Technical Report

NetApp ONTAP Select Deploy on Intel NUC

Solution Deployment

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Abstract

NetApp® ONTAP® Select Deploy is an essential component of the ONTAP Select infrastructure, serving to create and monitor clusters and facilitate high availability for two-node clusters. This document shows how to install Select Deploy on an Intel NUC to create a small form-factor Select Deploy appliance.

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Solution Overview

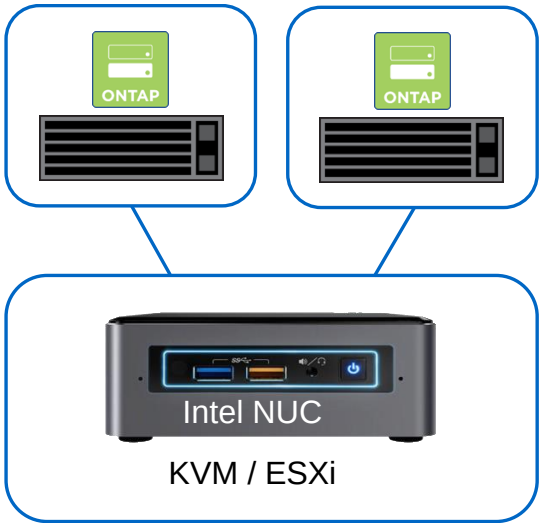
ONTAP Select Deploy is an essential tool used to create and monitor ONTAP Select clusters. Additionally, it provides a mediator service that enables high availability for two-node Select clusters. Deploy is provided as a virtual machine (VM) that runs on either the VMware ESXi or KVM hypervisors. In certain small-form-factor deployments, the hosts used for Select do not have enough resources to run both a Select node and a Deploy VM. In those instances, an Intel NUC can be used to run Deploy as a low-cost, small-form-factor standalone appliance.

1.1 Solution Technology

In this solution, ONTAP Select Deploy runs as the sole VM on the Intel NUC using either the KVM or VMware ESXi hypervisors. You can access Deploy using the CLI, an API, or a web UI to create ONTAP Select clusters.

Figure 1 shows the technical components of the solution.

Figure 1) ONTAP Select Deploy.



1.2 Use Case Summary

This solution applies to the following use cases:

- ONTAP Select Deploy on Intel NUC using KVM
- ONTAP Select Deploy on Intel NUC using VMware ESXi

2 ONTAP Select Deploy on Intel NUC Using KVM

In an effort to keep cost as low as possible, this configuration was tested using CentOS, KVM, and a relatively low-powered NUC configuration.

2.1 Technology Requirements

Hardware Requirements

Table 1 lists the hardware components that are required to implement Deploy on a NUC using KVM.

Table 1) Deploy on KVM hardware requirements.

Hardware	Quantity
Intel NUC5CPYH	1
RAM	8GB
SSD	128GB

Software Requirements

Table 2 lists the software components that are required to implement Deploy on KVM.

Table 2) Deploy on KVM software requirements.

Software	Version
CentOS minimal install	7.4 (1708)
Open vSwitch	2.7.3
ONTAP Select Deploy	2.7.2

2.2 Deployment Procedures

Deploying the solution involves the following tasks:

- Install the base OS.
- Install KVM.
- Install and configure Open vSwitch.
- Install the ONTAP Select Deploy VM.
- Configure ONTAP Select Deploy.

Install the Base OS

To install the base OS, complete the following steps:

1. Create a bootable USB drive with a minimal build of Centos 7.4 (1708).
2. Boot the Intel NUC using the bootable USB drive.
3. Select the internal SSD as the installation destination using autopartitioning or customize the partitioning scheme by configuring it manually.
4. Under Network & Host Name, configure Ethernet for the local adapter using DHCP or a static IP address, if available.
5. Specify a host name for the installation.
6. Click Begin Installation.
7. Under User Settings, specify a root password.
8. Under User Settings, create a user called “admin” and select the option to make this user an administrator.
9. When the installation completes, remove the USB drive and click Reboot to reboot the system.

Install KVM

To install KVM, complete the following steps:

1. Log in as root.

2. Use the yum utility to install the following packages:

```
yum -y install qemu-kvm qemu-img virt-manager libvirt libvirt-python libvirt-client virt-install
virt-viewer bridge-utils
```

3. Start and enable the libvirtd service.

```
systemctl start libvirtd
systemctl enable libvirtd
```

4. Verify that the KVM module is loaded.

```
lsmod | grep kvm
kvm_intel             170086  0
kvm                   566340  1 kvm_intel
irqbypass              13503  1 kvm
```

5. Reboot.

Install and Configure Open vSwitch

To install Open vSwitch, complete the following steps:

1. Log in as admin and install packages required for building the Open vSwitch RPM.

```
sudo yum -y install make gcc openssl-devel autoconf automake rpm-build redhat-rpm-config python-
devel openssl-devel kernel-devel kernel-debug-devel libtool wget checkpolicy selinux-policy-devel
```

2. Create a directory to hold the RPM source files.

```
mkdir -p /home/admin/rpmbuild/SOURCES
```

3. Download the source files for Open vSwitch 2.7.3.

```
cd /home/admin/rpmbuild/SOURCES
wget http://openvswitch.org/releases/openvswitch-2.7.3.tar.gz
```

4. Extract the source files from the tarfile.

```
tar xzf openvswitch-2.7.3.tar.gz
```

5. Build the RPM.

```
rpmbuild -bb --nocheck /home/admin/rpmbuild/SOURCES/openvswitch-2.7.3/rhel/openvswitch.spec
```

6. Become root.

```
su -
```

7. Install the RPM.

```
yum -y localinstall /home/admin/rpmbuild/RPMS/x86_64/openvswitch-2.7.3-1.x86_64.rpm
```

8. Stop and disable the NetworkManager service.

```
systemctl stop NetworkManager
systemctl disable NetworkManager
```

9. Start the Open vSwitch service and enable it to start automatically upon future reboots.

```
systemctl start openvswitch.service
chkconfig openvswitch on
```

10. Create a backup of the existing ifcfg file for the Ethernet interface. Note that your device name may differ from the one shown here.

```
cp /etc/sysconfig/network-scripts/ifcfg-enp3s0 /home/admin/ifcfg-enp3s0.bak
```

11. Create the ifcfg file for the OVS bridge. Modify it as necessary to fit your network.

```
vi /etc/sysconfig/network-scripts/ifcfg-ovsbridge0

DEVICE="ovsbridge0"
BOOTPROTO="dhcp"
ONBOOT="yes"
TYPE="OVSBridge"
DEVICETYPE="ovs"
```

12. Edit the ifcfg file for the Ethernet interface to associate it with the OVS bridge.

```
vi /etc/sysconfig/network-scripts/ifcfg-enp3s0

TYPE=Ethernet
DEVICE="enp3s0"
BOOTPROTO="none"
NAME=enp3s0
ONBOOT=yes
OVS_BRIDGE=ovsbridge0
TYPE="OVSPort"
DEVICETYPE="ovs"
```

13. Reboot.
14. Log in as root and verify the OVS installation.

```
[root@deploy ~]# ovs-vsctl -V
ovs-vsctl (Open vSwitch) 2.7.3
DB Schema 7.14.0

[root@deploy ~]# ovs-ofctl show ovsbridge0
OFPT_FEATURES_REPLY (xid=0x2): dpid:000094c691196b3a
n_tables:254, n_buffers:0
capabilities: FLOW_STATS TABLE_STATS PORT_STATS QUEUE_STATS ARP_MATCH_IP
actions: output enqueue set_vlan_vid set_vlan_pcp strip_vlan mod_dl_src mod_dl_dst mod_nw_src
mod_nw_dst mod_nw_tos mod_tp_src mod_tp_dst
 1(enp3s0): addr:94:c6:91:19:6b:3a
     config:     0
     state:      0
     current:    1GB-FD AUTO_NEG
     advertised: 10MB-HD 10MB-FD 100MB-HD 100MB-FD 1GB-FD COPPER AUTO_NEG AUTO_PAUSE
AUTO_PAUSE_ASYM
     supported:  10MB-HD 10MB-FD 100MB-HD 100MB-FD 1GB-HD 1GB-FD COPPER AUTO_NEG
     speed: 1000 Mbps now, 1000 Mbps max
 LOCAL(ovsbridge0): addr:94:c6:91:19:6b:3a
     config:     0
     state:      0
     speed: 0 Mbps now, 0 Mbps max
OFPT_GET_CONFIG_REPLY (xid=0x4): frags=normal miss_send_len=0
```

Install the ONTAP Select Deploy VM

To install the ONTAP Select Deploy VM, complete the following steps:

1. Log in as root.
2. Create a directory in which to store the ONTAP Select Deploy VM.

```
mkdir /home/deployontap
```

3. Using secure copy or another suitable file transfer method, copy the ONTAP Select Deploy raw disk image (downloaded from the NetApp Support site) to the `/home/deployontap` directory you just created.

```
scp ONTAPdeploy2.7.1.raw.tgz root@10.62.202.59:/home/deployontap
```

4. Extract the contents of the compressed tar file.

```
cd /home/deployontap
tar -xvzf ONTAPdeploy2.7.1.raw.tgz
```

5. Remove the compressed tar file.

```
rm ONTAPdeploy2.7.1.raw.tgz
```

6. Install the Deploy VM.

```
[root@nuc deployontap]# virt-install --name=deployontap --vcpus=2 --ram=4096 --os-type=linux --
os-variant=generic --controller=scsi,model=virtio-scsi --disk
path=/home/deployontap/ONTAPdeploy.raw,device=disk,bus=scsi,format=raw --network
"type=bridge,source=ovsbridge0,model=virtio,virtualport_type=openvswitch" --console=pty --import
--wait 0

Starting install...
Domain creation completed.
```

7. Configure the Deploy VM to start automatically when the KVM host starts.

```
[root@nuc deployontap]# virsh autostart deployontap
Domain deployontap marked as autostarted
```

Configure ONTAP Select Deploy

To configure ONTAP Select Deploy, complete the following steps:

1. Connect to the console of the ONTAP Select Deploy VM.

```
virsh console deployontap
```

2. Provide network configuration information.

```
Network Configuration
---------------------
Host name            : deployontap
Use DHCP to set networking information? [n]: y


Selected host name    : deployontap
Selected IP           : From DHCP
Selected net mask     : From DHCP
Selected gateway      : From DHCP
Selected primary DNS  : From DHCP
Selected secondary DNS: From DHCP
Search domains        : From DHCP
Calculated network    : From DHCP
Calculated broadcast  : From DHCP
Are these values correct? [y]: y
```

3. Log in as admin using the password “admin123” and change the admin password.

```
deployontap login: admin
Password: ********

Linux deployontap 3.16.0-4-amd64 #1 SMP Debian 3.16.51-2 (2017-12-03) x86_64

The programs included with the Debian GNU/Linux system are free software;
the exact distribution terms for each program are described in the
individual files in /usr/share/doc/*/copyright.

Debian GNU/Linux comes with ABSOLUTELY NO WARRANTY, to the extent
permitted by applicable law.
NetApp ONTAP Select Deploy Utility.
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Password change is required.

Enter current password: ********
Enter new password: ********
Retype new password: ********
Password for user "admin" updated successfully.
```

4. Provide AutoSupport® information.

```
AutoSupport Configuration
-------------------------
Enter Product Company: NetApp
Enter Proxy URL    :
AutoSupport configuration set successfully.
```

5. Type `CTRL-]` to exit the virsh console session.

ONTAP Select Deploy is now configured. You can log in with a web browser and use Deploy to create new ONTAP Select cluster instances.

3 ONTAP Select Deploy on Intel NUC Using ESXi

This option uses a newer and faster Intel NUC with a seventh generation processor. This configuration was chosen because it works with VMware ESXi 6.5 using drivers included on the standard install media.

3.1 Technology Requirements

Hardware Requirements

Table 1 lists the hardware components that are required to implement Deploy on the NUC using ESXi.

Table 3) Deploy on ESXi hardware requirements.

Hardware	Quantity
Intel NUC7i3BNH	1
RAM	8GB
SSD	128GB

Software Requirements

Table 2 lists the software components that are required to implement Deploy on ESXi.

Table 4) Deploy on ESXi software requirements.

Software	Version
VMware ESXi	6.5u1
ONTAP Select Deploy	2.7.2

3.2 Deployment Procedures

Deploying the solution requires the following tasks:

- Install ESXi.
- Install the ONTAP Select Deploy VM.
- Verify the ONTAP Select Deploy configuration.

Install ESXi

To install ESXi, complete the following steps:

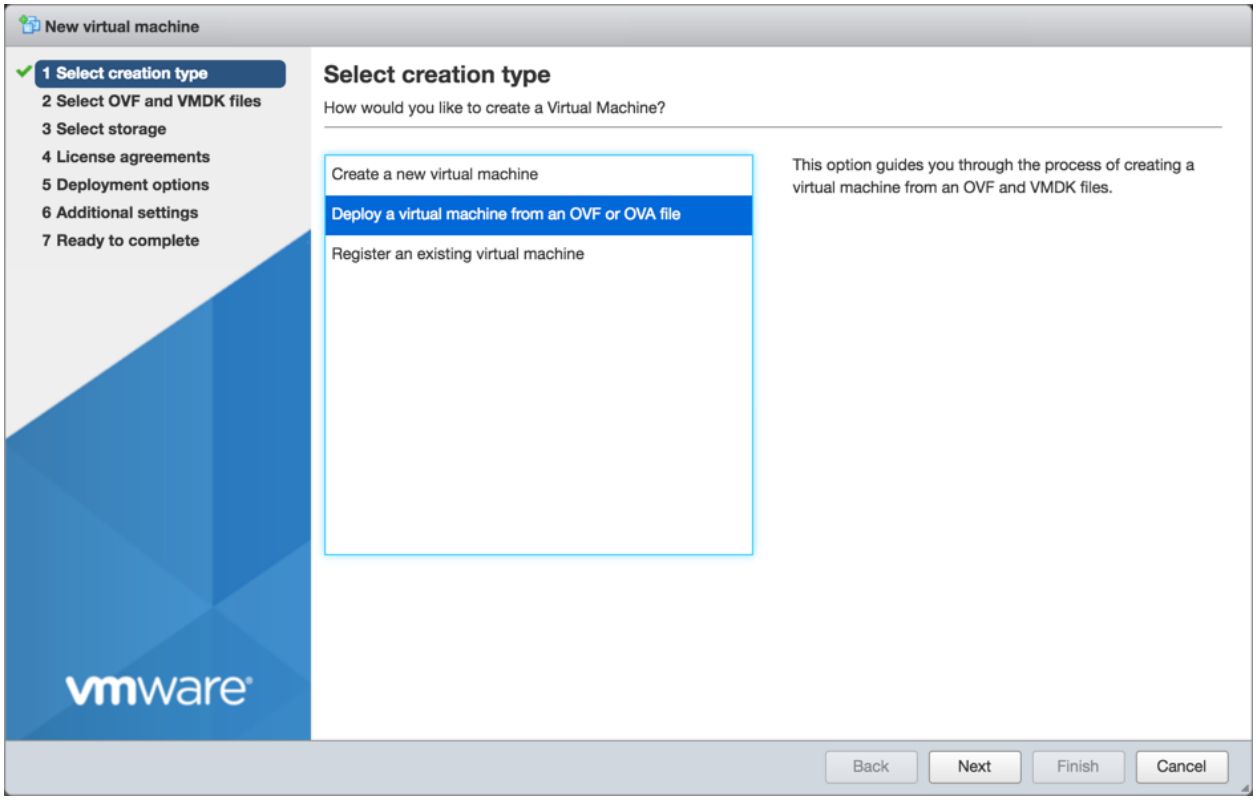
1. Create a bootable USB thumb drive with ESXi 6.5u1.

2. Boot the NUC using this USB drive.
3. Press Enter at the Welcome to the VMware ESXi 6.5.0 Installation screen to begin the installation.
4. Press F11 to accept the EULA.
5. Select the local NUC SSD as the installation target.
6. Select the appropriate keyboard layout.
7. Enter and confirm a root password.
8. Press F11 to install ESXi.
9. Remove the USB drive and press Enter to reboot when the installation is complete.
10. Press F2 and log in as root.
11. Navigate to the Configure Management Network option and select it.
12. Navigate to IPV4 Configuration and select it.
13. Apply the appropriate network settings for your network.
14. Press ESC twice to exit the management network wizard and to log out.
15. Use a web browser to log in using the IP address you assigned to the NUC.
16. Log in as root, using the password assigned in step 7.
17. Navigate to Host > Manage > Licensing and add the ESXi license key.

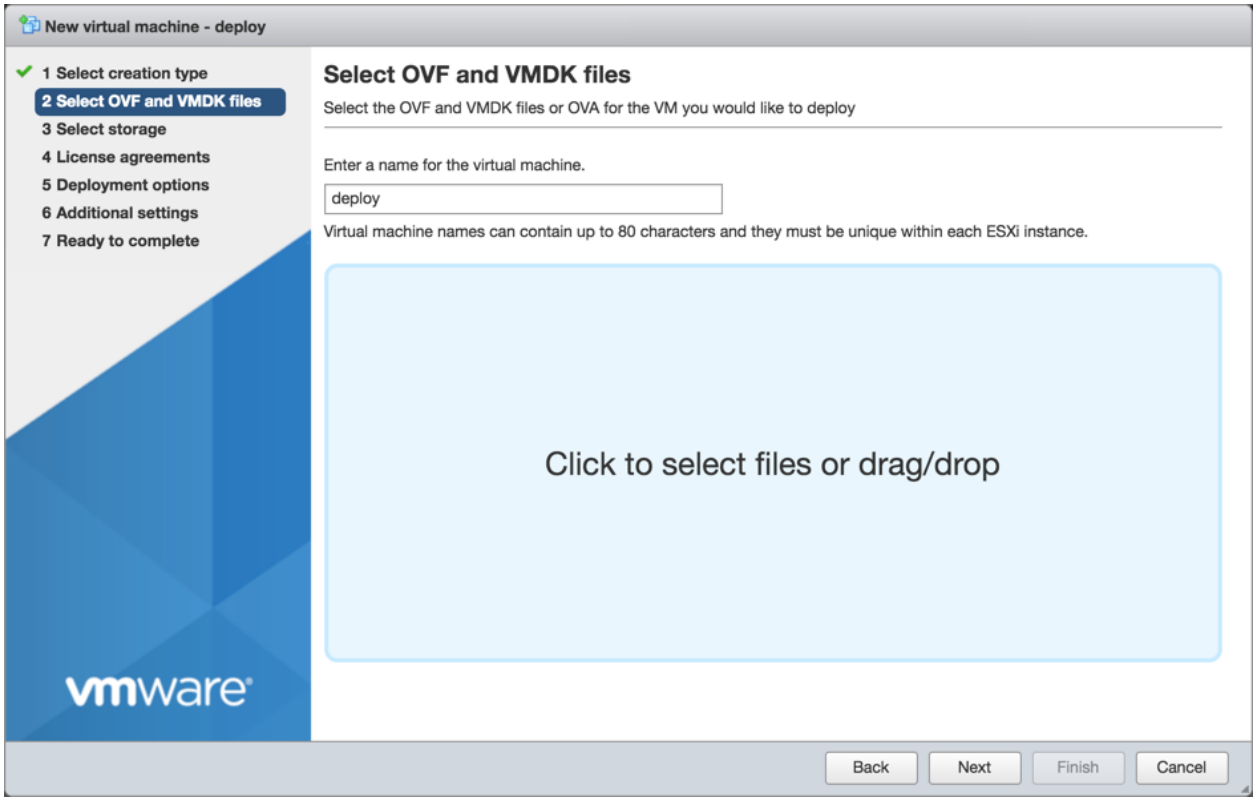
Install the ONTAP Select Deploy VM

To install the ONTAP Select Deploy VM, complete the following steps:

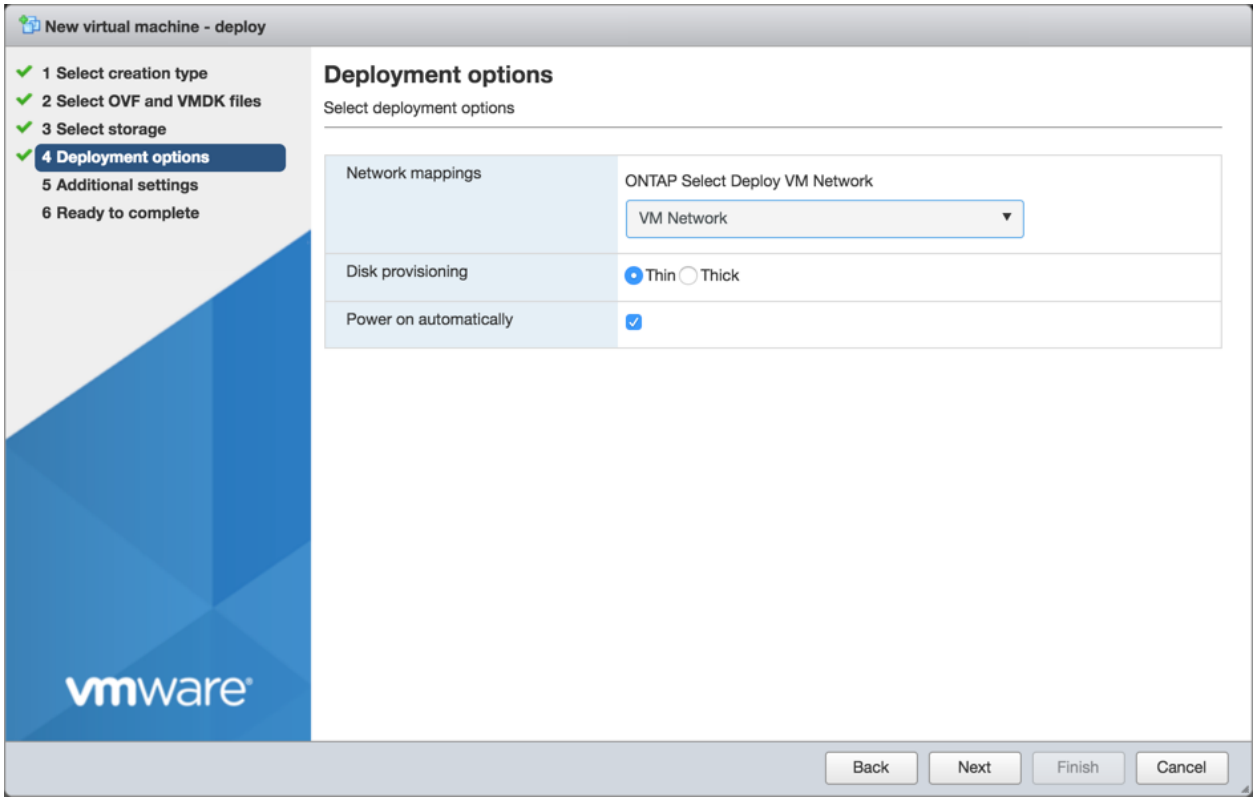
1. Log in to the ESXi host using a web browser.
2. Right-click the host and select Create/Register VM.
3. Select Deploy a Virtual Machine from an OVF or OVA File and click Next.



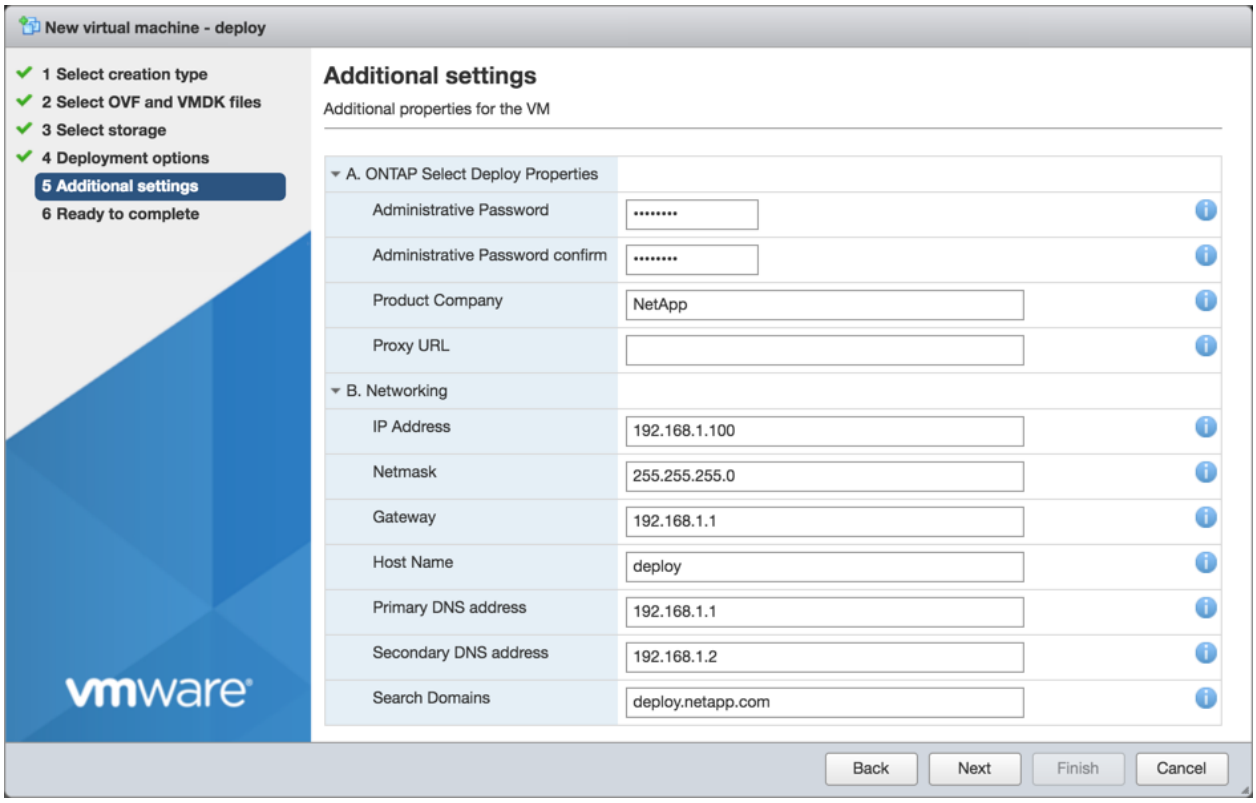
4. Enter a name for the Deploy VM.
5. Click the blue rectangle and choose the ONTAP Select Deploy OVA, then click Next.



6. Choose the local NUC datastore and click Next.
7. Verify that Power on Automatically is selected and click Next.



8. Under Additional Settings, expand the A and B categories and provide the required configuration information, then click Next.

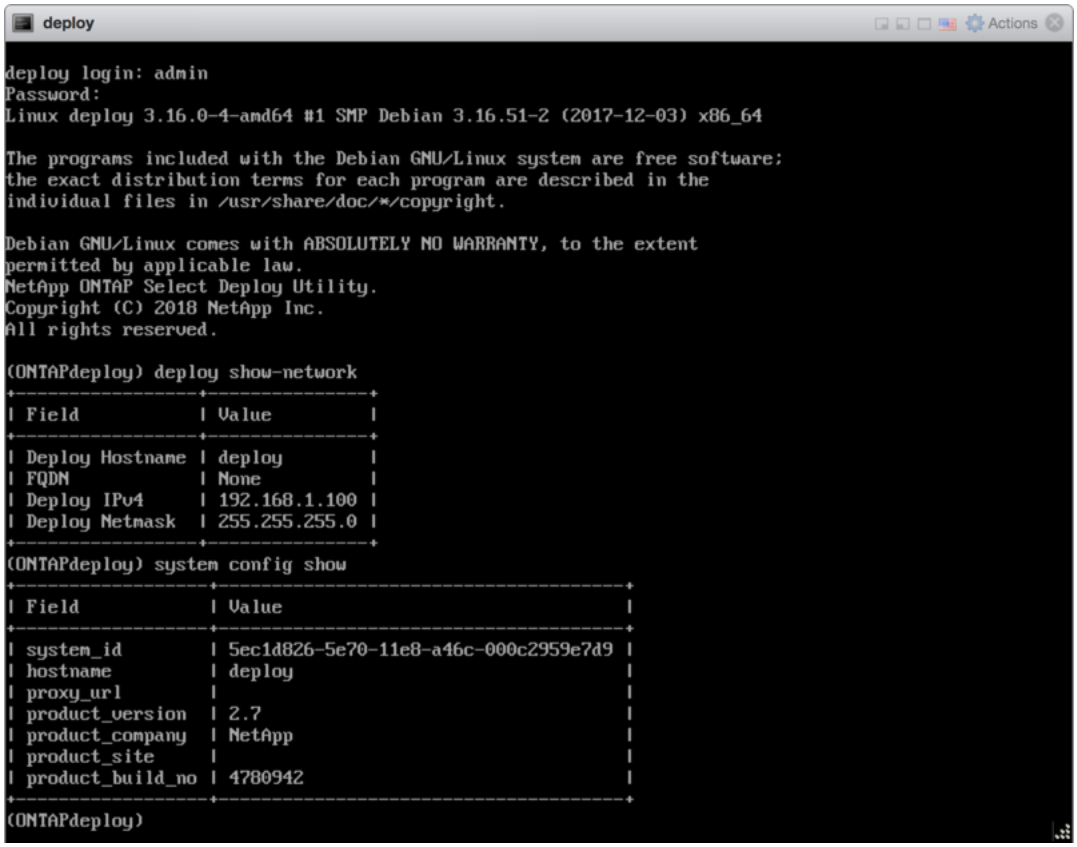


9. Review and confirm your settings, then click Finish.
10. After the VM creation task completes, the VM is powered on automatically.

Verify the ONTAP Select Deploy Configuration

To verify the ONTAP Select Deploy configuration, complete the following steps:

1. Open the Deploy VM console.
2. Log in as admin using the password assigned in the previous section.
3. Run the `deploy show-network` and `system config show` commands and verify that the output matches the settings specified in the previous section.



ONTAP Select Deploy is now configured. You can log in with a web browser and use Deploy to create new ONTAP Select cluster instances.

Conclusion

ONTAP Select Deploy is a critical component of an ONTAP Select infrastructure. Because it is packaged as a VM, it is easy to install it wherever there is a hypervisor with sufficient resources available to host the Deploy VM. The Intel NUC makes an ideal deployment target when a low-cost, small-form-factor solution is required. Although two specific hardware configurations were tested for this report, additional NUC configurations might work as well, provided that they contain the necessary compute resources and are compatible with the chosen hypervisor.

Where to Find Additional Information

To learn more about the information described in this document, refer to the following documents and/or websites:

- ONTAP Select Documentation Center
  https://mysupport.netapp.com/documentation/productlibrary/index.html?productID=62293
- ONTAP Select Resources
  https://mysupport.netapp.com/info/web/ECMLP2556945.html

Version History

Version	Date	Document Version History
Version 1.0	June 2018	Initial release

Refer to the Interoperability Matrix Tool (IMT) on the NetApp Support site to validate that the exact product and feature versions described in this document are supported for your specific environment. The NetApp IMT defines the product components and versions that can be used to construct configurations that are supported by NetApp. Specific results depend on each customer's installation in accordance with published specifications.