VeloCloud Virtual Edge Deployment Guide

VMware SD-WAN by VeloCloud 3.3

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VeloCloud Virtual Edge Deployment Guide

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This guide describes VeloCloud Virtual Edge deployment.

This chapter includes the following topics:

Overview of Virtual Edge

The Virtual Edge is available as a virtual machine that can be installed on standard hypervisors.

The following sections provide information on how to install the Virtual Edge on KVM and VMware ESXi hypervisors.

Deployment Prerequisites

This section describes deployment prerequisites and instance requirements.

Virtual Edge Requirements

For the Virtual Edge, you need:

- 2 x Intel vCPUs with AES-NI instruction set
- 4Gb of memory
- Virtual disk (approximately 8 Gb of disk space)
- 3 to 8 vNICs (default is 2 x L2 interfaces and 6 x L3 interfaces)

Firewall/NAT Requirements

If the VeloCloud Virtual Edge is deployed behind the Firewall and/or a NAT device, the following requirements apply:

- The Firewall must allow outbound traffic from the VeloCloud Virtual Edge to TCP/443 (for communication with the VeloCloud Orchestrator).
- The Firewall must allow traffic outbound to Internet on ports UDP/2426 (VCMP).

Other Considerations

VeloCloud Virtual Edge deployment involves the following considerations.

- The VeloCloud Edge is a latency-sensitive application. Consult the VMware documentation to tune the Virtual Machine as a latency-sensitive application.
- For best performance, set the CPU scheduling affinity to dedicate CPU cores to the Virtual Edge and turn on Intel Virtualization Technology (Intel VT) on the hypervisor.
- For best performance, VMware and KVM should be set with SR-IOV support. KVM instructions are provided in the document below. For VMware, see the following documentation: https://pubs.vmware.com/vsphere-51/index.jsp#com.vmware.vsphere.networking.doc/GUID-C5043E19-F84D-4E2E-9162-16D9967C2DB8.html
- The default username for the VCE ssh console: `root`

Overview of cloud-init

This section provides an overview of the cloud-init package.

About cloud-init

Cloud-init is a Linux package responsible for handling early initialization of instances. If available in the distributions, it allows for configuration of many common parameters of the instance directly after installation. This creates a fully functional instance that is configured based on a series of inputs. This mode of installation requires two files, meta-data and user-data.

Cloud-init's behavior can be configured via user-data. User-data can be given by the user at the time of launching the instance. This is typically done by attaching a secondary disk in ISO format that cloud-init will look for at first boot time. This disk contains all early configuration data that will be applied at that time.

The VeloCloud Virtual Edge supports cloud-init and all essential configurations packaged in an ISO image.

Create the cloud-init meta-data and user-data Files

Note This section has been updated for the 3.3.0 release.

The final installation configuration options are set with a pair of cloud-init configuration files. The first installation configuration file contains the metadata. Create this file with a text editor and name it `meta-data`. This file provides information that identifies the instance of the VeloCloud Virtual Edge being installed. The instance-id can be any identifying name, and the local-hostname should be a host name that follows your site standards.

1 Create the meta-data file that contains the instance `name.instance-id`: `vedge1local-hostname: vedge1`

2 Create the `network-config` file that contains the WAN configuration. Only WAN interfaces that require static IP addressing need to be specified here. By default, all VCE WAN interfaces are configured for DHCP. Multiple interfaces can be specified.

```
version: 1
config:
  - type: physical
    name: GE3
    subnets:
      - type: static
        address: 10.1.0.2
        netmask: 255.255.255.0
        gateway: 10.1.0.1
```

3 Create the `user-data` file. This file contains three main modules: VCO, Activation Code, and Ignore Certificates Errors.

Module	Description
`vco`	IP Address/URL of the VCO.
`activation_code`	Activation code for the Virtual Edge. The activation code is generated while creating an Edge instance on the VCO.
`vco_ignore_cert_errors`	Option to verify or ignore any certificate validity errors.

The activation code is generated while creating an Edge instance on the VCO.

Important There is no default password in VCE image. The password must be provided in cloud-config:

```
#cloud-config
password: passw0rd
chpasswd: { expire: False }
ssh_pwauth: True
velocloud:
      vce:
            vco: 10.32.0.3
            activation_code: F54F-GG4S-XGFI
            vco_ignore_cert_errors: true
```

Create the ISO File

Once you have completed your files, they need to be packaged into an ISO image. This ISO image is used as a virtual configuration CD with the virtual machine. This ISO image (called seed.iso in the example below), is created with the following command on Linux system:

```
genisoimage –output seed.iso –volid cidata –joliet –rock user–data meta–data network–config
```

Including network-config is optional. If the file is not present, the DHCP option will be used by default.

Once the ISO image is generated, transfer the image to a datastore on the host machine.

Install Virtual Edge on KVM

This section describes how to install and activate the Virtual Edge on KVM using a cloud-init config file. The cloud-init config contains interface configurations and the activation key of the Edge. The Virtual Edge has been tested on host OS Ubuntu 14.04.LTS with KVM version 2.0.

Considerations

KVM provides multiple ways to provide networking to virtual machines. The following have been used by VeloCloud:

- SR-IOV
- Linux Bridge
- OpenVSwitch Bridge

Validate or Enable SR-IOV

This section is necessary only if you need to enable SR-IOV on the HOST.

To properly validate that SR-IOV is ready to be used:

- Verify this by running:

  ```
  lspci | grep –i ethernet
  ```

- Verify that you have Virtual Functions:

  ```
  01:10.0 Ethernet controller: Intel Corporation 82599 Ethernet Controller Virtual Function (rev 01)
  ```

If you don’t have Virtual Functions, but you have a NIC that supports Virtual Functions, you will need to enable it.

Generally, enabling SR-IOV consists of the following in three steps:

1 Enable SR-IOV in BIOS.

This will be dependent on your BIOS. Login to the BIOS console and look for SR-IOV Support/DMA. You can verify support on prompt by checking that Intel has the correct CPU flag.

```
cat /proc/cpuinfo | grep vmx
```

2 Add the Options on Boot (in /etc/default/grub).

```
GRUB_CMDLINE_LINUX="intel_iommu=on"
```

a After this. run the following commands:

```
update-grub
update-initramfs -u
```

b Reboot and make sure iommu is enabled.

```
velocloud@KVMperf3:~$ dmesg | grep -i IOMMU
```

```
[ 0.000000] Command line: BOOT_IMAGE=/vmlinuz-3.13.0-107-generic root=/dev/mapper/qa--
multiboot--002--vg-root ro intel_iommu=on splash quiet vt.handoff=7
[ 0.000000] Kernel command line: BOOT_IMAGE=/vmlinuz-3.13.0-107-generic root=/dev/mapper/qa--
multiboot--002--vg-root ro intel_iommu=on splash quiet vt.handoff=7
[ 0.000000] Intel-IOMMU: enabled
[ 0.083191] dmar: IOMMU 0: reg_base_addr fbffc000 ver 1:0 cap d2078c106f0466 ecap f020de
[ 0.083197] dmar: IOMMU 1: reg_base_addr c7ffc000 ver 1:0 cap d2078c106f0466 ecap f020de
velocloud@KVMperf3:~$
```

3 Add the ixgbe Driver in Linux by clicking the link below. https://downloadcenter.intel.com/download/14687/Intel-Network-Adapter-Driver-for-PCIe-Intel-10-Gigabit-Ethernet-Network-Connections-Under-Linux-

a On the left section of the Intel website (**Other Versions** section), click the **5.2.1** link.

b Download ixgbe from Intel. Follow compile options.

c Configure ixgbe config (`tar` and `sudo make install`).

```
velocloud@KVMperf1:~$ cat /etc/modprobe.d/ixgbe.conf
```

d If the file doesn't exist, create it.

```
options ixgbe max_vfs=32,32
options ixgbe allow_unsupported_sfp=1
options ixgbe MDD=0,0
blacklist ixgbevf
```

e Execute the following command and reboot:

```
update-initramfs -u
```

f Use modinfo to see if it is property installed.

```
velocloud@KVMperf1:~$ modinfo ixgbe and ip link
filename: /lib/modules/4.4.0-62-generic/updates/drivers/net/ethernet/intel/ixgbe/ixgbe.ko
version: 5.0.4
license: GPL
description: Intel(R) 10GbE PCI Express Linux Network Driver
author: Intel Corporation, <linux.nics@intel.com>
srcversion: BA7E024DFE57A92C4F1DC93
```

After rebooting the VM, you should see the interfaces.

Installation Steps

These steps explain how to run VeloCloud Virtual Edge on KVM using the libvirt. This deployment was tested in Ubuntu 14.04LTS.

To run VeloCloud Virtual Edge on KVM using the libvirt:

1 Use gunzip to extract the `qcow2` file to the image location (for example, `/var/lib/libvirt/images`).

2 Create the Network pools that you are going to use for the device. Provided below sample on pool using SR-IOV and pool using OpenVswitch.

SR-IOV Sample

```
<network>
  <name>sriovpool</name> <!--This is the name of the file you created-->
  <forward mode='hostdev' managed='yes'>
    <pf dev='eth1'/> <!--Use the netdev name of your SR-IOV devices PF here-->
  </forward >
</network>
```

OpenVSwitch Sample

```
<network>
 <name>passthrough</name>
 <model type='virtio'/>
 <forward mode="bridge"/>
 <bridge name="passthrough"/>
 <virtualport type='openvswitch'>
 </virtualport>
 <vlan trunk='yes'>
 <tag id='33' nativeMode='untagged'/>
 <tag id='200'/>
 <tag id='201'/>
 <tag id='202'/>
 </vlan>
 </network>
 Bridge
 <network>
 <name>passthrough</name>
 <model type='virtio'/>
 <forward mode="bridge"/>
```

```
 </network>
<domain type='kvm'>
 <name>vedge1</name>
 <memory unit='KiB'>4194304</memory>
 <currentMemory unit='KiB'>4194304</currentMemory>
 <vcpu placement='static'>2</vcpu>
 <resource>
 <partition>/machine</partition>
 </resource>
 <os>
 <type arch='x86_64' machine='pc-i440fx-trusty'>hvm</type>
 <boot dev='hd'/>
 </os>
 <features>
 <acpi/>
 <apic/>
 <pae/>
 </features>
<!--
Set the CPU mode to host model to leverage all the available features on the host CPU
-->
 <cpu mode='host-model'>
 <model fallback='allow'/>
 </cpu>
 <clock offset='utc'/>
 <on_poweroff>destroy</on_poweroff>
 <on_reboot>restart</on_reboot>
 <on_crash>restart</on_crash>
 <devices>
 <emulator>/usr/bin/kvm-spice</emulator>
 <!--
 Below is the location of the qcow2 disk image
 -->
 <disk type='file' device='disk'>
 <driver name='qemu' type='qcow2'/>
 <source file='/var/lib/libvirt/images/edge-VC_KVM_GUEST-x86_64-2.3.0-18- R23-20161114-GA-updatable-
ext4.qcow2'/>
 <target dev='sda' bus='sata'/>
 <address type='drive' controller='0' bus='0' target='0' unit='0'/>
 </disk>
 <!--
 If using cloud-init to boot up virtual edge, attach the 2nd disk as CD-ROM
 -->
 <disk type='file' device='cdrom'>
 <driver name='qemu' type='raw'/>
 <source file='/home/vcadmin/cloud-init/vedge1/seed.iso'/>
 <target dev='sdb' bus='sata'/>
 <readonly/>
 <address type='drive' controller='1' bus='0' target='0' unit='0'/>
 </disk>
 <controller type='usb' index='0'>
 <address type='pci' domain='0x0000' bus='0x00' slot='0x01' function='0x2'/>
 </controller>
 <controller type='pci' index='0' model='pci-root'/>
 <controller type='sata' index='0'>
```

```
 <address type='pci' domain='0x0000' bus='0x00' slot='0x05' function='0x0'/>
 </controller>
 <controller type='ide' index='0'>
 <address type='pci' domain='0x0000' bus='0x00' slot='0x01' function='0x1'/>
 </controller>
 <!--
 The first two interfaces are for the default L2 interfaces, NOTE VLAN support just for SR-IOV and
OpenvSwitch
 -->
 < interfacetype='network'>
 < modeltype='virtio'/>
 < sourcenetwork='LAN1'/>
 < vlan>< tagid='#hole2_vlan#'/></ vlan>
 < aliasname=LAN1/>
 < addresstype='pci' domain='0x0000' bus='0x00' slot='0x12' function='0x0'/>
 </ interface>
 < interfacetype='network'>
 < modeltype='virtio'/>
 < sourcenetwork=LAN2/>
 < vlan>< tagid='#LAN2_VLAN#'/></ vlan>
 < aliasname='hostdev1'/>
 < addresstype='pci' domain='0x0000' bus=' 0x00' slot='0x13' function='0x0'/>
 </ interface>
<!--
 The next two interfaces are for the default L3 interfaces. Note that additional 6 routed interfaces
are supported for a combination of 8 interfaces total
 -->
 < interfacetype='network'>
 < modeltype='virtio'/>
 < sourcenetwork=WAN1/>
 < vlan>< tagid='#hole2_vlan#'/></ vlan>
 < aliasname=LAN1/>
 < addresstype='pci' domain='0x0000' bus='0x00' slot='0x12' function='0x0'/>
 </ interface>
 < interfacetype='network'>
 < modeltype='virtio'/>
 < source network=LAN2/>
 < vlan>< tag id='#LAN2_VLAN#'/></ vlan>
 < aliasname='hostdev1'/>
 < addresstype='pci' domain='0x0000' bus='0x00' slot='0x13' function='0x0'/>
 </ interface>
 <serial type='pty'>
 <target port='0'/>
 </serial>
 <console type='pty'>
 <target type='serial' port='0'/>
 </console>
 <input type='mouse' bus='ps2'/>
 <input type='keyboard' bus='ps2'/>
 <graphics type='vnc' port='-1' autoport='yes' listen='127.0.0.1'>
 <listen type='address' address='127.0.0.1'/>
 </graphics>
 <sound model='ich6'>
 <address type='pci' domain='0x0000' bus='0x00' slot='0x04' function='0x0'/>
 </sound>
```

```
<video>
<model type='cirrus' vram='9216' heads='1'/>
<address type='pci' domain='0x0000' bus='0x00' slot='0x02' function='0x0'/>
</video>
<memballoon model='virtio'>
<address type='pci' domain='0x0000' bus='0x00' slot='0x06' function='0x0'/>
</memballoon>
</devices>
</domain>
```

Instructions

1 Save the above domain XML file (for example, `vedge1.xml`).

2 Run the following command to create the VM:

```
virsh define vedge1.xml
```

3 Run the following command to start the VM:

```
virsh start vedge1
```

Note `vedge1` is the name of the VM defined in the `<name>` element of the domain XML file. Replace `vedge1` with the name you specify in the `<name>` element.

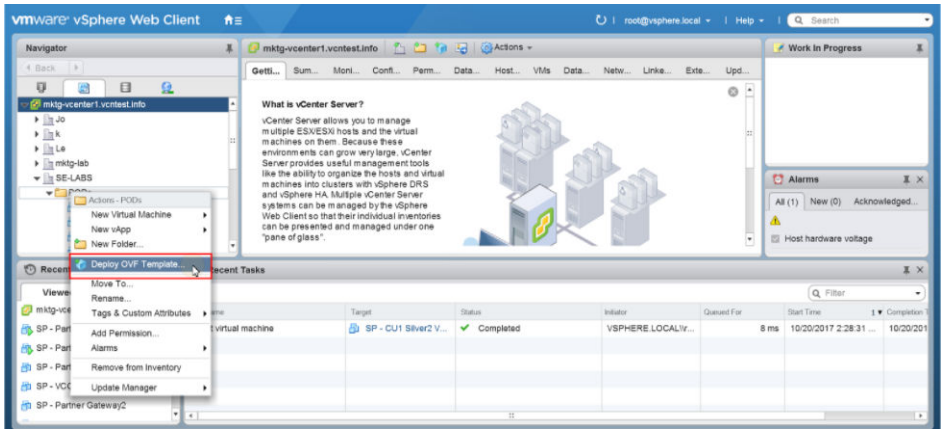
The Cloud-init already includes the activation key, which was generated while creating a new Virtual Edge on the VCO. The Virtual Edge is configured with the config settings from the Cloud-init file. This will configure the interfaces as the Virtual Edge is powered up. Once the Virtual Edge is online, it will activate with the VCO using the activation key. The VCO IP address and the activation key have been defined in the Cloud-init file.

Install Virtual Edge on VMware ESXi

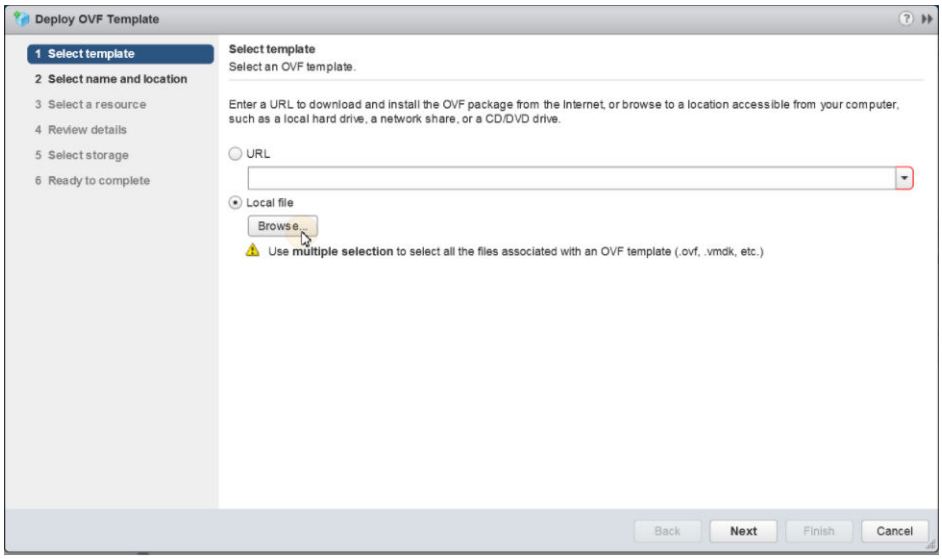
This section describes how to install Virtual Edge on VMware ESXi.

To install:

1 Use the vSphere client to deploy an OVF template, and then select the VCE OVA file.



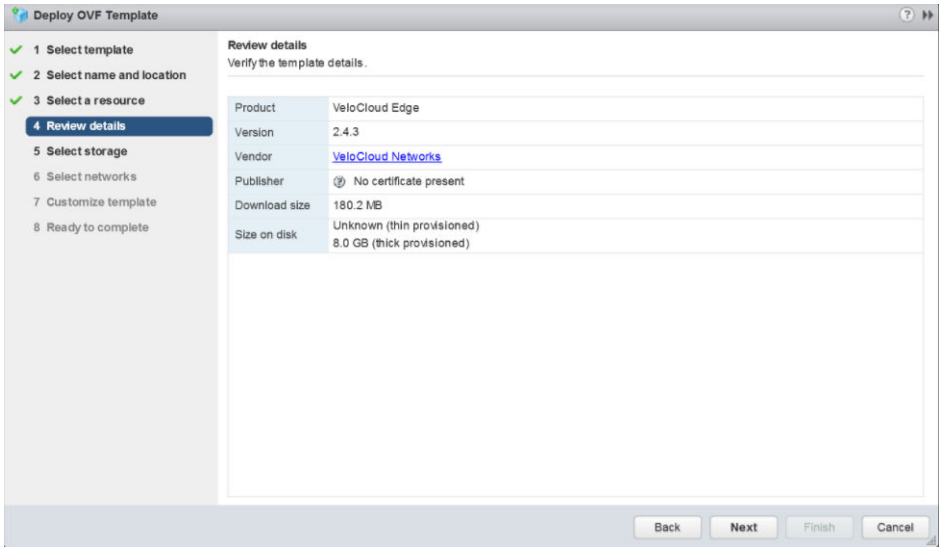
2 Select an OVF template from an URL or Local file.



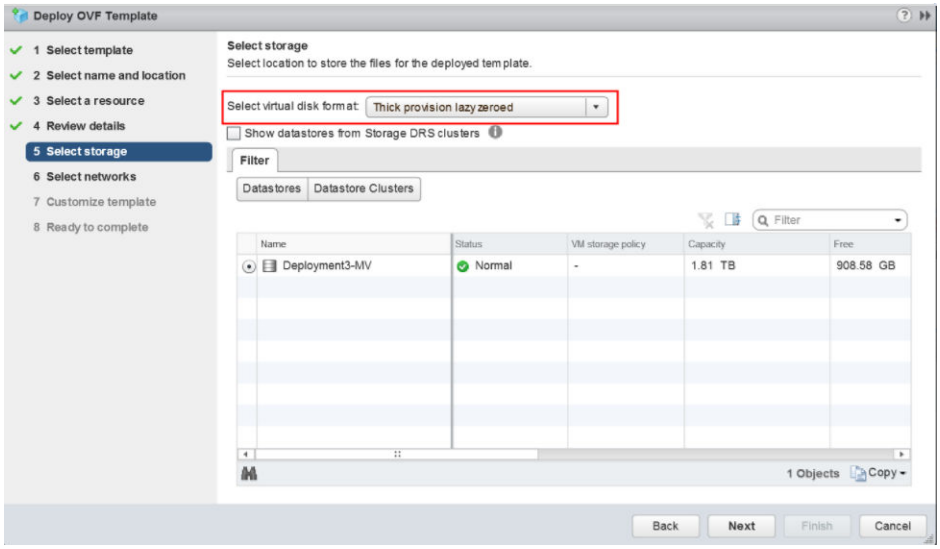
3 Select a name and location of the virtual machine.

4 Select a resource.

5 Verify the template details.

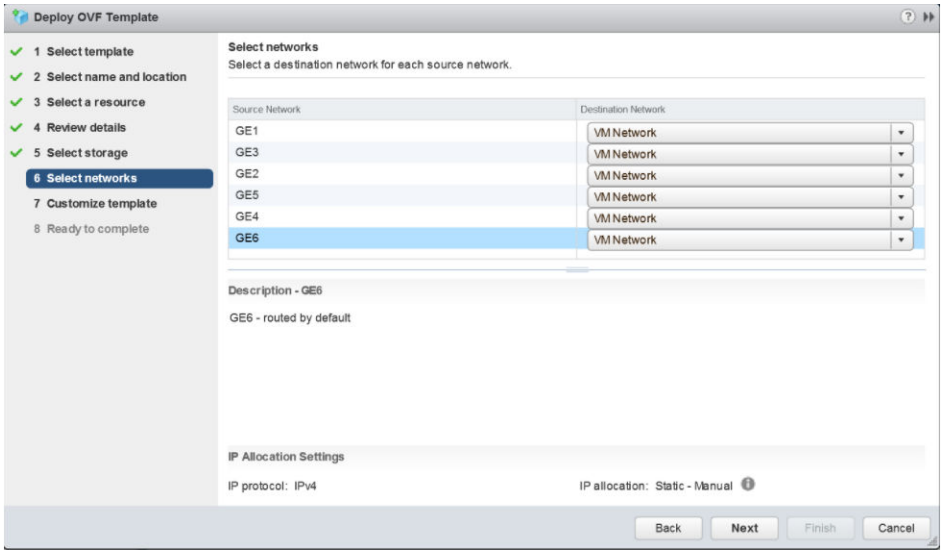


6 Select the storage location to store the files for the deployment template.



7 Configure the networks for each of the interfaces.

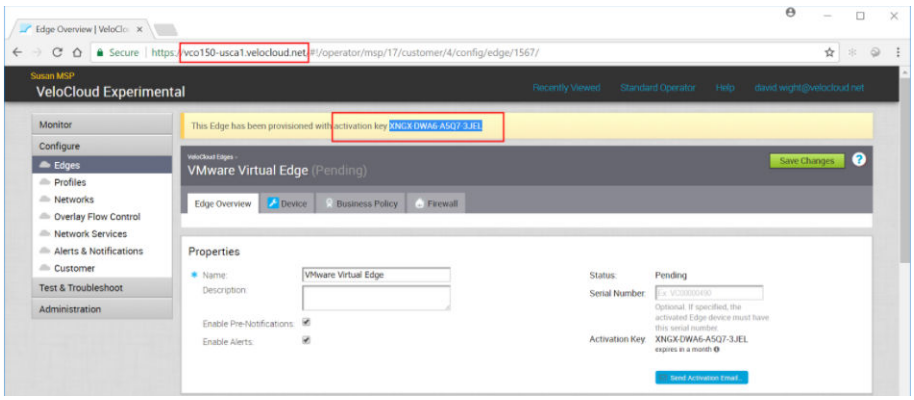
Note Skip this step if you are using a cloud-init file to provision the Virtual Edge on ESXi.



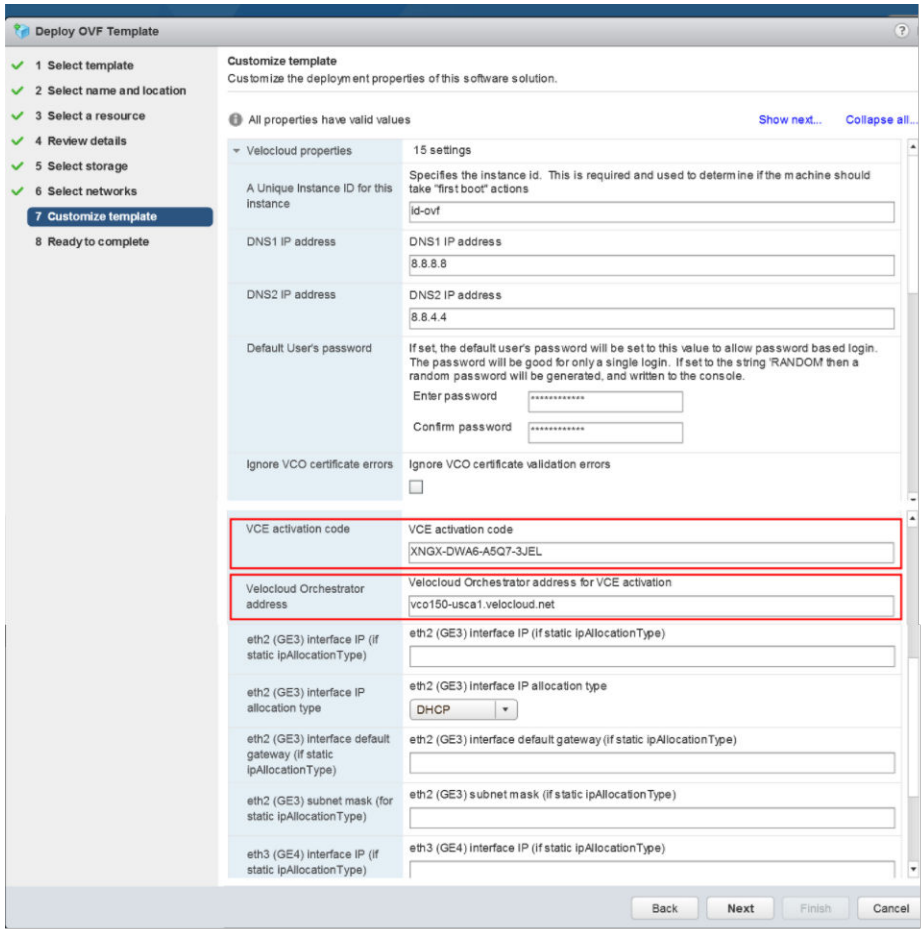
8 Customize the template by specifying the deployment properties. See the image below of the VCO that highlights the following substeps.

a From the VCO UI, retrieve the VCO URL/IP Address. You will need this address for Step c below.

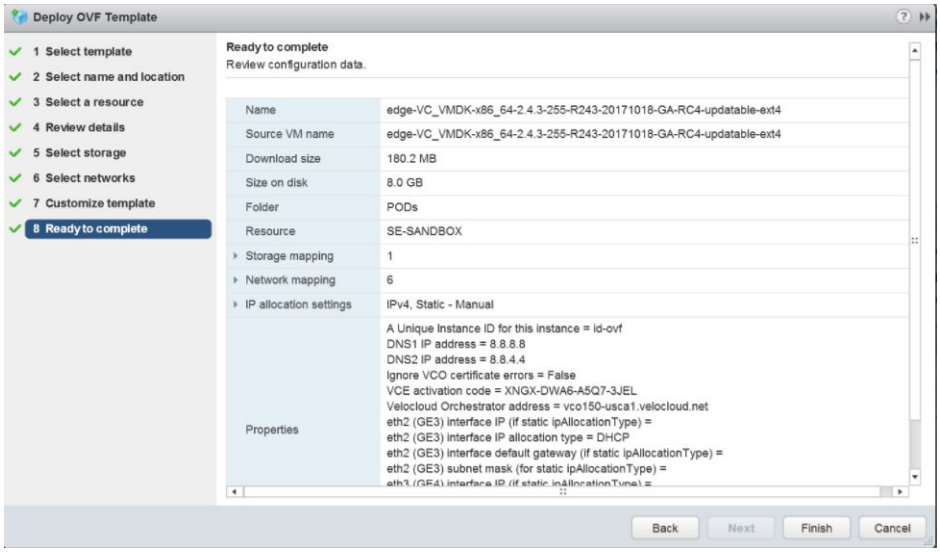
b Create a new Virtual Edge on the VCO for the Enterprise. Once the Edge is created, copy the Activation Key. You will need the Activation Key for Step c" below.



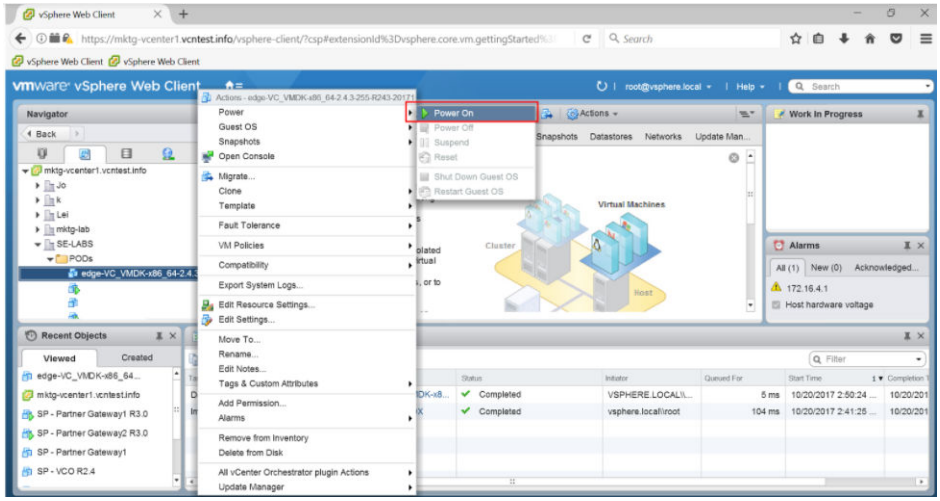
c On the customize template page shown in the image below, type in the Activation Code that you retrieved in Step b above, and the VCO URL/IP Address retrieved in Step a above, into the corresponding fields.



9 Review the configuration data.



10 Power on the Virtual Edge.



Once the Edge powers up, it will establish connectivity to the VCO.