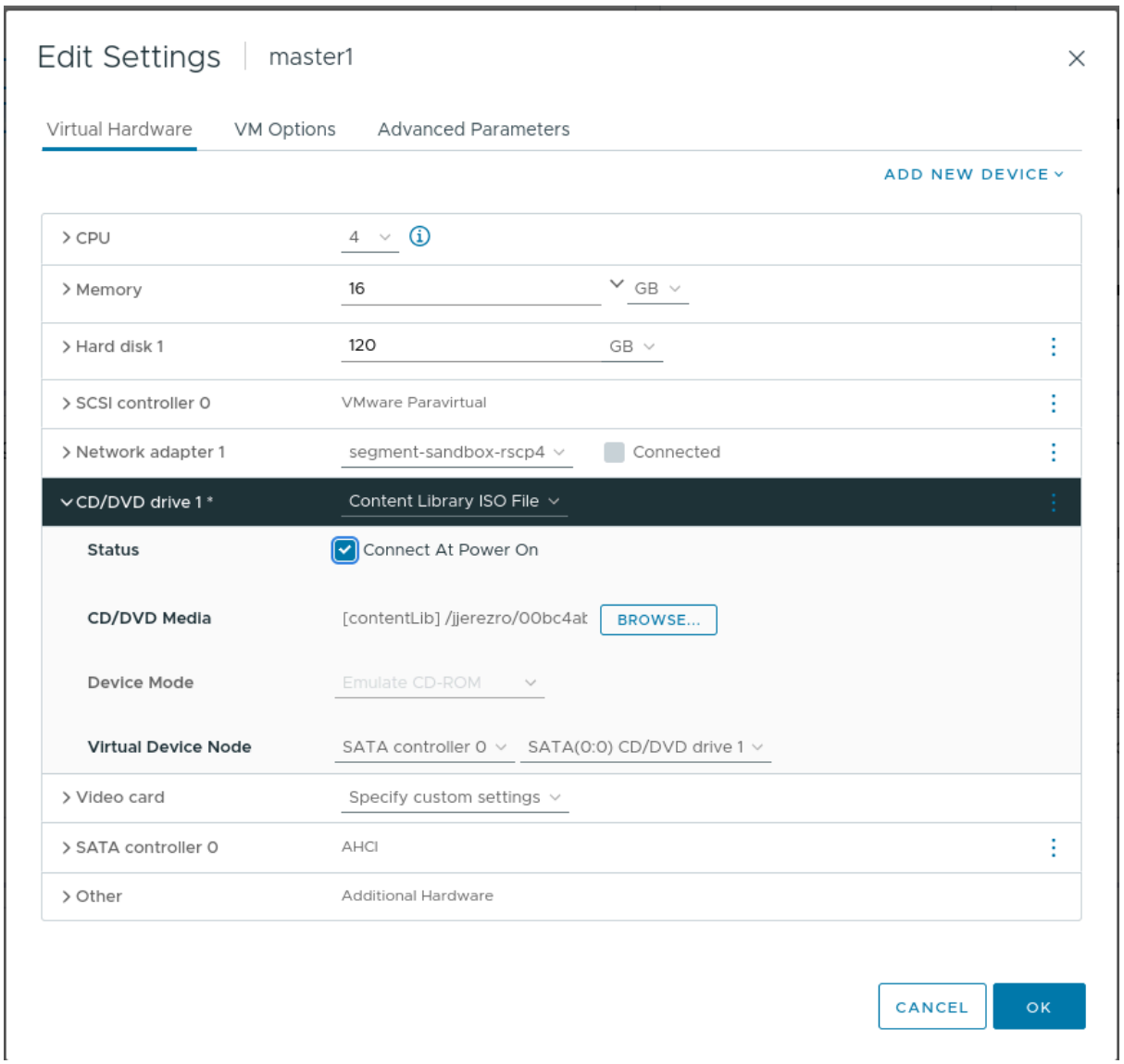
Once created, go to the content library -> Actions -> Import Item



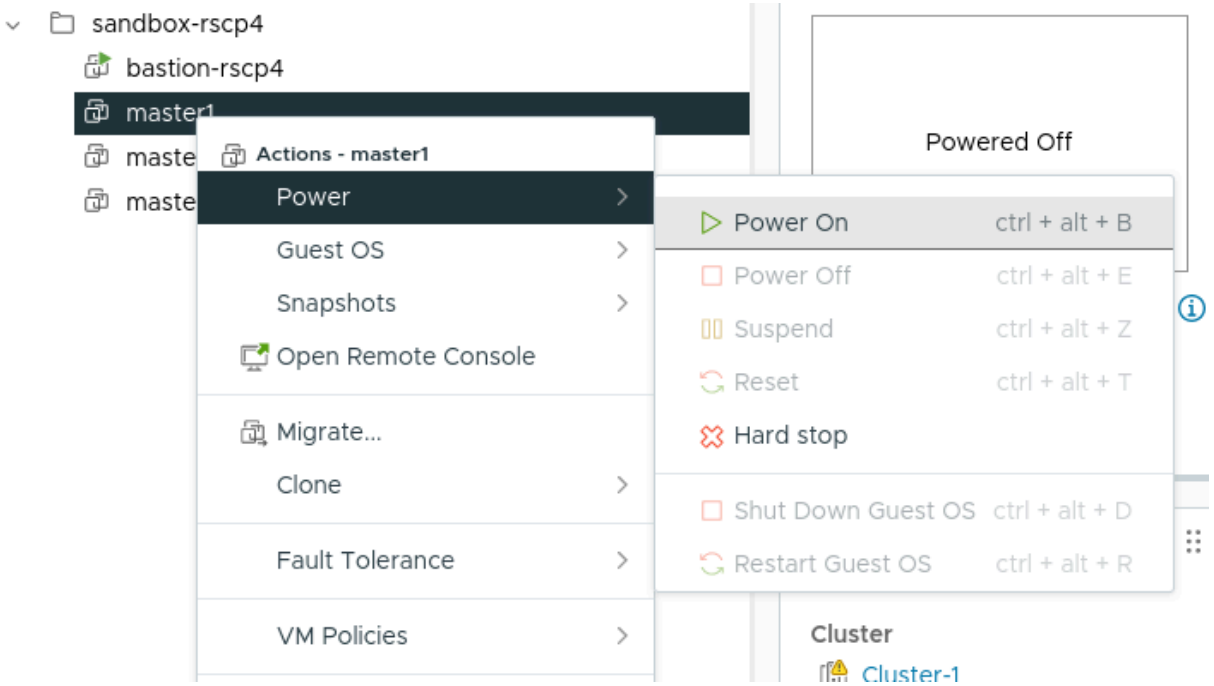
Boot the VMs with the discovery ISO

Edit the VM hardware and attach the discovery ISO from the content library to the CD.
Enable the option connect at Power On so that the VM boots from the ISO.
Repeat for all VMs





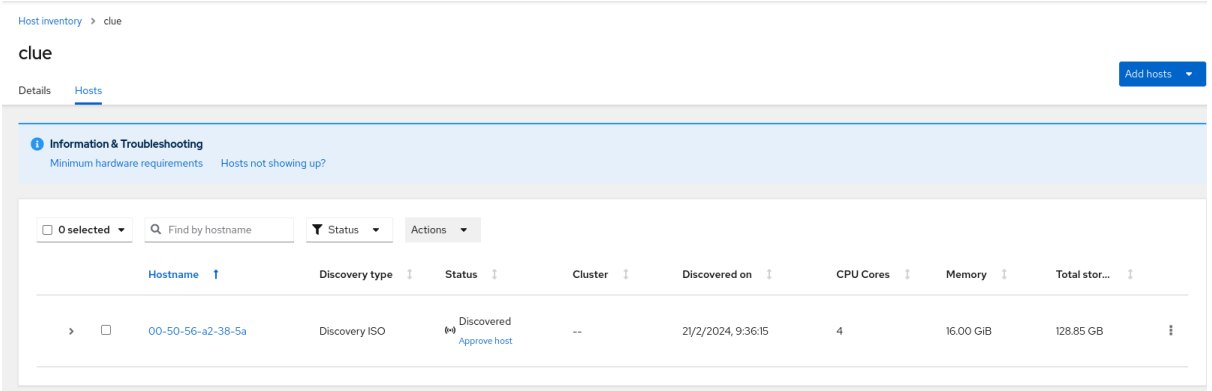
Boot the VMs, one by one



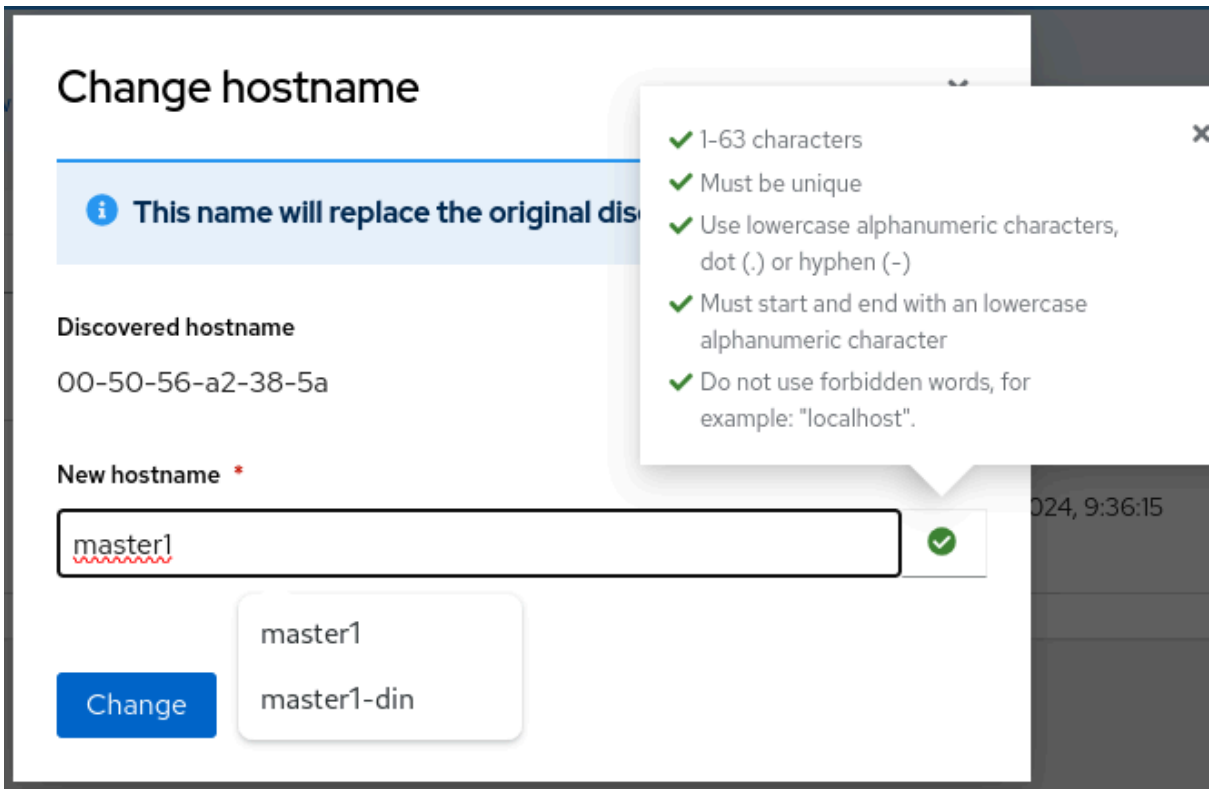
After a couple minutes the VM should be fully booted

```
Red Hat Enterprise Linux CoreOS 414.92.202305090606-0 (Plow) 4.14
SSH host key: SHA256:rmdmxBsOFph/FwOxxPpFPDAmt7U2VU3hUIfyjie1FKQ (ED25519)
SSH host key: SHA256:33CcEYjbbEhh0VbDnq7yNM5CDoM7p005R7RWij0nY7s (ECDSA)
SSH host key: SHA256:EJwvHX3HxcPowrqh+JoU1kz/xv2BZh2XVgMSO8wMcIg (RSA)
ens192: 192.168.188.100
Ignition: ran on 2024/02/21 08:35:43 UTC (this boot)
Ignition: user-provided config was applied
localhost login: _
```

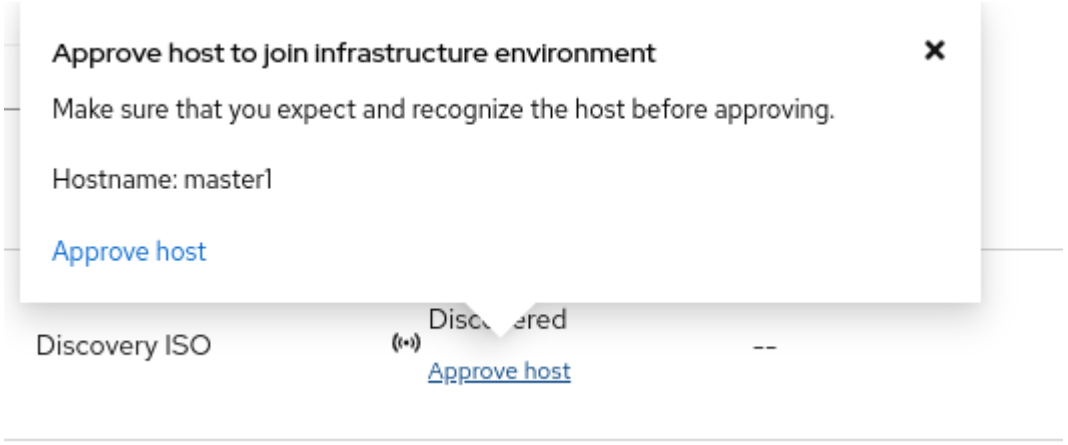
And the new host should appear in the Hosts list of the ACM inventory:



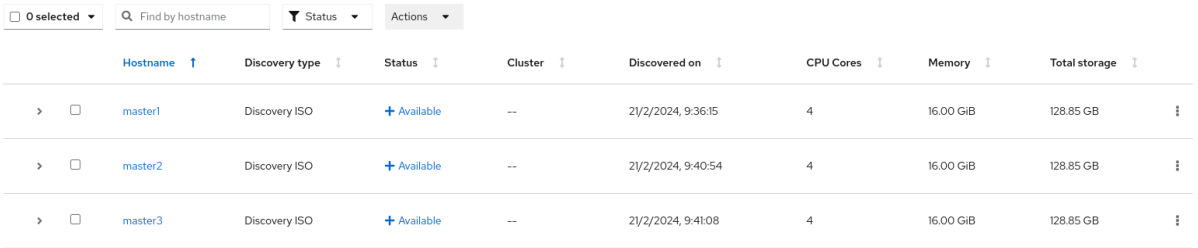
If the name cannot be resolved by DNS in the ACM host, it appears as the mac address, this can be changed here.



Approve the discovered host



The final result looks like this:

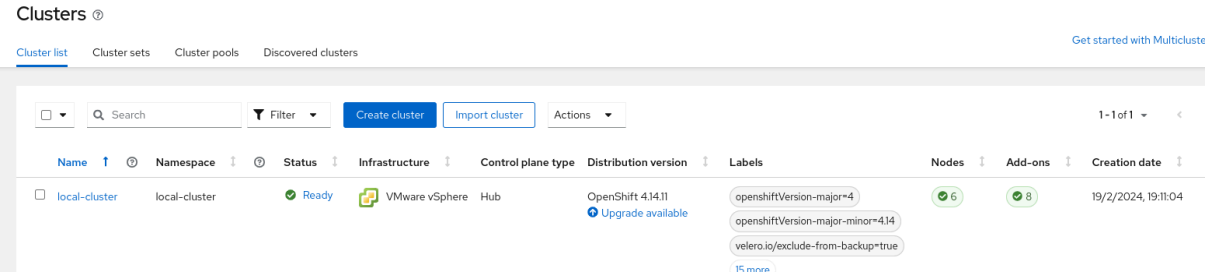


Hostname	Discovery type	Status	Cluster	Discovered on	CPU Cores	Memory	Total storage
master1	Discovery ISO	Available	--	21/2/2024, 9:36:15	4	16.00 GiB	128.85 GB
master2	Discovery ISO	Available	--	21/2/2024, 9:40:54	4	16.00 GiB	128.85 GB
master3	Discovery ISO	Available	--	21/2/2024, 9:41:08	4	16.00 GiB	128.85 GB

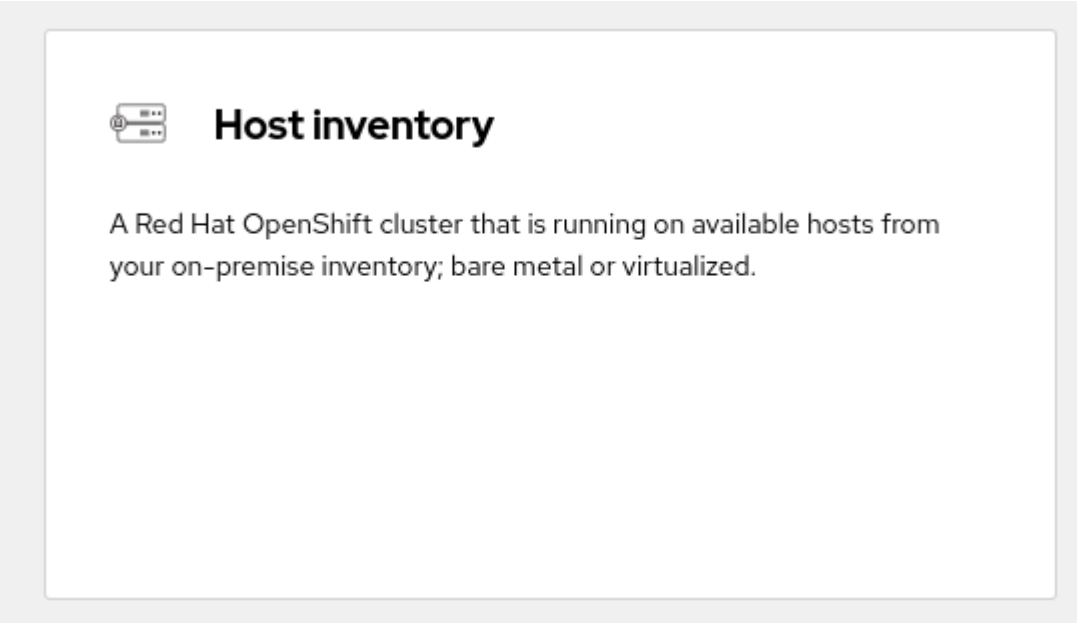
Create the cluster

https://access.redhat.com/documentation/en-us/red_hat_advanced_cluster_management_for_kubernetes/2.9/html/clusters/cluster_mce_overview#creating-a-cluster-on-premises

Go to Infrastructure -> Clusters -> Create cluster



Select Host inventory



In this case, choose Standalone as opposed to Hosted control plane cluster.

Standalone

Run an OpenShift cluster where the control plane and data plane are coupled. The control plane is hosted by a dedicated group of physical or virtual nodes and the network stack is shared.

- ✔ Increased resiliency with closely interconnected control plane and worker nodes.
- ✔ Provide customized control plane cluster configuration.
  - Standard
  - Single node OpenShift
  - Three-node cluster

Use existing hosts

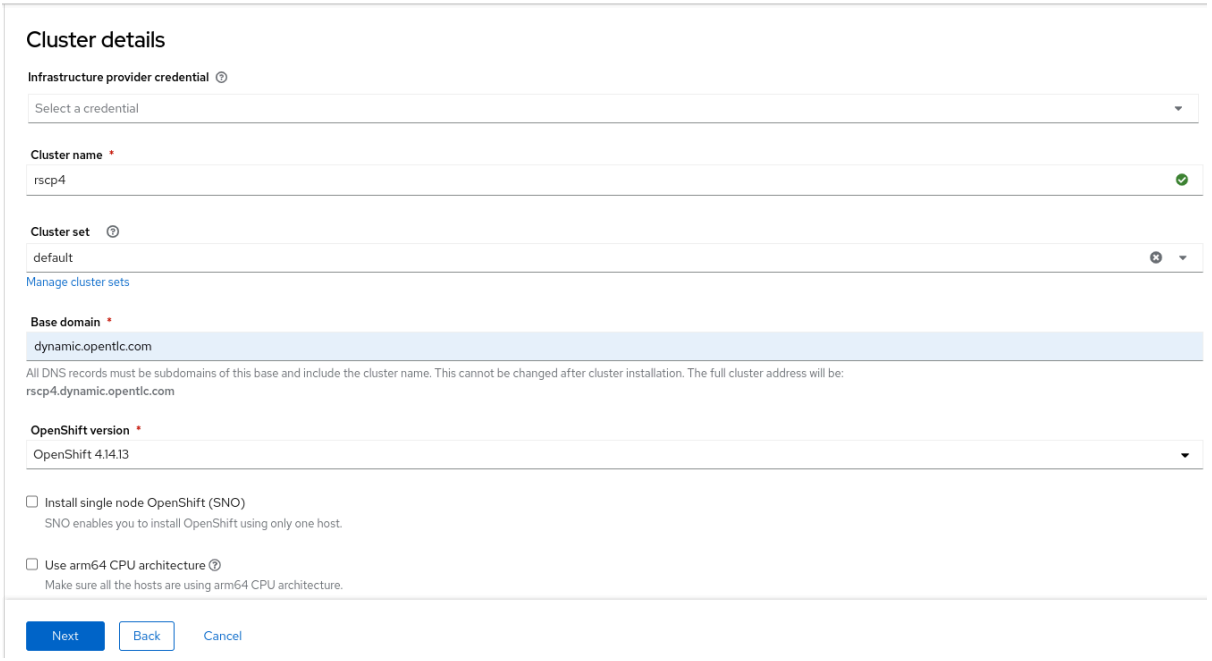
Use existing hosts

Create a cluster from hosts that have been discovered and made available in your host inventory.

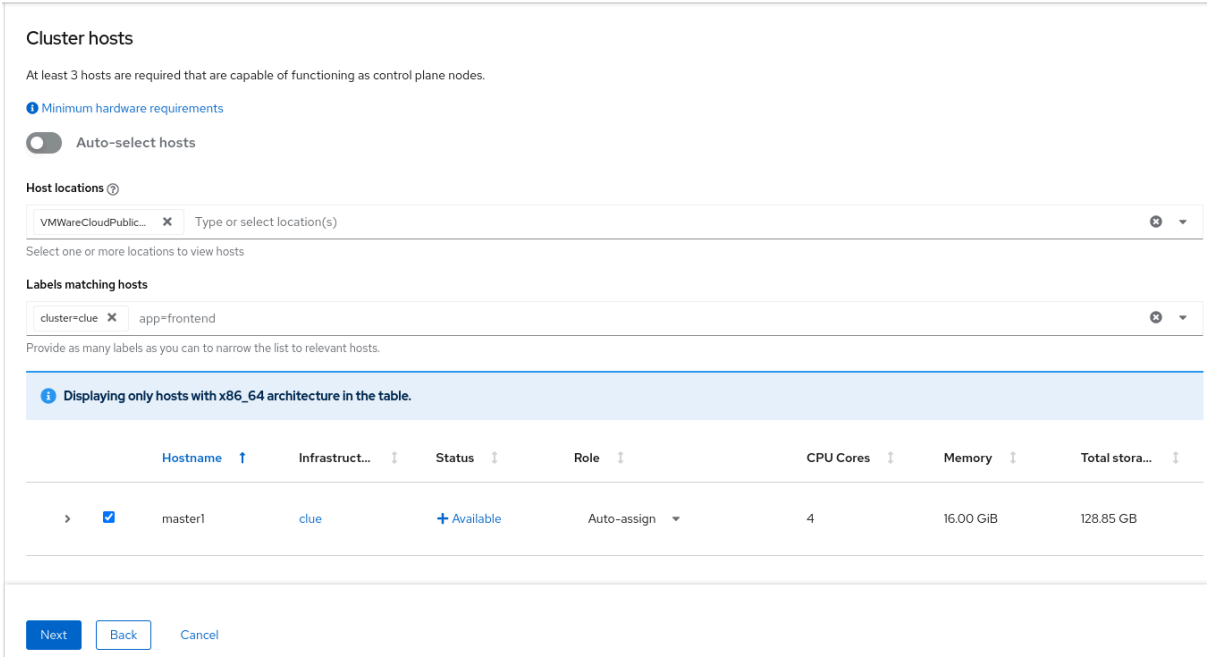
Enter the cluster details.
The cluster name must be the GUID assigned by demo.redhat.com

GUID	`rscp4`

The base domain in the case of demo.redhat.com is dynamic.opentlc.com
Add a pull secret



Assign the hosts for the cluster. In this case a 3 node compact cluster is being created, and the hosts are being assigned manually



After clicking Next on the previous page, the hosts are checked and bound

Hostname	Infrast...	Status	Role	CPU C...	Memo...	Total s...
master-0.rscp4.dynamic.opentlc.com	clue	Binding	Auto-assign	4	16.00 GiB	128.85 GB
master-1.rscp4.dynamic.opentlc.com	clue	Ready	Control plane node	4	16.00 GiB	128.85 GB
master-2.rscp4.dynamic.opentlc.com	clue	Binding	Auto-assign	4	16.00 GiB	128.85 GB

Next Back Cancel Binding hosts...

Add the networking configuration.
In this case User-Managed networking is used because the provide the LB and DNS
Add a public ssh key to propagate to the nodes.
It will take a short while until the hosts status goes from insufficient to Ready.

Host inventory

Hostname	Role	Status	Active NIC
master-0.rscp4.dynamic.opentlc.com	Auto-assign	Ready	-
master-1.rscp4.dynamic.opentlc.com	Control plane node	Ready	-
master-2.rscp4.dynamic.opentlc.com	Control plane node	Ready	-

Next Back Cancel

The next page shows the summary before proceeding to the actual cluster installation.

TODO

Cluster Image Sets

When the host inventory settings are defined, a collection of **clusterimagesets** are created:

- All belong to the fast channel.
- Only the ones with **visible: “true”** are shown as options when installing a new cluster

https://access.redhat.com/documentation/en-us/red_hat_advanced_cluster_management_for_kubernetes/2.9/html/clusters/cluster_mce_overview#release-images-intro

https://access.redhat.com/articles/6961617

https://github.com/stolostron/acm-hive-openshift-releases/blob/backplane-2.5/subscribe/subscription-stable.yaml

Install a cluster with customizations

How do I install a managed cluster with customizations, when I don’t have access to the install-config.yaml file?