FlexPod Datacenter using IaC with Cisco IMM M7, VMware vSphere 8, and NetApp ONTAP 9.12.1

Deployment Guide for FlexPod Datacenter using IaC with Cisco IMM M7, VMware vSphere 8, and NetApp ONTAP 9.12.1

Published Date: December 2023

In partnership with:

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Executive Summary

The FlexPod Datacenter solution is a validated design for deploying Cisco and NetApp technologies and products to build shared private and public cloud infrastructure. Cisco and NetApp have partnered to deliver a series of FlexPod solutions that enable strategic data center platforms. The success of the FlexPod solution is driven through its ability to evolve and incorporate both technology and product innovations in the areas of management, compute, storage, and networking. This document explains the deployment details of incorporating the Cisco UCS X-Series M7 and C-Series M7 servers into the FlexPod Datacenter and the ability to monitor and manage FlexPod components from the cloud using Cisco Intersight. Some of the key advantages of integrating Cisco UCS M7 servers into the FlexPod infrastructure are:

- **Upgraded servers:** 4th Gen Intel Xeon Scalable Processors with up to 60 cores per processor and up 8TB of DDR-4800 DIMMs.
- **Sustainability:** taking advantage of sustainability and power usage monitoring features of all the components of the stack and utilizing the Cisco UCS X-Series advanced power and cooling policies.
- **Simpler and programmable infrastructure:** infrastructure as code delivered using Ansible.
- **End-to-End 100Gbps Ethernet:** utilizing the 5th Generation Cisco UCS VICs 15231 and 15238, the 5th Generation Cisco UCS 6536 Fabric Interconnect, and the Cisco UCSX-I-9108-100G Intelligent Fabric Module to deliver 100Gbps Ethernet from the server through the network to the storage.
- **End-to-End 32Gbps Fibre Channel:** utilizing the 5th Generation Cisco UCS VICs 15231 and 15238, the 5th Generation Cisco UCS 6536 Fabric Interconnect, and the Cisco UCSX-I-9108-100G Intelligent Fabric Module to deliver 32Gbps Ethernet from the server (via 100Gbps FCoE) through the network to the storage.
- **Built for investment protections:** design ready for future technologies such as liquid cooling and high-Wattage CPUs; CXL-ready.

In addition to the compute-specific hardware and software innovations, the integration of the Cisco Intersight cloud platform with VMware vCenter, NetApp Active IQ Unified Manager, and Cisco Nexus and MDS switches delivers monitoring, orchestration, and workload optimization capabilities for different layers (virtualization, storage, and networking) of the FlexPod infrastructure. The modular nature of the Cisco Intersight platform also provides an easy upgrade path to additional services, such as workload optimization.

For information about the FlexPod design and deployment details, including the configuration of various elements of design and associated best practices, refer to Cisco Validated Designs for FlexPod, here: https://www.cisco.com/c/en/us/solutions/design-zone/data-center-design-guides/flexpod-design-guides.html.

Solution Overview

This chapter contains the following:

- Introduction
- Audience
- Purpose of this Document
- What's New in this Release?

Introduction

The Cisco Unified Compute System (Cisco UCS) with Intersight Managed Mode (IMM) is a modular compute system, configured and managed from the cloud. It is designed to meet the needs of modern applications and to improve operational efficiency, agility, and scale through an adaptable, future-ready, modular design. The Cisco Intersight platform is a Software-as-a-Service (SaaS) infrastructure lifecycle management platform that delivers simplified configuration, deployment, maintenance, and support.

Powered by the Cisco Intersight cloud-operations platform, the Cisco UCS with X-Series and Cisco UCS C-Series enables the next-generation cloud-operated FlexPod infrastructure that not only simplifies data-center management but also allows the infra-structure to adapt to the unpredictable needs of modern applications as well as traditional workloads. With the Cisco Intersight platform, you get all the benefits of SaaS delivery and the full lifecycle management of Intersight-connected distributed servers and integrated NetApp storage systems across data centers, remote sites, branch offices, and edge environments.

Audience

The intended audience of this document includes but is not limited to IT architects, sales engineers, field consultants, professional services, IT managers, partner engineering, and customers who want to take advantage of an infrastructure built to deliver IT efficiency and enable IT innovation.

Purpose of this Document

This document provides deployment guidance around incorporating the Cisco Intersight-managed Cisco UCS X-Series and Cisco UCS C-Series platforms with Cisco UCS M7 servers and end-to-end 100Gbps within the FlexPod Datacenter infrastructure. This document introduces various design elements and explains various considerations and best practices for a successful deployment. The document also highlights the design and product requirements for integrating virtualization and storage systems to Cisco Intersight to deliver a true cloud-based integrated approach to infrastructure management.

What's New in this Release?

The following design elements distinguish this version of FlexPod from previous models:

- Cisco UCS X210C M7, C220 M7, and C240 M7 servers with Intel Xeon Scalable Processors with up to 60 cores per processor, up to 8TB of DDR-4800 DIMMs, and Cisco 5th Generation Virtual Interface Cards (VICs)
- An updated, more complete end-to-end Infrastructure as Code (IaC) Day 0 configuration of the FlexPod Infrastructure utilizing Ansible Scripts
- NetApp ONTAP 9.12.1
- VMware vSphere 8.0

Deployment Hardware and Software

This chapter contains the following:

- Design Requirements
- Physical Topology
- Software Revisions
- Ansible Automation Workflow and Solution Deployment

Design Requirements

The FlexPod Datacenter with Cisco UCS and Cisco Intersight meets the following general design requirements:

- Resilient design across all layers of the infrastructure with no single point of failure
- Scalable design with the flexibility to add compute capacity, storage, or network bandwidth as needed
- Modular design that can be replicated to expand and grow as the needs of the business grow
- Flexible design that can support different models of various components with ease
- Simplified design with ability to integrate and automate with external automation tools
- Cloud-enabled design which can be configured, managed, and orchestrated from the cloud using GUI or APIs

To deliver a solution which meets all these design requirements, various solution components are connected and configured as covered in the upcoming sections.

Physical Topology

The FlexPod Datacenter solution with Cisco UCS IMM M7, VMware 8.0, and NetApp ONTAP 9.12.1 is built using the following hardware components:

- Cisco UCS X9508 Chassis with Cisco UCSX-I-9108-100G intelligent fabric modules (IFMs) and up to eight Cisco UCS X210C M7 Compute Nodes with 4th Generation Intel Xeon Scalable CPUs
- Fifth-generation Cisco UCS 6536 Fabric Interconnects to support 100GbE, 25GbE, and 32GFC connectivity from various components
- Cisco UCS C220 M7 and C240 M7 rack mount servers with 4th Generation Intel Xeon Scalable CPUs
- High-speed Cisco NX-OS-based Nexus 93600CD-GX switching design to support 100GE and 400GE connectivity
- NetApp AFF A800 end-to-end NVMe storage with 25G or 100G Ethernet and (optional) 32G Fibre Channel connectivity
- Cisco MDS 9132T* switches to support Fibre Channel storage configuration

Note: * Cisco MDS 9132T and FC connectivity is not needed when implementing IP-based connectivity design supporting iSCSI boot from SAN, NFS, and NVMe-TCP.

The software components of this solution consist of:

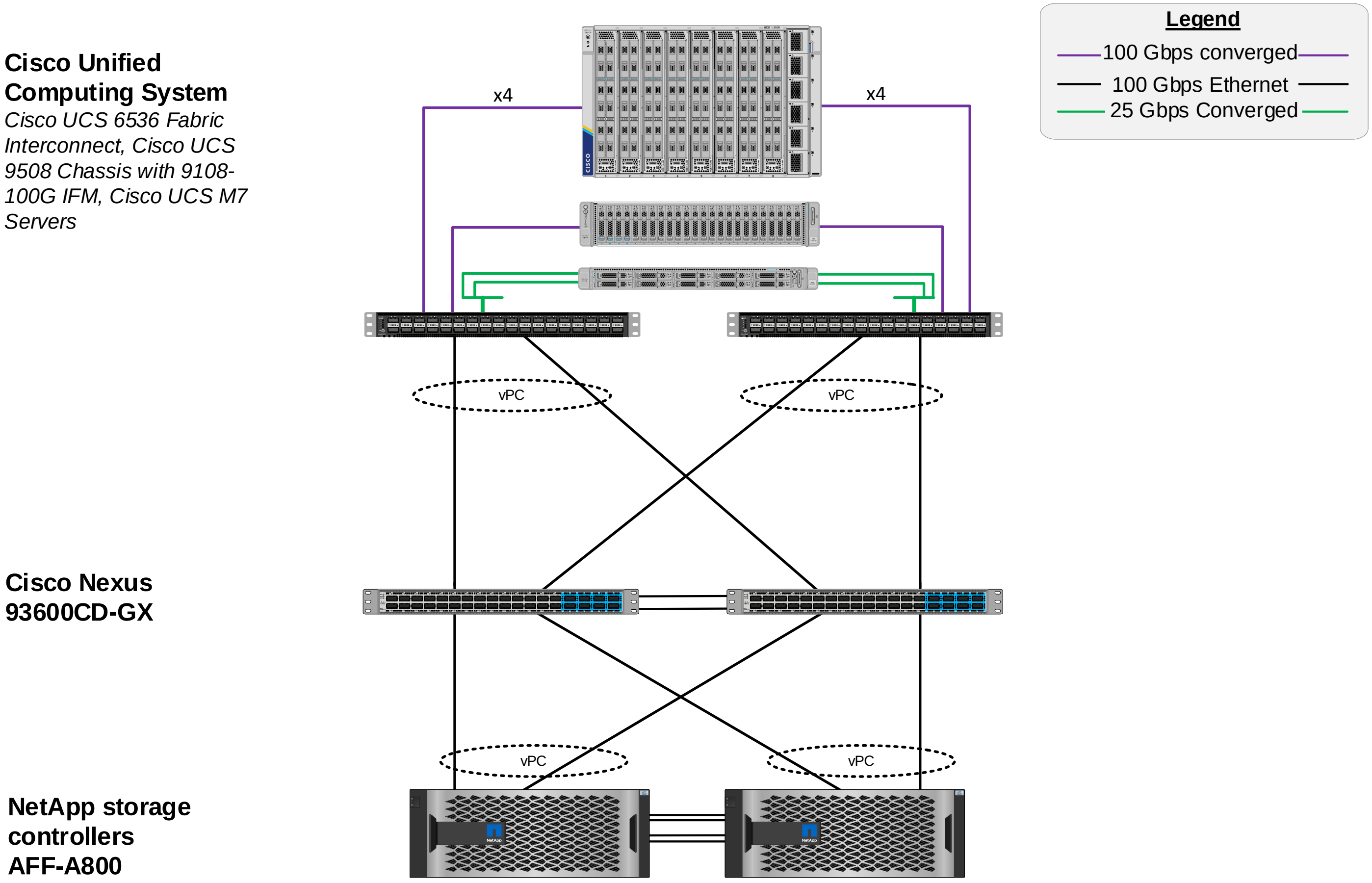
- Cisco Intersight to deploy, maintain, and support the Cisco UCS server components
- Cisco Intersight SaaS platform to maintain and support the FlexPod components

- Cisco Intersight Assist Virtual Appliance to help connect NetApp ONTAP, VMware vCenter, and Cisco Nexus and MDS switches with Cisco Intersight
- NetApp Active IQ Unified Manager to monitor and manage the storage and for NetApp ONTAP integration with Cisco Intersight
- VMware vCenter to set up and manage the virtual infrastructure as well as Cisco Intersight integration

FlexPod Datacenter for IP-based Storage Access

Figure 1 shows various hardware components and the network connections for the IP-based FlexPod design.

Figure 1. **FlexPod Datacenter Physical Topology for IP-based Storage Access**


Cisco Unified Computing System
Cisco UCS 6536 Fabric Interconnect, Cisco UCS 9508 Chassis with 9108-100G IFM, Cisco UCS M7 Servers
x4
x4
Legend
100 Gbps converged
100 Gbps Ethernet
25 Gbps Converged
vPC
vPC
Cisco Nexus 93600CD-GX
vPC
vPC
NetApp storage controllers AFF-A800

The reference hardware configuration includes:

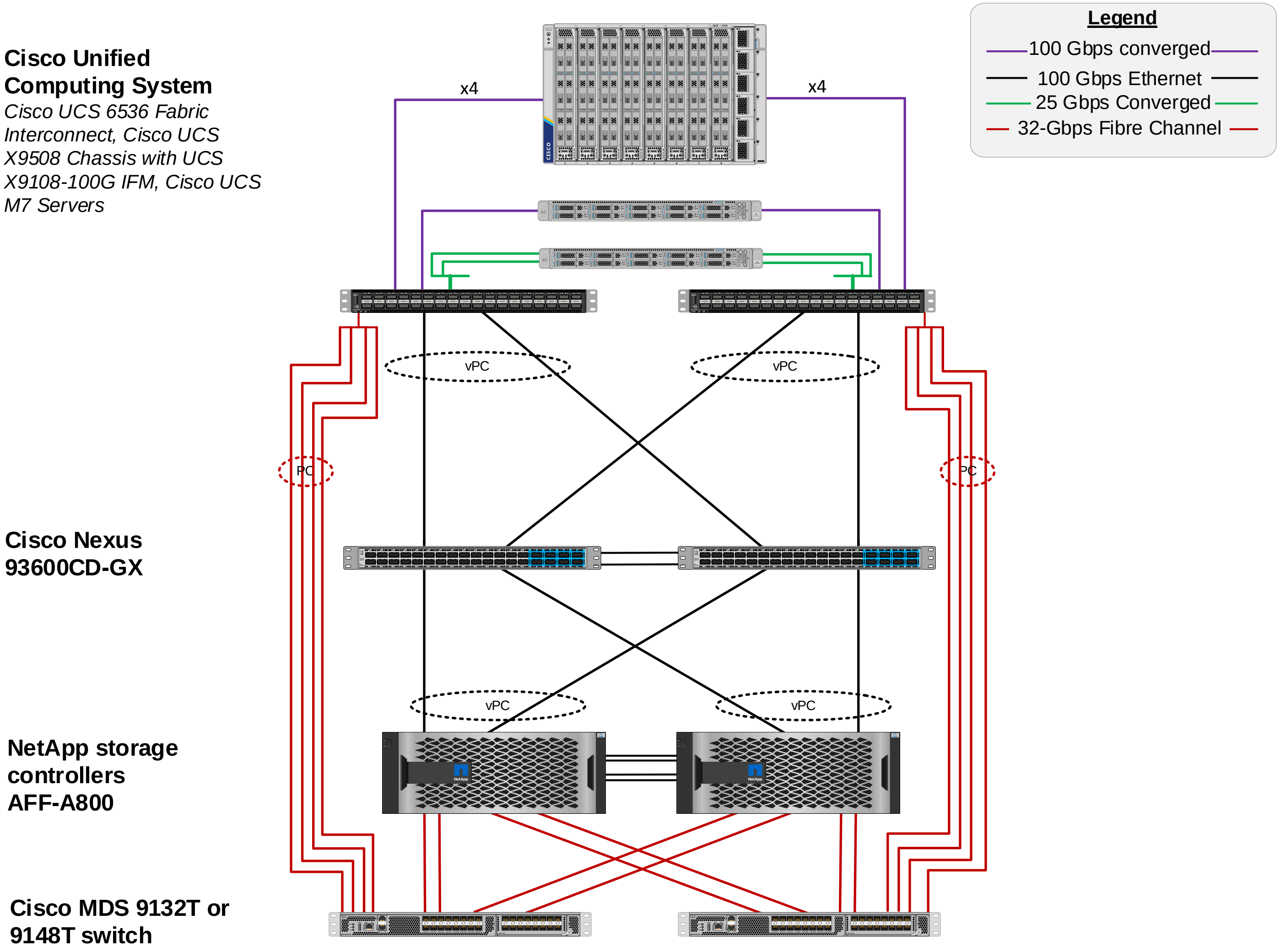
- Two Cisco Nexus 93600CD-GX Switches in Cisco NX-OS mode provide the switching fabric.
- Two Cisco UCS 6536 Fabric Interconnects (FI) provide the chassis connectivity. Two 100 Gigabit Ethernet ports from each FI, configured as a Port-Channel, are connected to each Nexus 93600CD-GX.
- One Cisco UCS X9508 Chassis connects to fabric interconnects using Cisco UCS UCSX-I-9108-100G IFMs, where four 100 Gigabit Ethernet ports are used on each IOM to connect to the appropriate FI. If additional bandwidth is required, all eight 100G ports can be utilized.
- One NetApp AFF A800 HA pair connects to the Cisco Nexus 93600CD-GX Switches using two 100 GE ports from each controller configured as a Port-Channel.

- One Cisco UCS C240 M7 rack mount server connects to the Fabric Interconnects using two 100 GE ports per server.
- One Cisco UCS C220 M7 rack mount server connects to the Fabric Interconnects using four 25 GE ports per server via breakout.

FlexPod Datacenter for FC-based Storage Access

Figure 2 shows various hardware components and the network connections for the FC-based FlexPod design.

Figure 2. FlexPod Datacenter Physical Topology for FC-based Storage Access



Cisco Unified Computing System
Cisco UCS 6536 Fabric Interconnect, Cisco UCS X9508 Chassis with UCS X9108-100G IFM, Cisco UCS M7 Servers
x4
x4
Legend
100 Gbps converged
100 Gbps Ethernet
25 Gbps Converged
32-Gbps Fibre Channel
vPC
vPC
PC
PC
Cisco Nexus 93600CD-GX
vPC
vPC
NetApp storage controllers AFF-A800
Cisco MDS 9132T or 9148T switch

The reference hardware configuration includes:

- Two Cisco Nexus 93600CD-GX Switches in Cisco NX-OS mode provide the switching fabric.
- Two Cisco UCS 6536 Fabric Interconnects (FI) provide the chassis connectivity. Two 100 Gigabit Ethernet ports from each FI, configured as a Port-Channel, are connected to each Cisco Nexus 93600CD-GX. Four FC ports are connected to the Cisco MDS 9132T switches using 32-Gbps Fibre Channel connections via breakout configured as a single port channel for SAN connectivity.

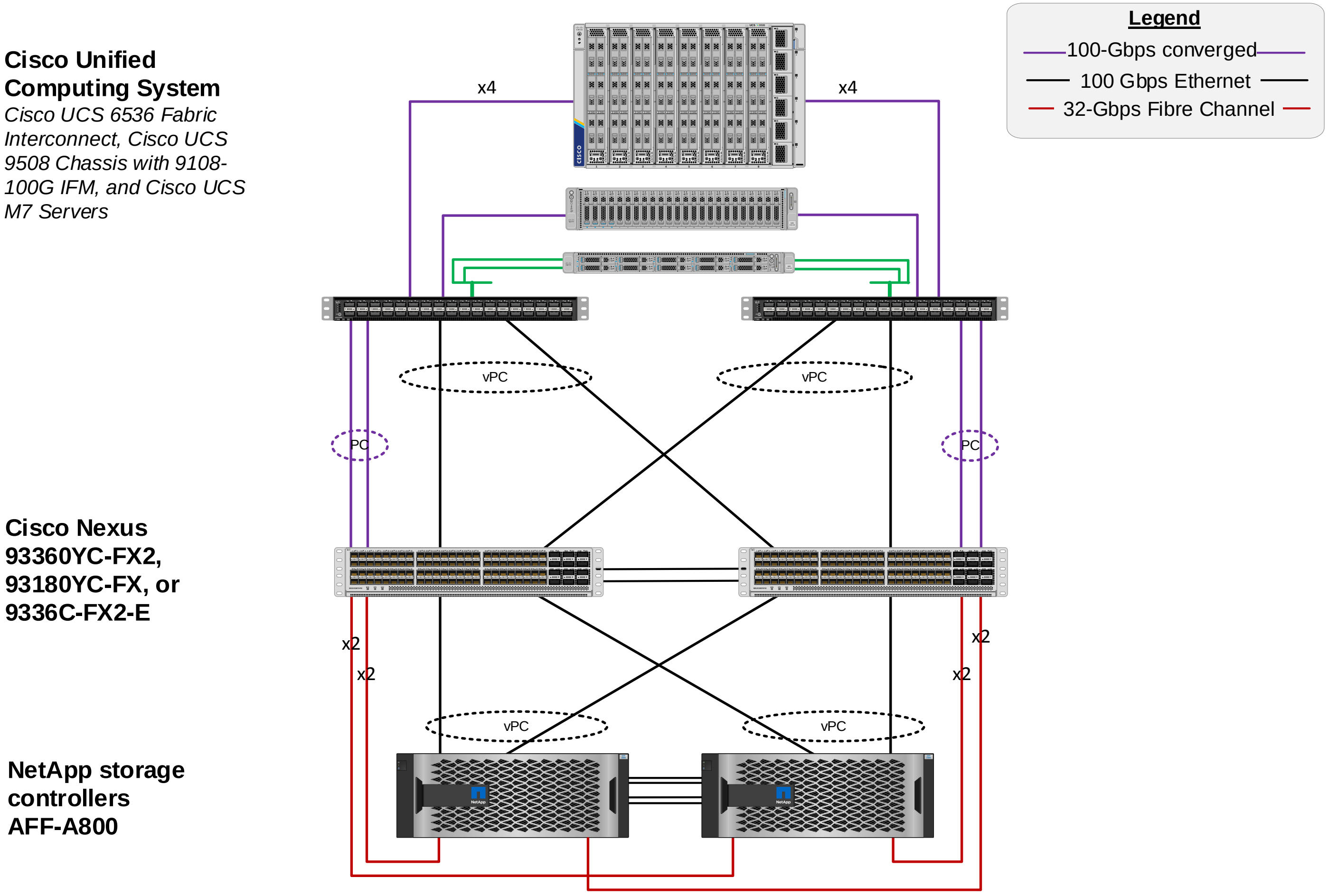
- One Cisco UCS X9508 Chassis connects to fabric interconnects using Cisco UCS UCSX-I-9108-100G IFMs, where four 100 Gigabit Ethernet ports are used on each IOM to connect to the appropriate FI. If additional bandwidth is required, all eight 100G ports can be utilized. The chassis to fabric interconnect connections are converged and carry both Ethernet and Fibre Channel over Ethernet (FCoE).
- One NetApp AFF A800 HA pair connects to the Cisco Nexus 93600CD-GX Switches using two 100 GE ports from each controller configured as a Port-Channel. Two 32Gbps FC ports from each controller are connected to each Cisco MDS 9132T for SAN connectivity.
- One Cisco UCS C240 M7 Rack Mount Server connects to the Fabric Interconnects using two 100 GE ports per server. These connections are also converged and carry both Ethernet and FCoE.
- One Cisco UCS C220 M7 Rack Mount Server connects to the Fabric Interconnects using four 25 GE ports per server. These connections are also converged and carry both Ethernet and FCoE.

Note: The NetApp storage controller and disk shelves should be connected according to best practices for the specific storage controller and disk shelves. For disk shelf cabling, refer to NetApp Support: https://docs.netapp.com/us-en/ontap-systems/index.html

FlexPod Datacenter for FC-based Storage Access with Nexus SAN Switching

Figure 3 shows various hardware components and the network connections for the FC-based FlexPod design.

Figure 3. **FlexPod Datacenter Physical Topology for FC-based Storage Access with Cisco Nexus SAN Switching**


Legend
100-Gbps converged
100 Gbps Ethernet
32-Gbps Fibre Channel
Cisco Unified Computing System
Cisco UCS 6536 Fabric Interconnect, Cisco UCS 9508 Chassis with 9108-100G IFM, and Cisco UCS M7 Servers
x4
x4
vPC
vPC
PC
PC
Cisco Nexus 93360YC-FX2, 93180YC-FX, or 9336C-FX2-E
x2
x2
x2
x2
vPC
vPC
NetApp storage controllers AFF-A800

The reference hardware configuration includes:

- Two Cisco Nexus 93180YC-FX, 93360YC-FX2, or 9336C-FX2-E Switches in Cisco NX-OS mode provide the switching fabric for both LAN and SAN.
- Two Cisco UCS 6536 Fabric Interconnects (FI) provide the chassis connectivity. Two 100 Gigabit Ethernet ports from each FI, configured as a Port-Channel, are connected to each Nexus switch. Two 100G FCoE ports are connected to the Cisco Nexus switches configured as a single Ethernet port channel for SAN connectivity.
- One Cisco UCS X9508 Chassis connects to fabric interconnects using Cisco UCS UCSX-I-9108-100G IFMs, where four 100 Gigabit Ethernet ports are used on each IOM to connect to the appropriate FI. If additional bandwidth is required, all eight 100G ports can be utilized. The chassis to fabric interconnect connections are converged and carry both Ethernet and Fibre Channel over Ethernet (FCoE).
- One NetApp AFF A800 HA pair connects to the Cisco Nexus Switches using two 100 GE ports from each controller configured as a Port-Channel. Two 32Gbps FC ports from each controller are connected to each Cisco Nexus switch for SAN connectivity (Cisco Nexus 9336C-FX2-E using breakout).
- One Cisco UCS C220 M7 Rack Mount Server connects to the Fabric Interconnects using two 100 GE ports per server. These connections are also converged and carry both Ethernet and FCoE.
- One Cisco UCS C220 M7 Rack Mount Server connects to the Fabric Interconnects four 25 GE ports per server. These connections are also converged and carry both Ethernet and FCoE.

Note: The NetApp storage controller and disk shelves should be connected according to best practices for the specific storage controller and disk shelves. For disk shelf cabling, refer to NetApp Support: https://docs.netapp.com/us-en/ontap-systems/index.html

VLAN Configuration

Table 1 lists VLANs configured for setting up the FlexPod environment along with their usage.

Table 1. VLAN Usage

VLAN ID	Name	Usage	IP Subnet used in this deployment
2	Native-VLAN	Use VLAN 2 as native VLAN instead of default VLAN (1).	
1020	OOB-MGMT-VLAN	Out-of-band management VLAN to connect management ports for various devices	10.102.0.0/24; GW: 10.102.0.254
1021	IB-MGMT-VLAN	In-band management VLAN utilized for all in-band management connectivity - for example, ESXi hosts, VM management, and so on.	10.102.1.0/24; GW: 10.102.1.254
1022	VM-Traffic	VM data traffic VLAN	10.102.2.0/24; GW: 10.102.2.254
3050	NFS-VLAN	NFS VLAN for mounting datastores in ESXi servers for VMs	192.168.50.0/24 **
3010*	iSCSI-A	iSCSI-A path for storage traffic including boot-from-san traffic	192.168.10.0/24 **
3020*	iSCSI-B	iSCSI-B path for storage traffic including boot-from-san traffic	192.168.20.0/24 **

VLAN ID	Name	Usage	IP Subnet used in this deployment
3030	NVMe-TCP-A	NVMe-TCP-A path when using NVMe-TCP	192.168.30.0/24 **
3040	NVMe-TCP-B	NVMe-TCP-B path when using NVMe-TCP	192.168.40.0/24 **
3000	vMotion	VMware vMotion traffic	192.168.0.0/24 **

* iSCSI VLANs are not required if using FC storage access.

** IP gateway is not needed since no routing is required for these subnets

It is assumed that if you are using FC boot, that you would also use NFS and optionally FC-NVMe, but not iSCSI or NVMe-TCP. On the other hand, it is also assumed that if you are using iSCSI boot, that you would also use NFS and optionally NVMe-TCP, but not FC or FC-NVMe.

Some of the key highlights of VLAN usage are as follows:

- VLAN 1020 allows you to manage and access out-of-band management interfaces of various devices.
- VLAN 1021 is used for in-band management of VMs, ESXi hosts, and other infrastructure services.
- VLAN 3050 provides ESXi hosts access to the NFS datastores hosted on the NetApp Controllers for deploying VMs.
- A pair of iSCSI VLANs (3010 and 3020) is configured to provide access to boot LUNs for ESXi hosts. These VLANs are not needed if you are using FC-only connectivity.
- A pair of NVMe-TCP VLANs (3030 and 3040) are configured to provide access to NVMe datastores when NVMe-TCP is being used.
- VLAN 3000 is used for VM vMotion.

Table 2 lists the infrastructure VMs necessary for deployment as outlined in this document.

Table 2. Virtual Machines

Virtual Machine Description	VLAN	IP Address	Comments
vCenter Server	1021	10.102.1.100	Hosted on either pre-existing management infrastructure (preferred) or on FlexPod
NetApp ONTAP Tools for VMware vSphere	1021	10.102.1.99	Hosted on FlexPod
NetApp SnapCenter Plug-in for VMware vSphere	1021	10.102.1.98	Hosted on either pre-existing management infrastructure (preferred) or on FlexPod
NetApp Active IQ Unified Manager	1021	10.102.1.97	Hosted on FlexPod
Cisco Intersight Assist	1021	10.102.1.96	Hosted on FlexPod

Virtual Machine Description	VLAN	IP Address	Comments
Nexus Dashboard Fabric Controller (NDFC)-SAN	1021 and 1020	10.102.1.21	Hosted on a server that is under the FlexPod Datacenter, but not part of a cluster. Consider deploying an extra server for this in the FlexPod Management Cluster and moving this server out to the Datacenter level in vCenter.

Software Revisions

Table 3 lists the software revisions for various components of the solution.

Table 3. Software Revisions

Layer	Device	Image Bundle	Comments
Compute	Cisco UCS	4.2(3d)	Cisco UCS GA release for infrastructure including FIs and IOM/IFM.
	Cisco UCS X210C M7	5.1(1.230052)	
	Cisco UCS C220/240 M7	4.3(1.230138)	
Network	Cisco Nexus 93600CD-GX NX-OS	10.2(5)M	
	Cisco MDS 9132T	9.3(2)	Requires SMART Licensing
Storage	NetApp AFF A800/A400	ONTAP 9.12.1*	Latest patch release
Software	Cisco Intersight Assist Appliance	1.0.9-558	1.0.9-538 initially installed and then automatically upgraded
	VMware vCenter	8.0	Latest 8.0 Build
	VMware ESXi	8.0	Latest 8.0 Build
	VMware ESXi nfnic FC Driver	5.0.0.37	Supports FC-NVMe
	VMware ESXi nenic Ethernet Driver	1.0.45.0	
	NetApp ONTAP Tools for VMware vSphere	9.12	Formerly Virtual Storage Console (VSC)
	NetApp SnapCenter Plug-in for VMware vSphere	4.8	
	NetApp Active IQ Unified Manager	9.12	

Note: NetApp ONTAP 9.13.1 was also tested with the ONTAP Ansible scripts in the Github repository for this project.

FlexPod Cabling

The information in this section is provided as a reference for cabling the physical equipment in a FlexPod environment. To simplify cabling requirements, a cabling diagram was used.

The cabling diagram in this section contains the details for the prescribed and supported configuration of the NetApp AFF 400 running NetApp ONTAP 9.12.1.

Note: For any modifications of this prescribed architecture, consult the NetApp Interoperability Matrix Tool (IMT).

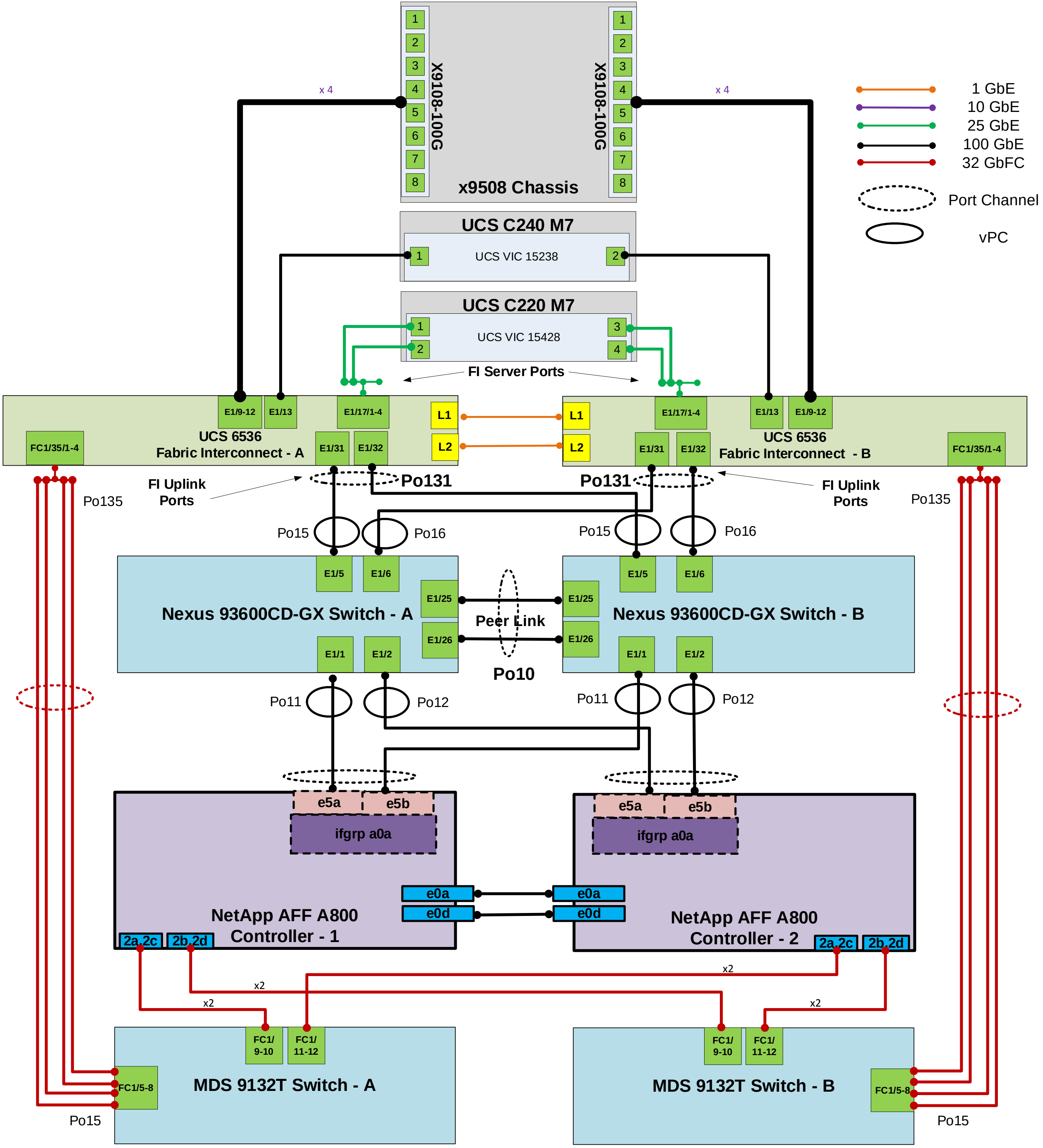
Note: This document assumes that out-of-band management ports are plugged into an existing management infrastructure at the deployment site. These interfaces will be used in various configuration steps.

Note: Be sure to use the cabling directions in this section as a guide.

The NetApp storage controller and disk shelves should be connected according to best practices for the specific storage controller and disk shelves. For disk shelf cabling, refer to NetApp Support.

Figure 4 details the cable connections used in the validation lab for the FlexPod topology based on the Cisco UCS 6536 fabric interconnect. Four 32Gb uplinks connect as port-channels from each Cisco UCS Fabric Interconnect to the MDS switches, and a total of eight 32Gb links connect the MDS switches to the NetApp AFF controllers. Also, two 100Gb links connect each Cisco UCS Fabric Interconnect to the Cisco Nexus Switches and each NetApp AFF controller to the Cisco Nexus Switches. Additional 1Gb management connections will be needed for an out-of-band network switch that sits apart from the FlexPod infrastructure. Each Cisco UCS fabric interconnect and Cisco Nexus switch is connected to the out-of-band network switch, and each AFF controller has a connection to the out-of-band network switch. Layer 3 network connectivity is required between the Out-of-Band (OOB) and In-Band (IB) Management Subnets. This cabling diagram includes both the FC-boot and iSCSI-boot configurations.

Figure 4. FlexPod Cabling with Cisco UCS 6536 Fabric Interconnect

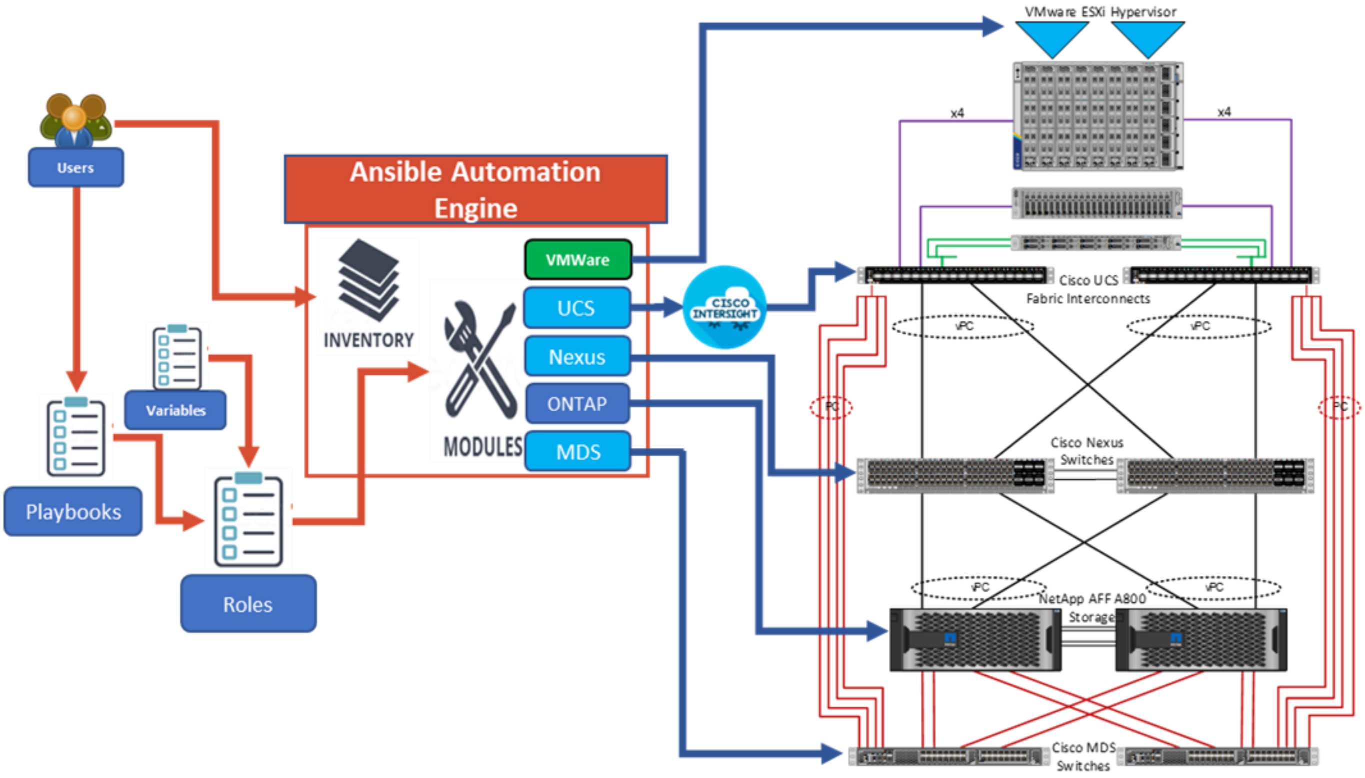


Ansible Automation Workflow and Solution Deployment

The Ansible automated FlexPod solution uses a management workstation (control machine) to run Ansible playbooks to configure Cisco Nexus, NetApp ONTAP Storage, Cisco UCS, Cisco MDS, and VMware ESXi.

Figure 5 illustrates the FlexPod solution implementation workflow which is explained in the following sections. The FlexPod infrastructure layers are first configured in the order illustrated.

Figure 5. **Ansible Automation Workflow**



Prerequisites

Setting up the solution begins with a management workstation or VM that has access to the Internet and with a working installation of Ansible. The management workstation commonly runs a variant of Linux or MacOS for ease of use with these command-line-based tools. Instructions for installing the workstation are not included in this document, but basic installation and configuration of Ansible is explained. A guide for getting started with Ansible can be found here: https://docs.ansible.com/ansible_community.html

- To use the Ansible playbooks demonstrated in this document, the management workstation must also have a working installation of Git and access to the Cisco DevNet public GitHub repository. The Ansible playbooks used in this document are cloned from the public repositories, located at the following links:
    - Cisco DevNet: https://developer.cisco.com/codeexchange/github/repo/ucs-compute-solutions/FlexPod-IMM-VMware
    - GitHub repository: https://github.com/ucs-compute-solutions/FlexPod-IMM-VMwarehttps://github.com/ucs-compute-solutions/FlexPod-IMM-VMware
- The Cisco Nexus and MDS Switches, NetApp Storage, and Cisco UCS must be physically racked, cabled, powered, and configured with management IP addresses before the Ansible-based installation procedure can begin as shown in the cabling diagram (Figure 4). If necessary, upgrade the Cisco Nexus Switches to release 10.2(5)M, and the Cisco MDS Switches to release 9.3(2).
- Before running each Ansible Playbook to setup the Network, Storage, Cisco UCS, and VMware ESXi various variables must be updated based on the customers environment and specific implementation with

values such as the VLANs, pools and ports on Cisco UCS, IP addresses for NFS, iSCSI, and NVMe-TCP interfaces and values needed for VMware ESXi.

- Day 2 Configuration tasks such as adding datastores or ESXi servers can be performed manually or with Cisco Intersight Cloud Orchestrator (ICO).

Procedure 1. Prepare Management Workstation (Control Machine)

In this procedure, the installation steps are performed on either RHEL 8.8 or Rocky Linux 8.8 (install default Server with GUI) management host to prepare the host for solution deployment to support the automation of Cisco UCS, Cisco Nexus, NetApp Storage, Cisco MDS, and VMware ESXi using Ansible Playbooks.

Note: The following steps were performed on both RHEL 8.8 and Rocky Linux 8.8 Virtual Machines as the admin user.

Step 1. Install Python 3.11.

```
sudo dnf install python3.11
```

Step 2. Install pip3.11.

```
curl https://bootstrap.pypa.io/get-pip.py -o get-pip.py
python3.11 get-pip.py
rm get-pip.py
```

Step 3. Install Ansible engine with Python 3.11.

```
python3.11 -m pip install --user ansible
```

Step 4. Configure Ansible to use python3.11.

```
echo [defaults] > ~/.ansible.cfg
echo interpreter_python=/usr/bin/python3.11 >> ~/.ansible.cfg
```

Step 5. Verify Ansible version to make sure it is release 2.9 or later.

```
ansible --version
ansible [core 2.15.2]
  config file = /home/admin/.ansible.cfg
  configured module search path = ['/home/admin/.ansible/plugins/modules',
'/usr/share/ansible/plugins/modules']
  ansible python module location = /home/admin/.local/lib/python3.11/site-packages/ansible
  ansible collection location = /home/admin/.ansible/collections:/usr/share/ansible/collections
  executable location = /home/admin/.local/bin/ansible
  python version = 3.11.2 (main, Jun  6 2023, 07:39:01) [GCC 8.5.0 20210514 (Red Hat 8.5.0-18)]
(/usr/bin/python3.11)
  jinja version = 3.1.2
  libyaml = True
```

Step 6. Install sshpass.

```
sudo dnf install sshpass
```

Step 7. Install git.

```
sudo dnf install git
```

Step 8. Install NetApp specific python modules.

```
pip3.11 install netapp-lib
```

Step 9. Install UCSM SDK.

```
pip3.11 install ucsmsdk
```

Note: This step and the collection installation below was put in just in case this Ansible machine will also be used with Cisco UCS Manager installations.

Step 10. Install ansible-galaxy collections and other dependencies for Cisco Nexus (and MDS), NetApp ONTAP, Cisco UCS, VMware, and NetApp management tools as follows:

```
ansible-galaxy collection install cisco.ucs –force
ansible-galaxy collection install cisco.intersight --force
ansible-galaxy collection install cisco.nxos --force
pip3.11 install ansible-pylibssh
ansible-galaxy collection install netapp.ontap --force
ansible-galaxy collection install community.vmware --force
pip3.11 install -r ~/.ansible/collections/ansible_collections/community/vmware/requirements.txt
pip3.11 install aiohttp
pip3.11 install pexpect
pip3.11 install jmespath
```

Note: The cisco.nxos collection is used for both Cisco Nexus and Cisco MDS configuration.

Procedure 2. Clone GitHub Collection

Note: You need to use a GitHub repository from one public location; the first step in the process is to clone the GitHub collection named FlexPod-IMM-VMware (https://github.com/ucs-compute-solutions/FlexPod-IMM-VMware.git) to a new empty folder on the management workstation. Cloning the repository creates a local copy, which is then used to run the playbooks that have been created for this solution.

Step 1. From the management workstation, create a new folder for the project. The GitHub collection will be cloned in a new folder inside this one, named /home/admin/FlexPod-IMM-VMware.

Step 2. Open a command-line or console interface on the management workstation and change directories to the new folder just created.

Step 3. Clone the GitHub collection using the following command:

```
git clone https://github.com/ucs-compute-solutions/FlexPod-IMM-VMware.git
```

Step 4. Change directories to the new folder named FlexPod-IMM-VMware.

Network Switch Configuration

This chapter contains the following:

- Physical Connectivity
- Initial Configuration
- Ansible Nexus Switch Configuration

This chapter provides a detailed procedure for configuring the Cisco Nexus 93360YC-FX2 switches for use in a FlexPod environment. The Cisco Nexus 93360YC-FX2 will be used for LAN switching in this solution.

Note: The following procedures describe how to configure the Cisco Nexus switches for use in a base FlexPod environment. This procedure assumes the use of Cisco Nexus 9000 10.2(5)M.

- If using the Cisco Nexus 93360YC-FX2 switches or other Cisco Nexus switches for both LAN and SAN switching, please refer to section FlexPod with Cisco Nexus 93360YC-FX2 SAN Switching Configuration in the Appendix.
- The following procedure includes the setup of NTP distribution on both the mgmt0 port and the in-band management VLAN. The interface-vlan feature and ntp commands are used to set this up. This procedure also assumes that the default VRF is used to route the in-band management VLAN.
- This procedure sets up and uplink virtual port channel (vPC) with the IB-MGMT and OOB-MGMT VLANs allowed.
- This validation assumes that both switches have been reset to factory defaults by using the “write erase” command followed by the “reload” command.

Physical Connectivity

Follow the physical connectivity guidelines for FlexPod as explained in section FlexPod Cabling.

Initial Configuration

The following procedures describe this basic configuration of the Cisco Nexus switches for use in the FlexPod environment. This procedure assumes the use of Cisco Nexus 9000 10.2(5)M, the Cisco suggested Nexus switch release at the time of this validation.

Procedure 1. Set Up Initial Configuration from a serial console

Set up the initial configuration for the Cisco Nexus A switch on <nexus-A-hostname>.

Step 1. Configure the switch.

Note: On initial boot, the NX-OS setup automatically starts and attempts to enter Power on Auto Provisioning.

```
Abort Power On Auto Provisioning [yes - continue with normal setup, skip - bypass password and basic
configuration, no - continue with Power On Auto Provisioning] (yes/skip/no)[no]: yes
Disabling POAP.......Disabling POAP
poap: Rolling back, please wait... (This may take 5-15 minutes)

         ---- System Admin Account Setup ----

Do you want to enforce secure password standard (yes/no) [y]: Enter
Enter the password for "admin": <password>
Confirm the password for "admin": <password>
Would you like to enter the basic configuration dialog (yes/no): yes
Create another login account (yes/no) [n]: Enter
Configure read-only SNMP community string (yes/no) [n]: Enter
Configure read-write SNMP community string (yes/no) [n]: Enter
Enter the switch name: <nexus-A-hostname>
```

```
Continue with Out-of-band (mgmt0) management configuration? (yes/no) [y]: Enter
Mgmt0 IPv4 address: <nexus-A-out_of_band_mgmt0-ip>
Mgmt0 IPv4 netmask: <nexus-A-mgmt0-netmask>
Configure the default gateway? (yes/no) [y]: Enter
IPv4 address of the default gateway: <nexus-A-mgmt0-gw>
Configure advanced IP options? (yes/no) [n]: Enter
Enable the telnet service? (yes/no) [n]: Enter
Enable the ssh service? (yes/no) [y]: Enter
Type of ssh key you would like to generate (dsa/rsa) [rsa]: Enter
Number of rsa key bits <1024-2048> [1024]: Enter
Configure the ntp server? (yes/no) [n]: Enter
Configure default interface layer (L3/L2) [L2]: Enter
Configure default switchport interface state (shut/noshut) [noshut]: shut
Enter basic FC configurations (yes/no) [n]: n
Configure CoPP system profile (strict/moderate/lenient/dense) [strict]: Enter
Would you like to edit the configuration? (yes/no) [n]: Enter
```

Step 2. Review the configuration summary before enabling the configuration.

```
Use this configuration and save it? (yes/no) [y]: Enter
```

Step 3. To set up the initial configuration of the Cisco Nexus B switch, repeat steps 1 and 2 with the appropriate host and IP address information.

Ansible Nexus Switch Configuration

Procedure 1. Configure the Cisco Nexus switches from the management workstation

Step 1. Add Nexus switch ssh keys to /home/admin/.ssh/known_hosts. Adjust known_hosts as necessary if errors occur.

```
ssh admin@<nexus-A-mgmt0-ip>
exit
ssh admin@<nexus-B-mgmt0-ip>
exit
```

Step 2. Edit the following variable files to ensure proper Cisco Nexus variables are entered:

- FlexPod-IMM-VMware/FlexPod-IMM-VMware/group_vars/secrets.yml
- FlexPod-IMM-VMware/FlexPod-IMM-VMware/inventory
- FlexPod-IMM-VMware/FlexPod-IMM-VMware/group_vars/all.yml
- FlexPod-IMM-VMware/FlexPod-IMM-VMware/host_vars/n9kA.yml
- FlexPod-IMM-VMware/FlexPod-IMM-VMware/host_vars/n9kB.yml
- FlexPod-IMM-VMware/FlexPod-IMM-VMware/roles/NEXUSconfig/defaults/main.yml

Note: Switch configuration can be done one switch at a time by commenting one switch out in inventory and running the playbook. This may need to be done if the switches are shared with other FlexPods and additional configuration needs to be added between playbook runs.

Step 3. From FlexPod-IMM-VMware/FlexPod-IMM-VMware, run the Setup_Nexus.yml Ansible playbook.

```
ansible-playbook ./Setup_Nexus.yml -i inventory
```

Step 4. When the Ansible playbook has been run on both switches, it is important to configure the local time so that logging time alignment and any backup schedules are correct. For more information on configuring the time-zone and daylight savings time or summertime, see Cisco Nexus 9000 Series NX-OS Fundamentals Configuration Guide, Release 10.2(x). Sample clock commands for the United States Eastern timezone are:

```
clock timezone EST -5 0
clock summer-time EDT 2 Sunday March 02:00 1 Sunday November 02:00 60
copy running-config startup-config
```

Step 5. ssh into each switch and run the following commands:

```
clock timezone <timezone> <hour-offset> <minute-offset>
clock summer-time <timezone> <start-week> <start-day> <start-month> <start-time> <end-week> <end-day> <end-month> <end-time> <offset-minutes>
copy running-config startup-config
```

NetApp ONTAP Storage Configuration

This chapter contains the following:

- NetApp AFF A800/A400 Controllers
- Disk Shelves
- NetApp ONTAP 9.12.1

Note: The Ansible scripts have now been tested with NetApp ONTAP 9.13.1 and NetApp ONTAP 9.14.1.

NetApp AFF A800/A400 Controllers

See the following section (NetApp Hardware Universe) for planning the physical location of the storage systems:

- Site Preparation
- System Connectivity Requirements
- Circuit Breaker, Power Outlet Balancing, System Cabinet Power Cord Plugs, and Console Pinout Requirements
- AFF Series Systems

NetApp Hardware Universe

The NetApp Hardware Universe (HWU) application provides supported hardware and software components for any specific ONTAP version. It also provides configuration information for all the NetApp storage appliances currently supported by ONTAP software and a table of component compatibilities.

To confirm that the hardware and software components that you would like to use are supported with the version of ONTAP that you plan to install, follow these steps at the NetApp Support site.

Procedure 1. Confirm hardware and software components

Step 1. Access the HWU application to view the System Configuration guides. Click the Products tab to select the Platforms menu to view the compatibility between different versions of the ONTAP software and the NetApp storage appliances with your desired specifications.

Step 2. Alternatively, to compare components by storage appliance, click Utilities and select Compare Storage Systems.

Controllers

Follow the physical installation procedures for the controllers found here: https://docs.netapp.com/us-en/ontap-systems/index.html.

Disk Shelves

NetApp storage systems support a wide variety of disk shelves and disk drives. The complete list of disk shelves that are supported by the NetApp AFF A400 is available at the NetApp Support site.

When using SAS disk shelves with NetApp storage controllers, go to: https://docs.netapp.com/us-en/ontap-systems/sas3/install-new-system.html for proper cabling guidelines.

When using NVMe drive shelves with NetApp storage controllers, refer to: https://docs.netapp.com/us-en/ontap-systems/ns224/hot-add-shelf.html for installation and servicing guidelines.

NetApp ONTAP 9.12.1

Complete Configuration Worksheet

Before running the setup script, complete the Cluster setup worksheet in the NetApp ONTAP 9 Documentation Center. You must have access to the NetApp Support site to open the cluster setup worksheet.

Ansible NetApp ONTAP Storage Configuration

End to End ONTAP Storage Configuration for a FlexPod is automated with Ansible. ONTAP Storage can be deployed via Ansible after the ONTAP Cluster setup is complete and the Cluster management network is configured.

A playbook by the name 'Setup_ONTAP.yml' is available at the root of this repository. It calls all the required roles to complete the setup of the ONTAP storage system.

The ONTAP setup is split into three sections, use the tags - ontap_config_part_1, ontap_config_part_2, and ontap_config_part_3 to execute parts of the playbook at the appropriate stage of setup.

Execute the playbook from the Ansible Control machine as an admin/ root user using the following commands:

- After setup of Cisco Nexus switches and bringing the NetApp storage cluster online: ansible-playbook -i inventory Setup_ONTAP.yml -t ontap_config_part_1
- After setup of Cisco UCS and deploying server profiles: ansible-playbook -i inventory Setup_ONTAP.yml -t ontap_config_part_2
- After setup of VMware vSphere 8.0 Setup: ansible-playbook -i inventory Setup_ONTAP.yml -t ontap_config_part_3

If you would like to run a part of the deployment, you may use the appropriate tag that accompanies each task in the role and run the playbook by running the following command:

```
ansible-playbook -i inventory Setup_ONTAP.yml -t <tag_name>
```

Configure ONTAP Nodes

Before running the setup script, review the configuration worksheets in the Software setup section of the ONTAP 9 Documentation Center to learn about configuring ONTAP. Table 4 lists the information needed to configure two ONTAP nodes. Customize the cluster-detail values with the information applicable to your deployment.

Table 4. ONTAP Software Installation Prerequisites

Cluster Detail	Cluster Detail Value
Cluster node 01 IP address	<node01-mgmt-ip>
Cluster node 01 netmask	<node01-mgmt-mask>
Cluster node 01 gateway	<node01-mgmt-gateway>
Cluster node 02 IP address	<node02-mgmt-ip>
Cluster node 02 netmask	<node02-mgmt-mask>
Cluster node 02 gateway	<node02-mgmt-gateway>
ONTAP 9.12.14 URL (http server hosting ONTAP	<url-boot-software>

Cluster Detail	Cluster Detail Value
software)	

Procedure 1. Configure Node 01

Step 1. Connect to the **storage system console port**. You should see a Loader-A prompt. However, if the storage system is in a reboot loop, press **Ctrl-C** to exit the autoboot loop when the following message displays:

```
Starting AUTOBOOT press Ctrl-C to abort…
```

Step 2. Allow the system to boot up.

```
autoboot
```

Step 3. Press **Ctrl-C** when prompted.

Note: Use the latest NetApp ONTAP release patch. In this example, it is 9.12.1P4. If NetApp ONTAP 9.12.1P4 is not the version of the software being booted, continue with the following steps to install new software. If NetApp ONTAP 9.12.1P4 is the version being booted, select option 8 and `y` to reboot the node, then continue with section Set Up Node.

Step 4. To install new software, select option **7** from the menu.

Step 5. Enter `y` to continue the installation.

Step 6. Select `e0M` for the network port for the download.

Step 7. Enter `n` to skip the reboot.

Step 8. Select option **7** from the menu: `Install new software first`

Step 9. Enter `y` to continue the installation.

Step 10. Enter the IP address, netmask, and default gateway for `e0M`.

```
Enter the IP address for port e0M: <node01-mgmt-ip>
Enter the netmask for port e0M: <node01-mgmt-mask>
Enter the IP address of the default gateway: <node01-mgmt-gateway>
```

Step 11. Enter the **URL** where the software can be found.

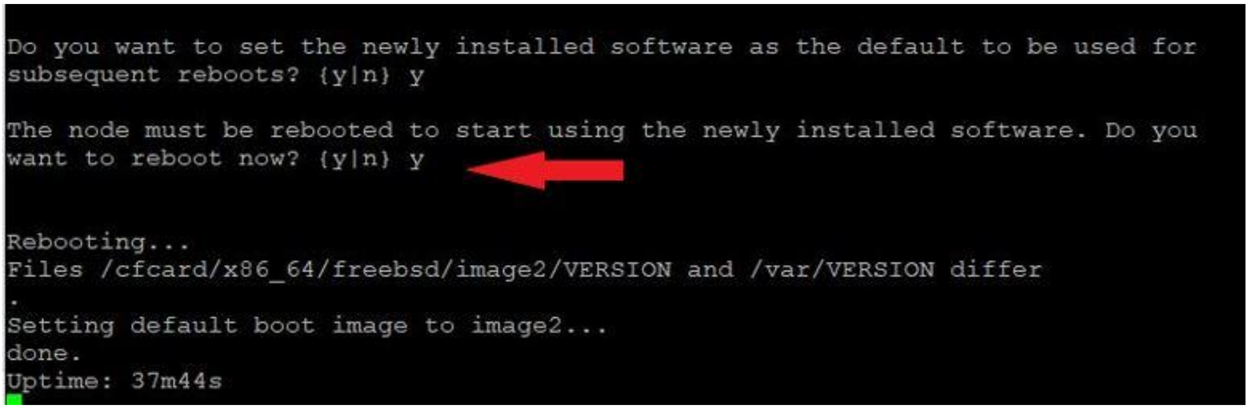
Note: The e0M interface should be connected to the management network and the web server must be reachable (using ping) from node 01.

```
<url-boot-software>
```

Step 12. Press **Enter** for the user name, indicating no user name.

Step 13. Enter `y` to set the newly installed software as the default to be used for subsequent reboots.

Step 14. Enter `y` to reboot the node now.



```
Do you want to set the newly installed software as the default to be used for
subsequent reboots? {y|n} y

The node must be rebooted to start using the newly installed software. Do you
want to reboot now? {y|n} y


Rebooting...
Files /cfcard/x86_64/freebsd/image2/VERSION and /var/VERSION differ
.
Setting default boot image to image2...
done.
Uptime: 37m44s
```

Note: When installing new software, the system might perform firmware upgrades to the BIOS and adapter cards, causing reboots and possible stops at the Loader-A prompt. If these actions occur, the system might deviate from this procedure.

Note: During the ONTAP installation a prompt to reboot the node requests a Y/N response.

Step 15. Press **Ctrl-C** when the following message displays:

```
Press Ctrl-C for Boot Menu
```

Step 16. Select option **4** for Clean Configuration and Initialize All Disks.

Step 17. Enter `y` to zero disks, reset config, and install a new file system.

Step 18. Enter `yes` to erase all the data on the disks.

Note: When initialization and creation of root aggregate is complete, the storage system reboots. You can continue with the configuration of node 02 while the initialization and creation of the root aggregate for node 01 is in progress. For more information about root aggregate and disk partitioning, please refer to the following NetApp ONTAP documentation on root-data partitioning: https://docs.netapp.com/us-en/ontap/concepts/root-data-partitioning-concept.html

Procedure 2. Configure Node 02

Step 1. Connect to the **storage system console port**. You should see a Loader-B prompt. However, if the storage system is in a reboot loop, press **Ctrl-C** to exit the autoboot loop when the following message displays:

```
Starting AUTOBOOT press Ctrl-C to abort…
```

Step 2. Allow the system to boot up.

```
autoboot
```

Step 3. Press **Ctrl-C** when prompted.

Note: If NetApp ONTAP 9.12.1P4 is not the version of the software being booted, continue with the following steps to install new software. If NetApp ONTAP 9.12.1P4 is the version being booted, select option 8 and `y` to reboot the node. Continue with section Set Up Node.

Step 4. To install new software, select option **7**.

Step 5. Enter `y` to continue the installation.

Step 6. Select `e0M` for the network port you want to use for the download.

Step 7. Enter `n` to skip the reboot.

Step 8. Select option **7**: `Install new software first`

Step 9. Enter `y` to continue the installation.

Step 10. Enter the IP address, netmask, and default gateway for e0M.

```
Enter the IP address for port e0M: <node02-mgmt-ip>
Enter the netmask for port e0M: <node02-mgmt-mask>
Enter the IP address of the default gateway: <node02-mgmt-gateway>
```

Step 11. Enter the **URL** where the software can be found.

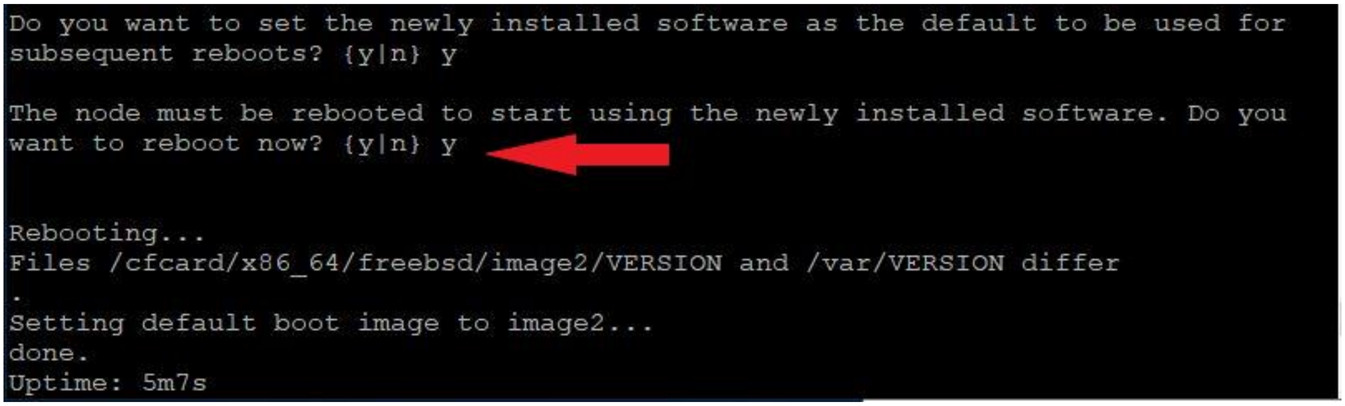
Note: The web server must be reachable (ping) from node 02.

```
<url-boot-software>
```

Step 12. Press `Enter` for the username, indicating no username.

Step 13. Enter `y` to set the newly installed software as the default to be used for subsequent reboots.

Step 14. Enter `y` to reboot the node now.



```
Do you want to set the newly installed software as the default to be used for
subsequent reboots? {y|n} y

The node must be rebooted to start using the newly installed software. Do you
want to reboot now? {y|n} y


Rebooting...
Files /cfcard/x86_64/freebsd/image2/VERSION and /var/VERSION differ
.
Setting default boot image to image2...
done.
Uptime: 5m7s
```

Note: When installing new software, the system might perform firmware upgrades to the BIOS and adapter cards, causing reboots and possible stops at the Loader-B prompt. If these actions occur, the system might deviate from this procedure.

Note: During the ONTAP installation a prompt to reboot the node requests a Y/N response.

Step 15. Press **Ctrl-C** when you see this message:

```
Press Ctrl-C for Boot Menu
```

Step 16. Select option **4** for Clean Configuration and Initialize All Disks.

Step 17. Enter `y` to zero disks, reset config, and install a new file system.

Step 18. Enter `yes` to erase all the data on the disks.

Note: When initialization and creation of root aggregate is complete, the storage system reboots. For more information about root aggregate and disk partitioning, please refer to the following ONTAP documentation on root-data partitioning. https://docs.netapp.com/us-en/ontap/concepts/root-data-partitioning-concept.html

Procedure 3. Set Up Node

Step 1. From a console port program attached to the storage controller A (node 01) console port, run the node setup script. This script appears when ONTAP 9.12.1 boots on the node for the first time.

Step 2. Follow the prompts to set up node 01.

```
Welcome to the cluster setup wizard.

You can enter the following commands at any time:
  "help" or "?" - if you want to have a question clarified,
  "back" - if you want to change previously answered questions, and
  "exit" or "quit" - if you want to quit the setup wizard.
     Any changes you made before quitting will be saved.

You can return to cluster setup at any time by typing "cluster setup".
To accept a default or omit a question, do not enter a value.

This system will send event messages and weekly reports to NetApp Technical Support.
To disable this feature, enter "autosupport modify -support disable" within 24 hours.

Enabling AutoSupport can significantly speed problem determination and resolution should a problem occur on
your system.
For further information on AutoSupport, see:
http://support.netapp.com/autosupport/

Type yes to confirm and continue {yes}: yes

Enter the node management interface port [e0M]: Enter
Enter the node management interface IP address: <node01-mgmt-ip>
Enter the node management interface netmask: <node01-mgmt-mask>
Enter the node management interface default gateway: <node01-mgmt-gateway>
```

```
A node management interface on port e0M with IP address <node01-mgmt-ip> has been created.

Use your web browser to complete cluster setup by accesing https://<node01-mgmt-ip>

Otherwise press Enter to complete cluster setup using the command line interface:
```

Step 3. To complete cluster setup, open a web browser and navigate to `https://<node01-mgmt-ip>`.

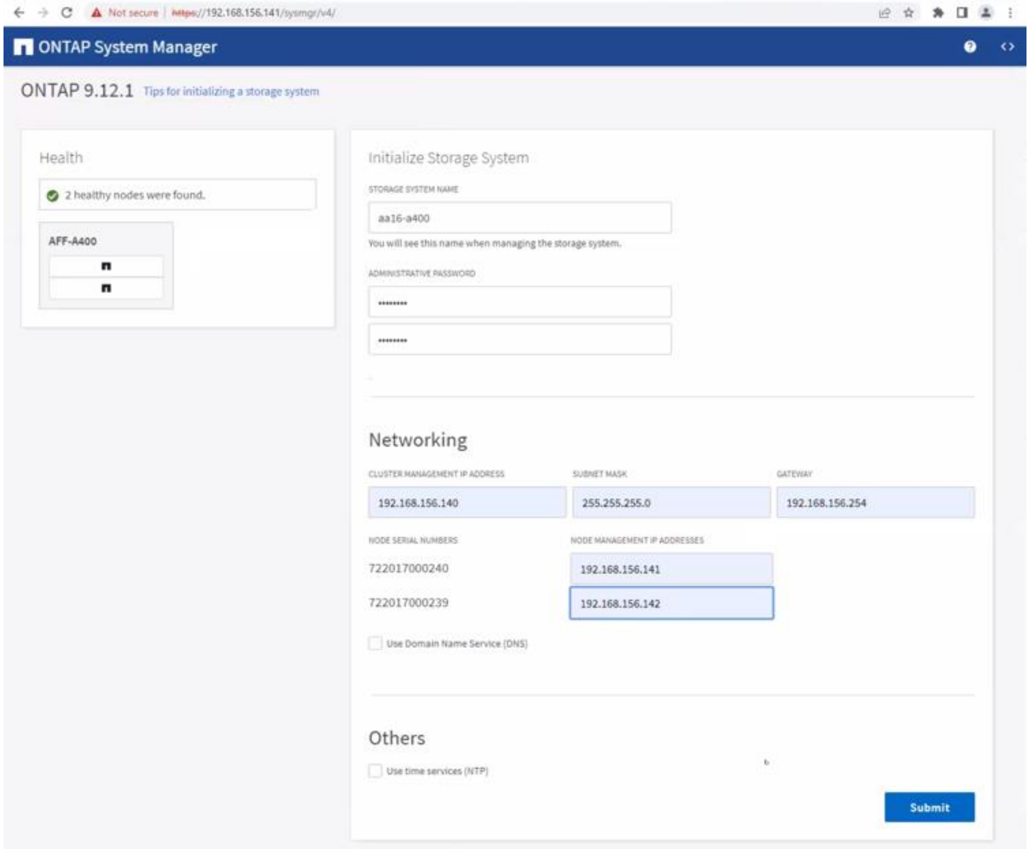
Table 5. Cluster Create in ONTAP Prerequisites

Cluster Detail	Cluster Detail Value
Cluster name	<clustername>
Cluster Admin SVM	<cluster-adm-svm>
Infrastructure Data SVM	<infra-data-svm>
ONTAP base license	<cluster-base-license-key>
Cluster management IP address	<clustermgmt-ip>
Cluster management netmask	<clustermgmt-mask>
Cluster management gateway	<clustermgmt-gateway>
Cluster node 01 IP address	<node01-mgmt-ip>
Cluster node 01 netmask	<node01-mgmt-mask>
Cluster node 01 gateway	<node01-mgmt-gateway>
Cluster node 02 IP address	<node02-mgmt-ip>
Cluster node 02 netmask	<node02-mgmt-mask>
Cluster node 02 gateway	<node02-mgmt-gateway>
Node 01 service processor IP address	<node01-sp-ip>
Node 01 service processor network mask	<node01-sp-mask>
Node 01 service processor gateway	<node01-sp-gateway>
Node 02 service processor IP address	<node02-sp-ip>
Node 02 service processor network mask	<node02-sp-mask>
Node 02 service processor gateway	<node02-sp-gateway>
Node 01 node name	<st-node01>
Node 02 node name	<st-node02>
DNS domain name	<dns-domain-name>
DNS server IP address	<dns-ip>
NTP server A IP address	<switch-a-ntp-ip>
NTP server B IP address	<switch-b-ntp-ip>

Cluster Detail	Cluster Detail Value
SNMPv3 User	<snmp-v3-usr>
SNMPv3 Authentication Protocol	<snmp-v3-auth-proto>
SNMPv3 Privacy Protocol	<snmpv3-priv-proto>

Note: Cluster setup can also be performed using the CLI. This document describes the cluster setup using the NetApp ONTAP System Manager guided setup.

Step 4. Complete the required information on the Initialize Storage System screen:



ONTAP 9.12.1 Tips for initializing a storage system

Health

2 healthy nodes were found.

AFF-A400

Initialize Storage System

STORAGE SYSTEM NAME: aa16-a400

You will see this name when managing the storage system.

ADMINISTRATIVE PASSWORD: ••••••••

••••••••

Networking

CLUSTER MANAGEMENT IP ADDRESS	SUBNET MASK	GATEWAY
192.168.156.140	255.255.255.0	192.168.156.254

NODE SERIAL NUMBERS	NODE MANAGEMENT IP ADDRESSES
722017000240	192.168.156.141
722017000239	192.168.156.142

□ Use Domain Name Service (DNS)

Others

□ Use time services (NTP)

Submit

a. Enter the cluster name and administrator password.

b. Complete the Networking information for the cluster and each node.

Note: Here, the DNS and NTP server manual configuration for the cluster is optional. Ansible scripts will configure the same when ONTAP playbook with the tag “ontap_config_part_1” is executed.

Note: The nodes should be discovered automatically; if they are not, Refresh the browser page. By default, the cluster interfaces are created on all the new factory shipping storage controllers.

Note: If all the nodes are not discovered, then configure the cluster using the command line.

Note: The node management interface can be on the same subnet as the cluster management interface, or it can be on a different subnet. In this document, we assume that it is on the same subnet.

Step 5. Click **Submit**.

Note: A few minutes will pass while the cluster is configured. You can use Ansible scripts at this point to configure the ONTAP Storage Configuration via Ansible.

Procedure 4. Ansible ONTAP Storage Configuration - Part 1

Step 1. Edit the following variable files to ensure proper ONTAP Storage variables are entered:

- FlexPod-IMM-VMware/FlexPod-IMM-VMware/group_vars/secrets.yml
- FlexPod-IMM-VMware/FlexPod-IMM-VMware/inventory
- FlexPod-IMM-VMware/FlexPod-IMM-VMware/group_vars/all.yml
- FlexPod-IMM-VMware/FlexPod-IMM-VMware/group_vars/ontap
- FlexPod-IMM-VMware/FlexPod-IMM-VMware/vars/ontap_main.yml

Step 2. From FlexPod-IMM-VMware/FlexPod-IMM-VMware, run the Setup_ONTAP.yml Ansible playbook with the associated tag for this section:

```
ansible-playbook -i inventory Setup_ONTAP.yml -t ontap_config_part_1
```

Note: Use the -vvv tag to see detailed execution output log.

Cisco Intersight Managed Mode Configuration

This chapter contains the following:

The Cisco Intersight platform is a management solution delivered as a service with embedded analytics for Cisco and third-party IT infrastructures. The Cisco Intersight Managed Mode (also referred to as Cisco IMM or Intersight Managed Mode) is an architecture that manages Cisco Unified Computing System (Cisco UCS) fabric interconnect-attached systems through a Redfish-based standard model. Cisco Intersight managed mode standardizes both policy and operation management for Cisco UCS C-Series M7 and Cisco UCS X210c M7 compute nodes used in this deployment guide.

Cisco UCS B-Series M6 servers, connected and managed through Cisco UCS FIs, are also supported by IMM. For a complete list of supported platforms, go to:

https://www.cisco.com/c/en/us/td/docs/unified_computing/Intersight/b_Intersight_Managed_Mode_Configuration_Guide/b_intersight_managed_mode_guide_chapter_01010.html

Procedure 1. Set up Cisco Intersight Managed Mode on Cisco UCS Fabric Interconnects

The Cisco UCS fabric interconnects need to be set up to support Cisco Intersight Managed Mode. When converting an existing pair of Cisco UCS fabric interconnects from Cisco UCS Manager mode to Intersight Managed Mode (IMM), first erase the configuration and reboot your system.

Note: Converting fabric interconnects to Cisco Intersight managed mode is a disruptive process, and configuration information will be lost. You are encouraged to make a backup of their existing configuration.

Step 1. Configure Fabric Interconnect A (FI-A). On the Basic System Configuration Dialog screen, set the management mode to Intersight. The remaining settings are similar to those for the Cisco UCS Manager Managed mode (UCSM-Managed).

```
Cisco UCS Fabric Interconnect A
To configure the Cisco UCS for use in a FlexPod environment in ucsm managed mode, follow these steps:
1.  Connect to the console port on the first Cisco UCS fabric interconnect.
  Enter the configuration method. (console/gui) ? console

  Enter the management mode. (ucsm/intersight)? intersight

  The Fabric interconnect will be configured in the intersight managed mode. Choose (y/n) to proceed: y

  Enforce strong password? (y/n) [y]: Enter

  Enter the password for "admin": <password>
  Confirm the password for "admin": <password>

  Enter the switch fabric (A/B) []: A

  Enter the system name:  <ucs-cluster-name>

  Physical Switch Mgmt0 IP address : <ucsa-mgmt-ip>

  Physical Switch Mgmt0 IPv4 netmask : <ucs-mgmt-mask>

  IPv4 address of the default gateway : <ucs-mgmt-gateway>

    DNS IP address : <dns-server-1-ip>

  Configure the default domain name? (yes/no) [n]: y

    Default domain name : <ad-dns-domain-name>

Following configurations will be applied:

    Management Mode=intersight
    Switch Fabric=A
    System Name=<ucs-cluster-name>
    Enforced Strong Password=yes
    Physical Switch Mgmt0 IP Address=<ucsa-mgmt-ip>
    Physical Switch Mgmt0 IP Netmask=<ucs-mgmt-mask>
    Default Gateway=<ucs-mgmt-gateway>
    DNS Server=<dns-server-1-ip>
    Domain Name=<ad-dns-domain-name>

  Apply and save the configuration (select 'no' if you want to re-enter)? (yes/no): yes
```

Step 2. After applying the settings, make sure you can ping the fabric interconnect management IP address. When Fabric Interconnect A is correctly set up and is available, Fabric Interconnect B will automatically discover Fabric Interconnect A during its setup process as shown in the next step.

Step 3. Configure Fabric Interconnect B (FI-B). For the configuration method, select **console**. Fabric Interconnect B will detect the presence of Fabric Interconnect A and will prompt you to enter the admin password for Fabric Interconnect A. Provide the management IP address for Fabric Interconnect B and apply the configuration.

```
Cisco UCS Fabric Interconnect B
Enter the configuration method. (console/gui) ? console

  Installer has detected the presence of a peer Fabric interconnect. This Fabric interconnect will be added
to the cluster. Continue (y/n) ? y

  Enter the admin password of the peer Fabric interconnect: <password>
    Connecting to peer Fabric interconnect... done
    Retrieving config from peer Fabric interconnect... done
    Peer Fabric interconnect Mgmt0 IPv4 Address: <ucsa-mgmt-ip>
    Peer Fabric interconnect Mgmt0 IPv4 Netmask: <ucs-mgmt-mask>

    Peer FI is IPv4 Cluster enabled. Please Provide Local Fabric Interconnect Mgmt0 IPv4 Address

  Physical Switch Mgmt0 IP address : <ucsb-mgmt-ip>

  Apply and save the configuration (select 'no' if you want to re-enter)? (yes/no): yes
```

Procedure 2. Set up Cisco Intersight Account

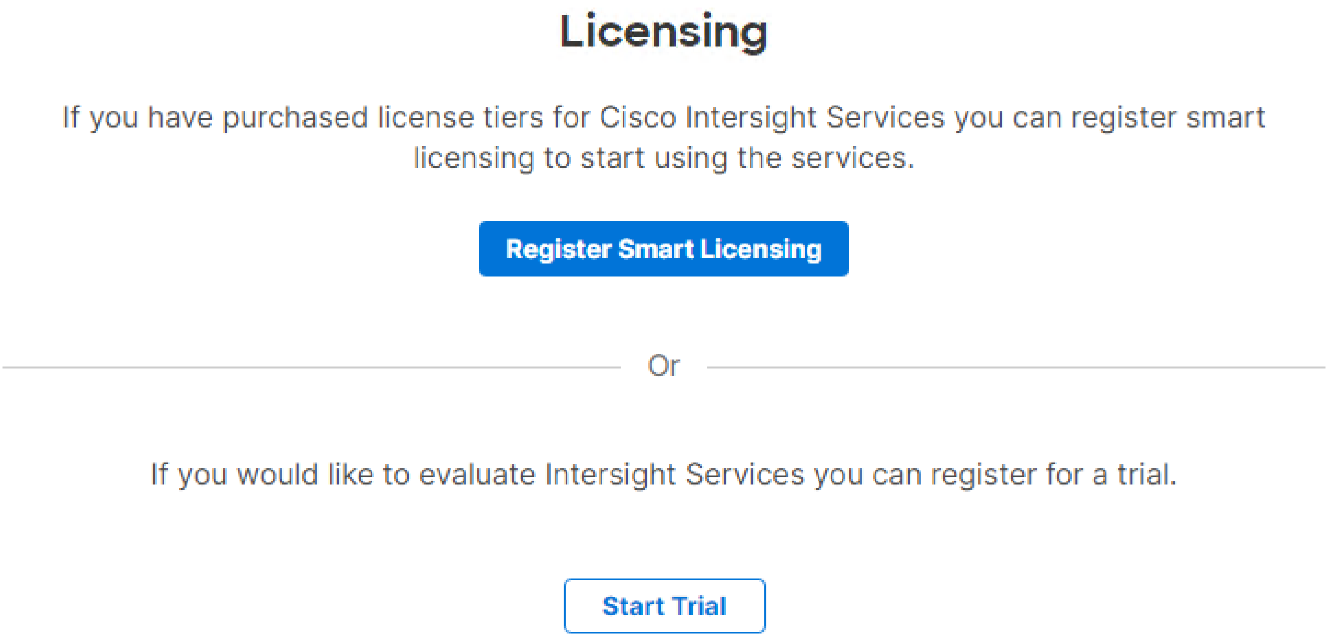
Step 1. Go to https://intersight.com and click Create an account. Complete the log in process.

Step 2. Select the appropriate Region and click **Next**.

Step 3. Read and accept the license agreement. Click **Next**.

Step 4. Provide an Account Name and click **Create**.

With a successful creation of the Intersight account, the following page will be displayed:



Licensing

If you have purchased license tiers for Cisco Intersight Services you can register smart licensing to start using the services.

If you would like to evaluate Intersight Services you can register for a trial.

Note: You can also choose to add the Cisco UCS FIs to an existing Cisco Intersight account.

Procedure 3. Set up Cisco Intersight Licensing

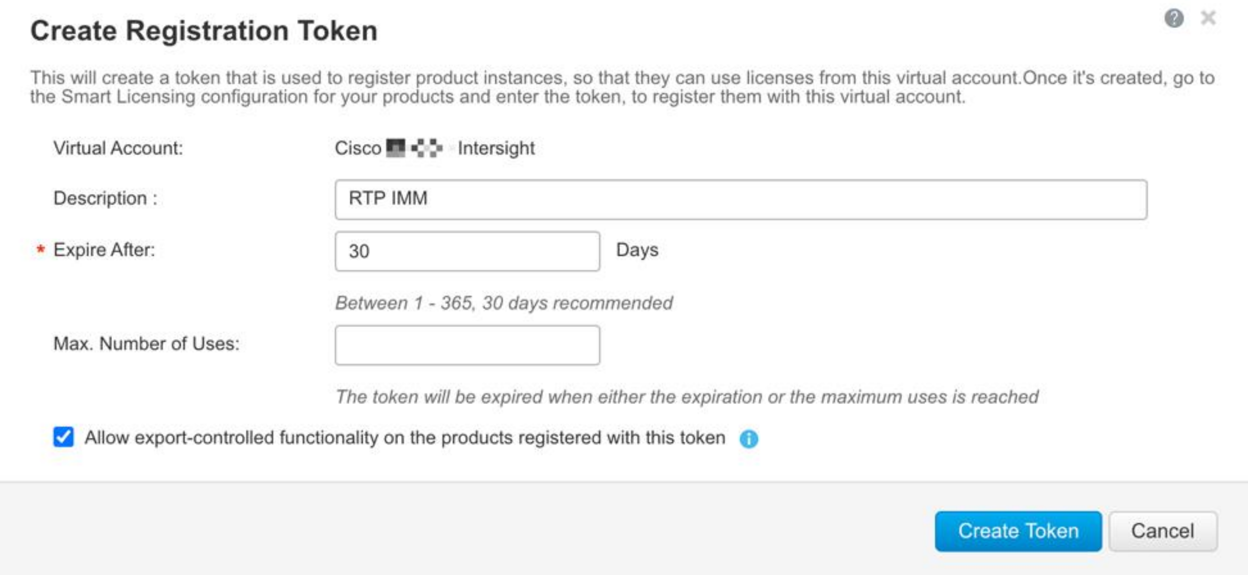
Note: When setting up a new Cisco Intersight account (as explained in this document), the account needs to be enabled for Cisco Smart Software Licensing.

Step 1. Log into the Cisco Smart Licensing portal: https://software.cisco.com/software/smart-licensing/alerts.

Step 2. Verify that the correct virtual account is selected.

Step 3. Under **Inventory** > **General**, click **New Token** to generate a new token for product registration.

Step 4. Fill in the form and click **Create Token**. Copy this newly created token.



Create Registration Token

This will create a token that is used to register product instances, so that they can use licenses from this virtual account.Once it's created, go to the Smart Licensing configuration for your products and enter the token, to register them with this virtual account.

Virtual Account: Cisco [redacted] Intersight

Description : RTP IMM

* Expire After: 30 Days

Between 1 - 365, 30 days recommended

Max. Number of Uses:

The token will be expired when either the expiration or the maximum uses is reached

☑ Allow export-controlled functionality on the products registered with this token

Step 5. In Cisco Intersight, if you created a new account, click **Register Smart Licensing**.

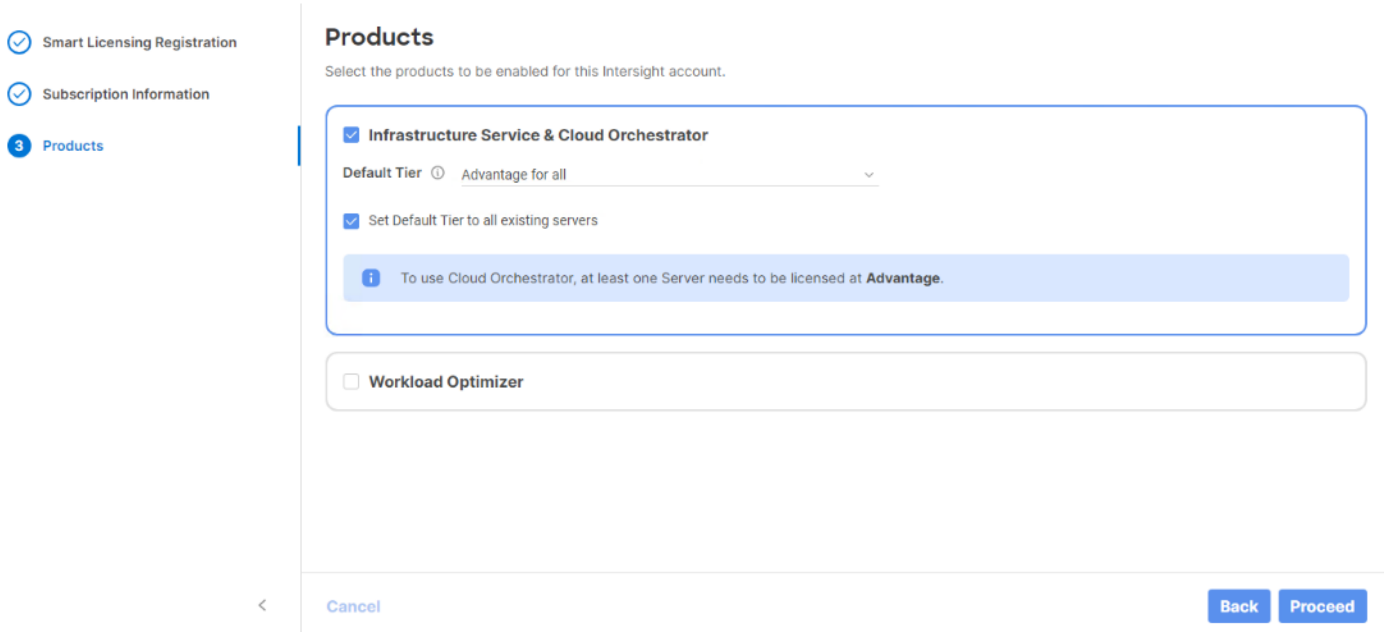
Step 6. Enter the copied token from the Cisco Smart Licensing portal. Click **Next**.

Step 7. With Enable Subscription Information selected, click **Next**. On the popup, click **Allow**.

Step 8. Select the products, you wish to enable (minimally Infrastructure Service). Use the pulldown to select the licenses or your Default Tier (for example, Advantage for all).

Step 9. From the Default Tier drop-down list select the license type (for example, Premier).

Step 10. Select Set Default Tier to all existing servers.



Smart Licensing Registration

Subscription Information

3 Products

Products

Select the products to be enabled for this Intersight account.

☑ **Infrastructure Service & Cloud Orchestrator**

Default Tier: Advantage for all

☑ Set Default Tier to all existing servers

To use Cloud Orchestrator, at least one Server needs to be licensed at **Advantage**.

□ **Workload Optimizer**

Step 11. Click **Proceed** then click **Confirm**.

Step 12. When the registration is successful, a Meet Intersight window will appear. Click **Let's Go** to review the latest Intersight features or click **Skip**.

Procedure 4. Set Up Cisco Intersight Resource Group

In this procedure, a Cisco Intersight resource group is created where resources such as targets will be logically grouped. In this deployment, a single resource group is created to host all the resources, but you can choose to create multiple resource groups for granular control of the resources.

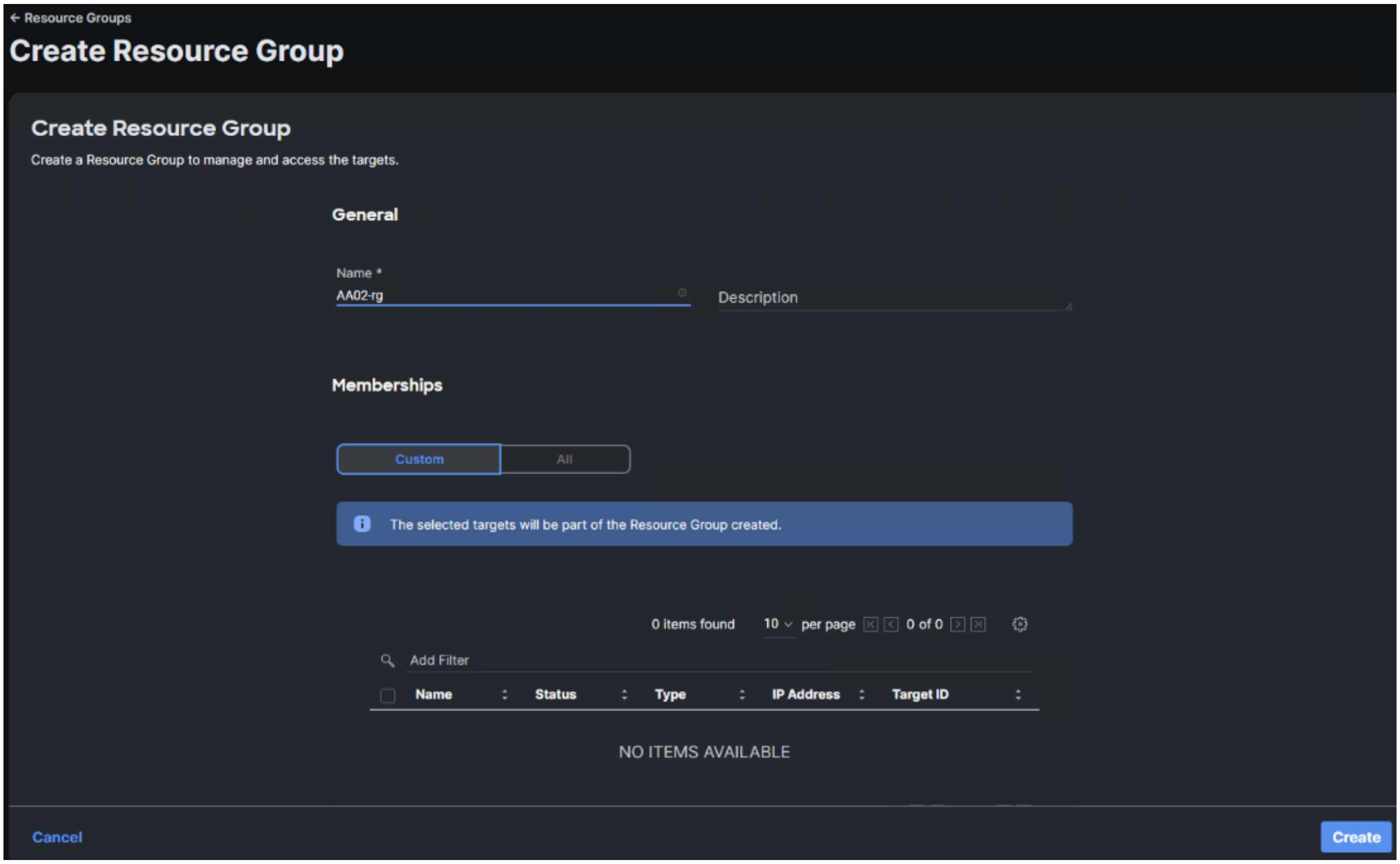
Step 1. Log into Cisco Intersight.

Step 2. Select **System**. On the left, click **Settings** (the gear icon).

Step 3. Click **Resource Groups** in the middle panel.

Step 4. Click **+ Create Resource Group** in the top-right corner.

Step 5. Provide a name for the Resource Group (for example, AA02-rg).


← Resource Groups

Create Resource Group

Create Resource Group

Create a Resource Group to manage and access the targets.

General

Name * AA02-rg

Description

Memberships

Custom | All

The selected targets will be part of the Resource Group created.

0 items found 10 per page 0 of 0

Add Filter

Name	Status	Type	IP Address	Target ID

NO ITEMS AVAILABLE

Cancel Create

Step 6. Under Memberships, select **Custom.**

Step 7. Click **Create.**

Procedure 5. Set Up Cisco Intersight Organization

In this procedure, an Intersight organization is created where all Cisco Intersight Managed Mode configurations including policies are defined.

Step 1. Log into the Cisco Intersight portal.

Step 2. Select **System.** On the left, click **Settings** (the gear icon).

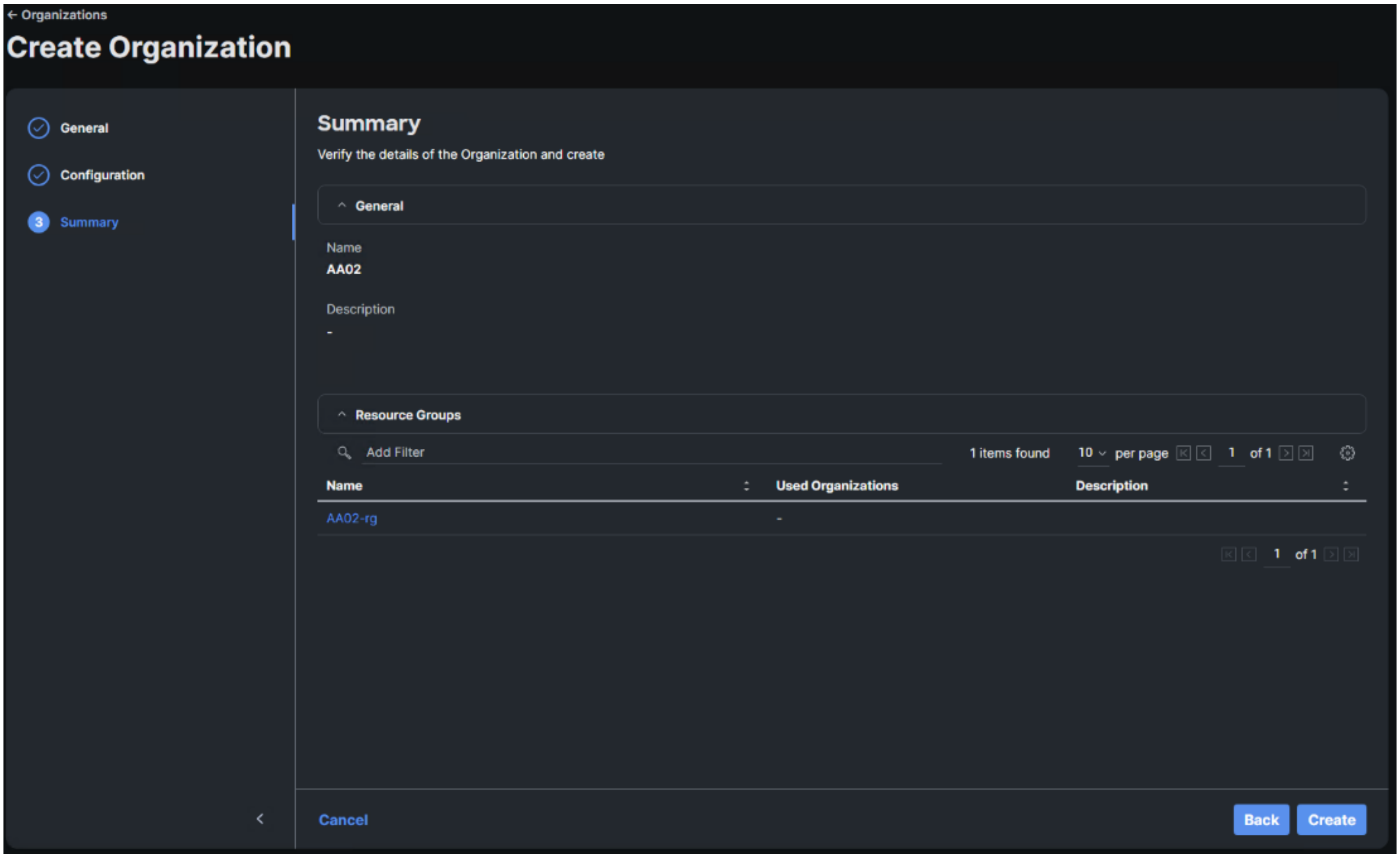
Step 3. Click **Organizations** in the middle panel.

Step 4. Click **+ Create Organization** in the top-right corner.

Step 5. Provide a name for the organization (for example, AA02), optionally select Share Resources with Other Organizations, and click **Next.**

Step 6. Select the Resource Group created in the last step (for example, AA02-rg) and click **Next.**

Step 7. Click **Create.**



← Organizations

Create Organization

Summary

Verify the details of the Organization and create

^ General

Name
AA02

Description
-

^ Resource Groups

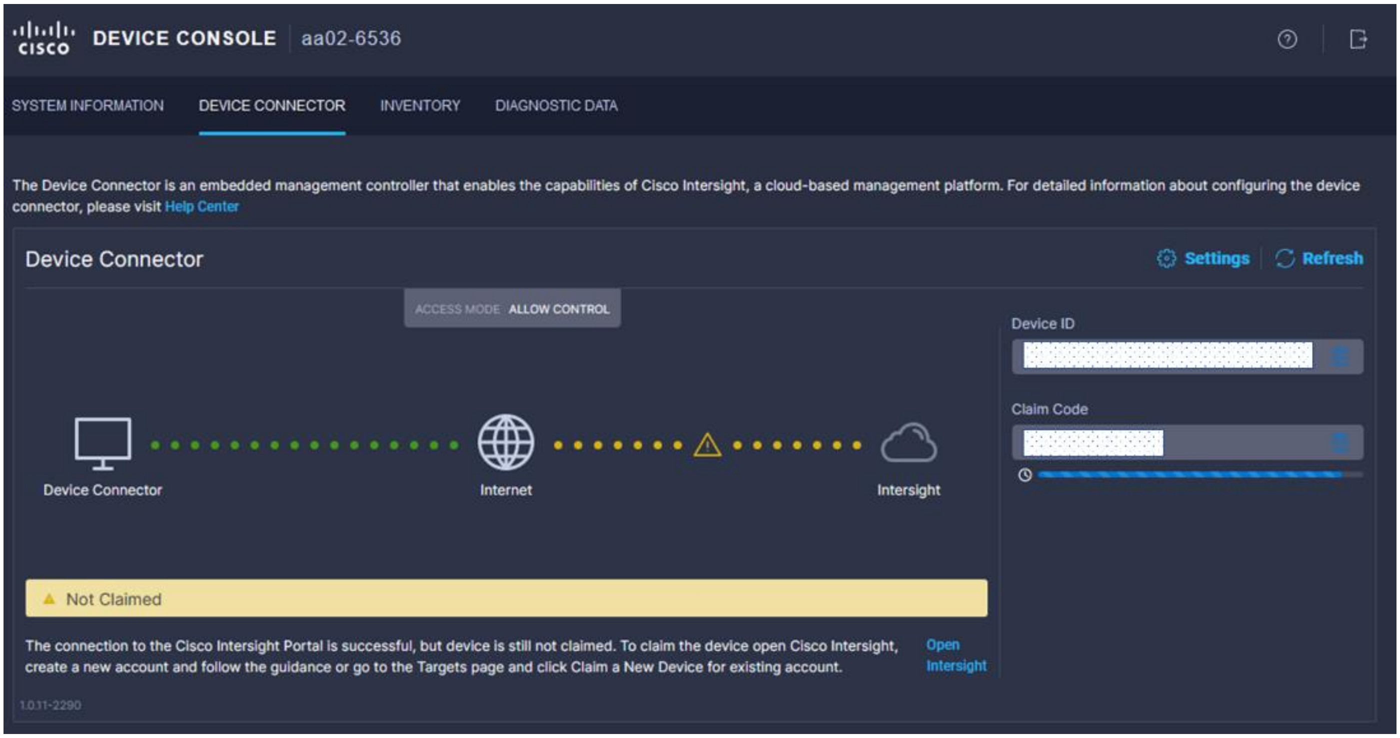
Name	Used Organizations	Description
AA02-rg	-	

Procedure 6. Claim Cisco UCS Fabric Interconnects in Cisco Intersight

Make sure the initial configuration for the fabric interconnects has been completed. Log into the Fabric Interconnect A Device Console using a web browser to capture the Cisco Intersight connectivity information.

Step 1. Use the management IP address of Fabric Interconnect A to access the device from a web browser and the previously configured admin password to log into the device.

Step 2. Under **DEVICE CONNECTOR**, the current device status will show “Not claimed.” Note or copy, the Device ID, and Claim Code information for claiming the device in Cisco Intersight.



The Device Connector is an embedded management controller that enables the capabilities of Cisco Intersight, a cloud-based management platform. For detailed information about configuring the device connector, please visit Help Center

Device Connector

Device ID: [redacted]

Claim Code: [redacted]

Not Claimed

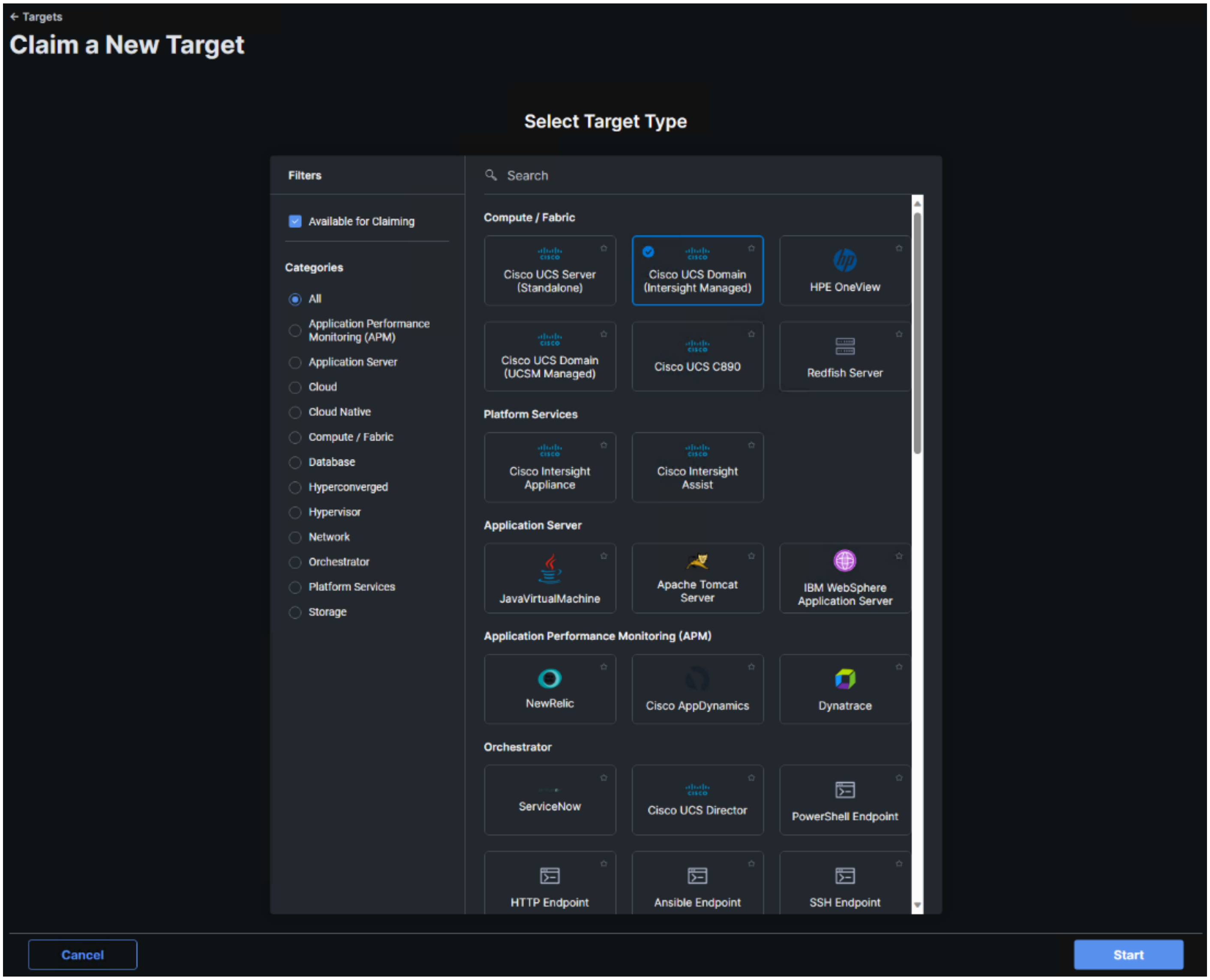
The connection to the Cisco Intersight Portal is successful, but device is still not claimed. To claim the device open Cisco Intersight, create a new account and follow the guidance or go to the Targets page and click Claim a New Device for existing account.

Step 3. Log into Cisco Intersight.

Step 4. Select System. On the left, click Administration > Targets.

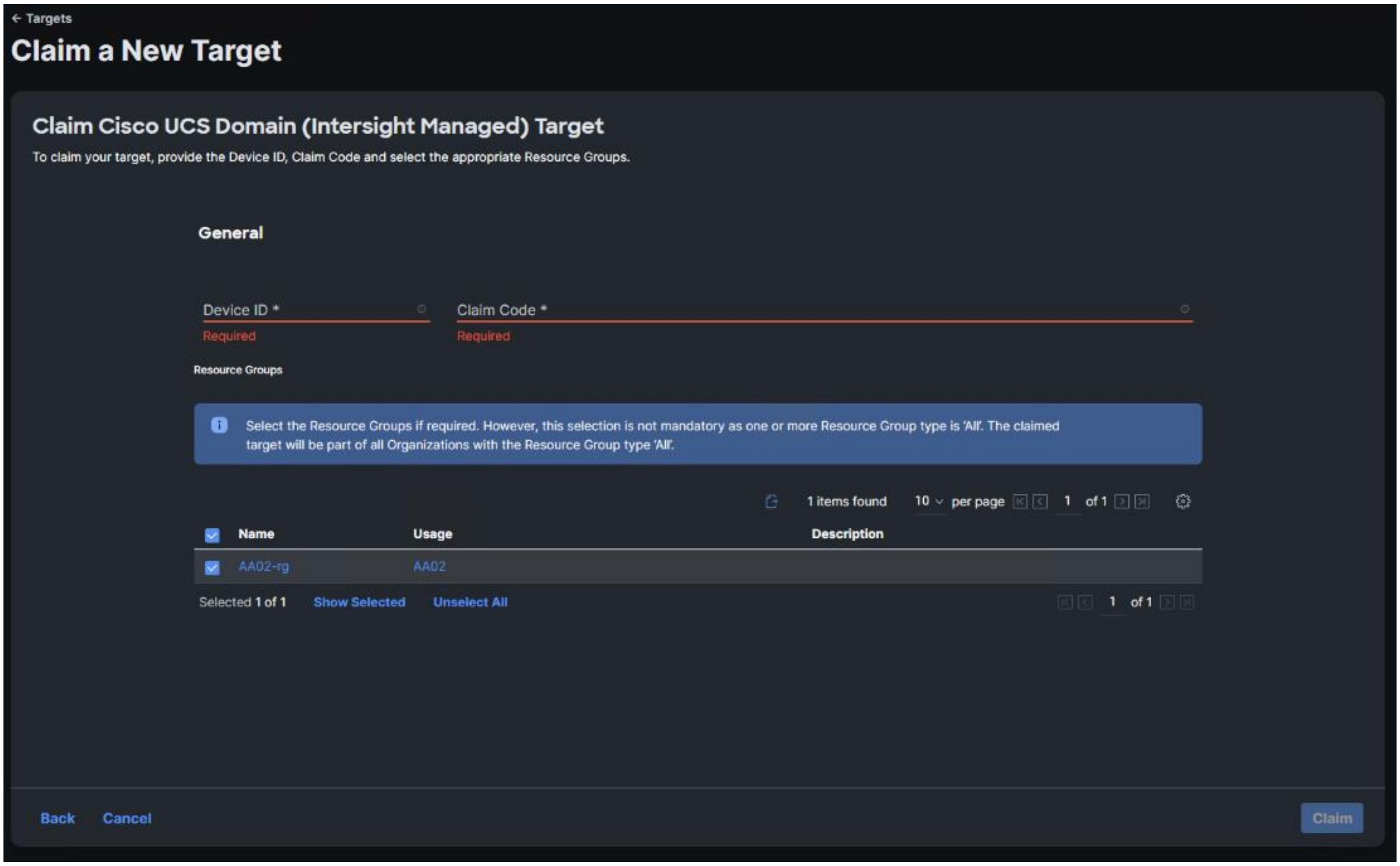
Step 5. Click Claim a New Target.

Step 6. Select Cisco UCS Domain (Intersight Managed) and click Start.



Step 7. Copy and paste the Device ID and Claim from the Cisco UCS FI to Intersight.

Step 8. Select the previously created Resource Group and click **Claim**.



← Targets

Claim a New Target

Claim Cisco UCS Domain (Intersight Managed) Target

To claim your target, provide the Device ID, Claim Code and select the appropriate Resource Groups.

General

Device ID *
Required

Claim Code *
Required

Resource Groups

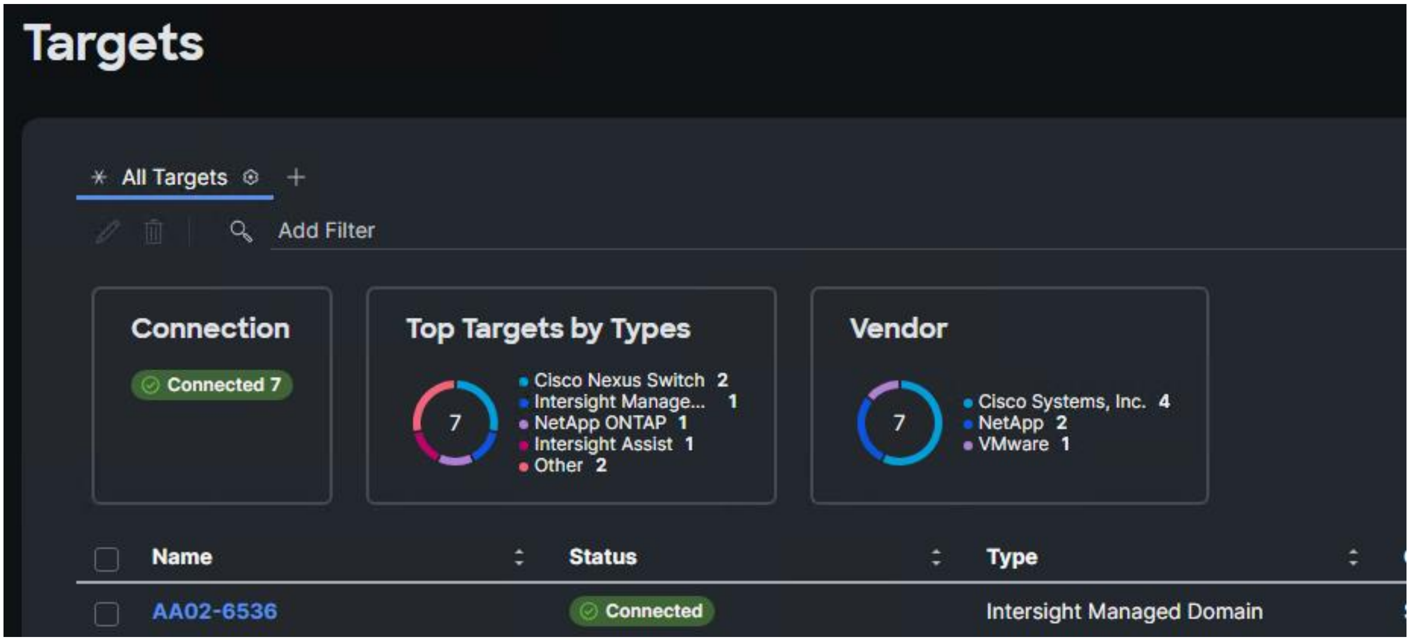
Select the Resource Groups if required. However, this selection is not mandatory as one or more Resource Group type is 'All'. The claimed target will be part of all Organizations with the Resource Group type 'All'.

1 items found 10 per page 1 of 1

☑	Name	Usage	Description
☑	AA02-rg	AA02	

Selected 1 of 1 Show Selected Unselect All 1 of 1

With a successful device claim, Cisco UCS FI should appear as a target in Cisco Intersight as shown below:



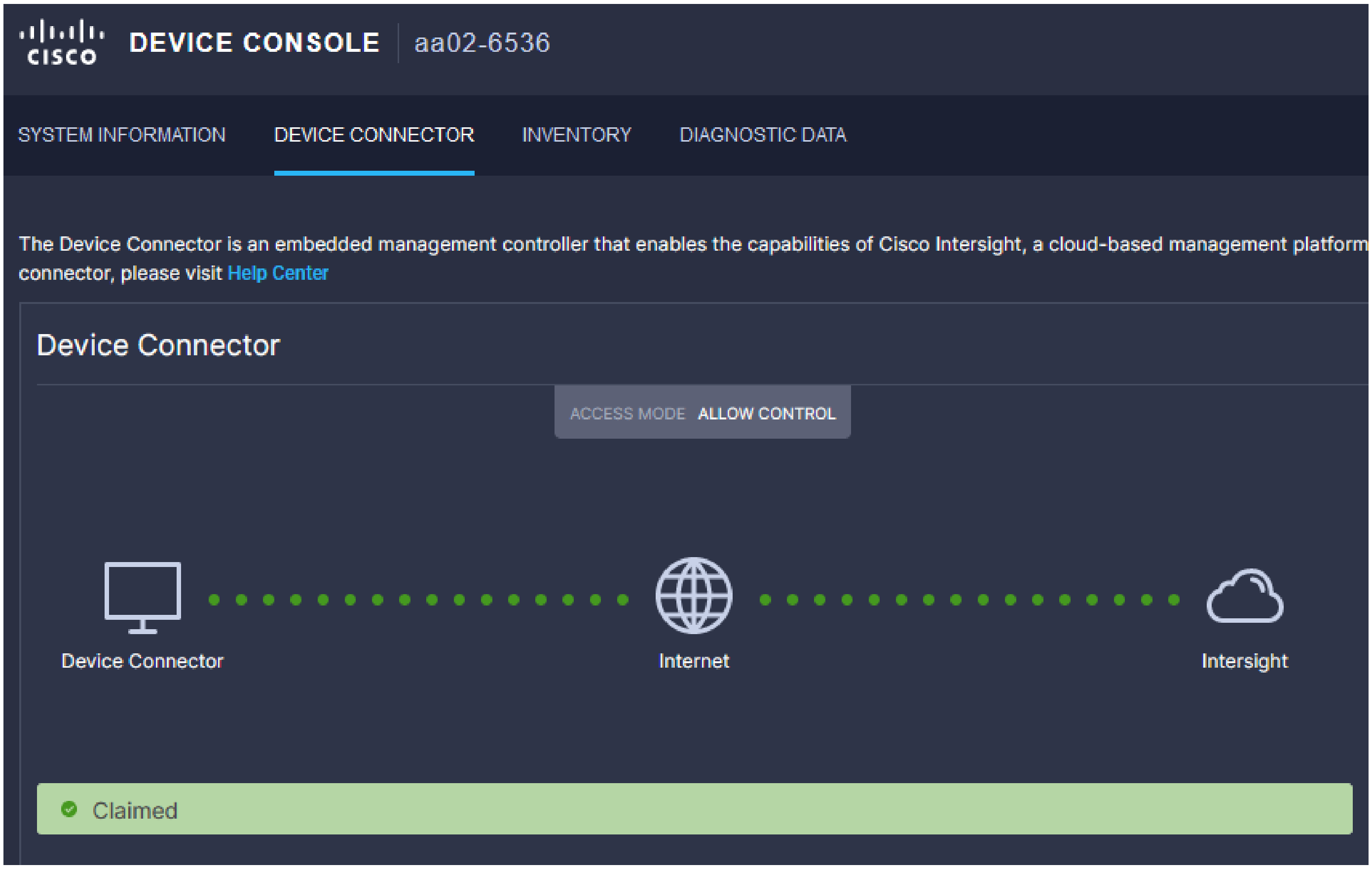
Targets

□	Name	Status	Type
□	AA02-6536	Connected	Intersight Managed Domain

Procedure 7. Verify Addition of Cisco UCS Fabric Interconnects to Cisco Intersight

Step 1. Log into the web GUI of the Cisco UCS fabric interconnect and click the browser refresh button.

The fabric interconnect status should now be set to **Claimed**.



DEVICE CONSOLE aa02-6536

SYSTEM INFORMATION DEVICE CONNECTOR INVENTORY DIAGNOSTIC DATA

The Device Connector is an embedded management controller that enables the capabilities of Cisco Intersight, a cloud-based management platform connector, please visit Help Center

Device Connector

ACCESS MODE ALLOW CONTROL

Claimed

Procedure 8. Upgrade Fabric Interconnect Firmware using Cisco Intersight

If your Cisco UCS 6536 Fabric Interconnects are not already running firmware release 4.2(3d) (NX-OS version 9.3(5)I42(3c)), upgrade them to 4.2(3d) or later.

Step 1. Log into the Cisco Intersight portal.

Step 2. From the drop-down list, select **Infrastructure Service** and then select **Fabric Interconnects** under Operate on the left.

Step 3. Click the ellipses "**…**" at the end of the row for either of the Fabric Interconnects and select **Upgrade Firmware**.

Step 4. Click **Start**.

Step 5. Verify the Fabric Interconnect information and click **Next**.

Step 6. Enable **Advanced Mode** using the toggle switch and uncheck Fabric Interconnect Traffic Evacuation.

Step 7. Select 4.2(3d) release from the list and click **Next**.

Step 8. Verify the information and click **Upgrade** to start the upgrade process.

Step 9. Watch the Request panel of the main Intersight screen as the system will ask for user permission before upgrading each FI. Click on the Circle with Arrow and follow the prompts on screen to grant permission.

Step 10. Wait for both the FIs to successfully upgrade.

Procedure 9. Configure a Cisco UCS Domain Profile

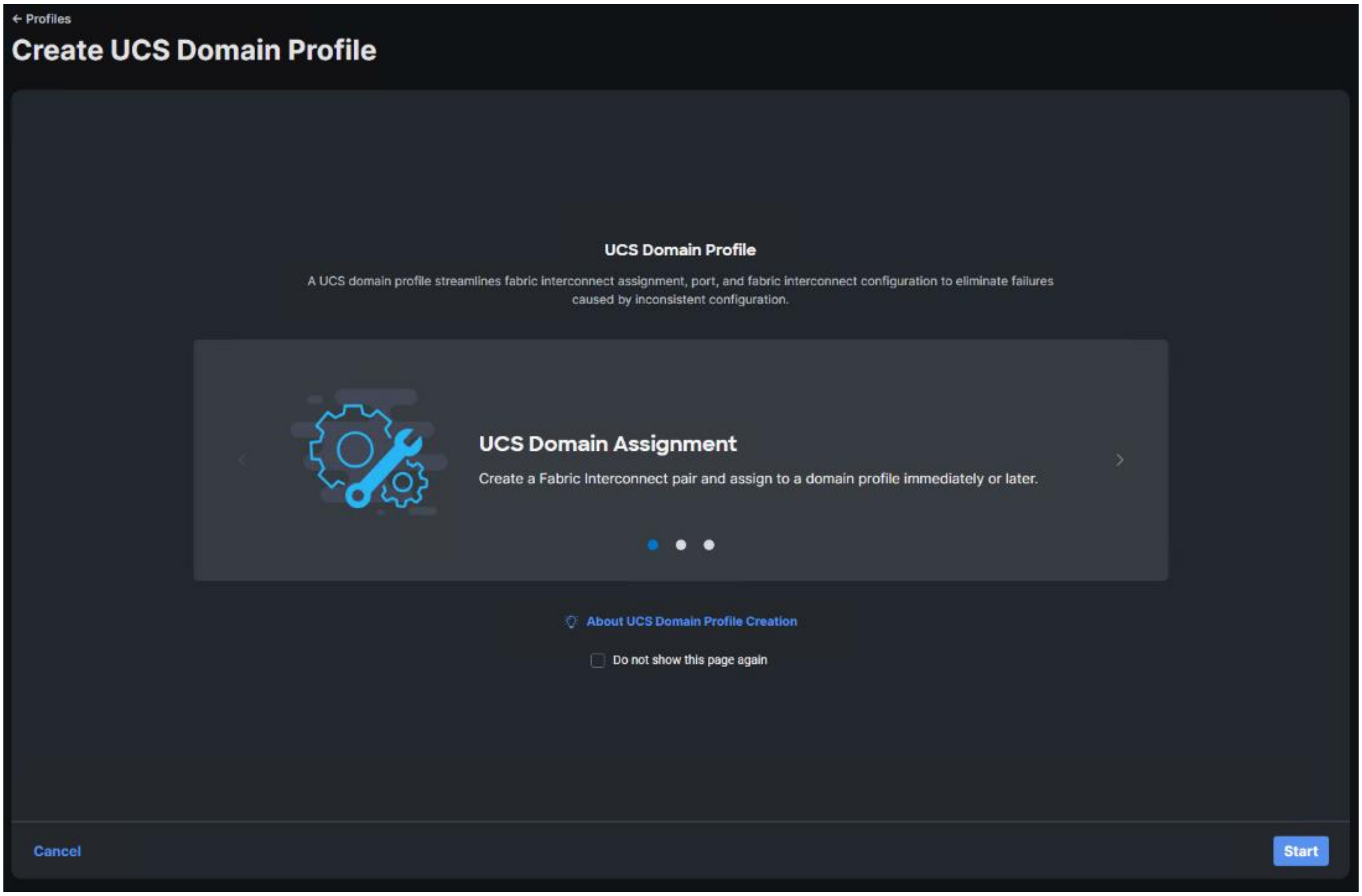
Note: A Cisco UCS domain profile configures a fabric interconnect pair through reusable policies, allows configuration of the ports and port channels, and configures the VLANs and VSANs in the network. It defines the characteristics of and configured ports on fabric interconnects. The domain-related policies can be attached to the profile either at the time of creation or later. One Cisco UCS domain profile can be assigned to one fabric interconnect domain.

Step 1. Log into the Cisco Intersight portal.

Step 2. From the drop-down list, select **Infrastructure Service** and then under Configure select **Profiles**.

Step 3. In the main window, select UCS Domain Profiles and click Create UCS Domain Profile.

Step 4. From the Create UCS Domain Profile screen, click **Start**.



← Profiles

Create UCS Domain Profile

UCS Domain Profile

A UCS domain profile streamlines fabric interconnect assignment, port, and fabric interconnect configuration to eliminate failures caused by inconsistent configuration.

UCS Domain Assignment

Create a Fabric Interconnect pair and assign to a domain profile immediately or later.

About UCS Domain Profile Creation

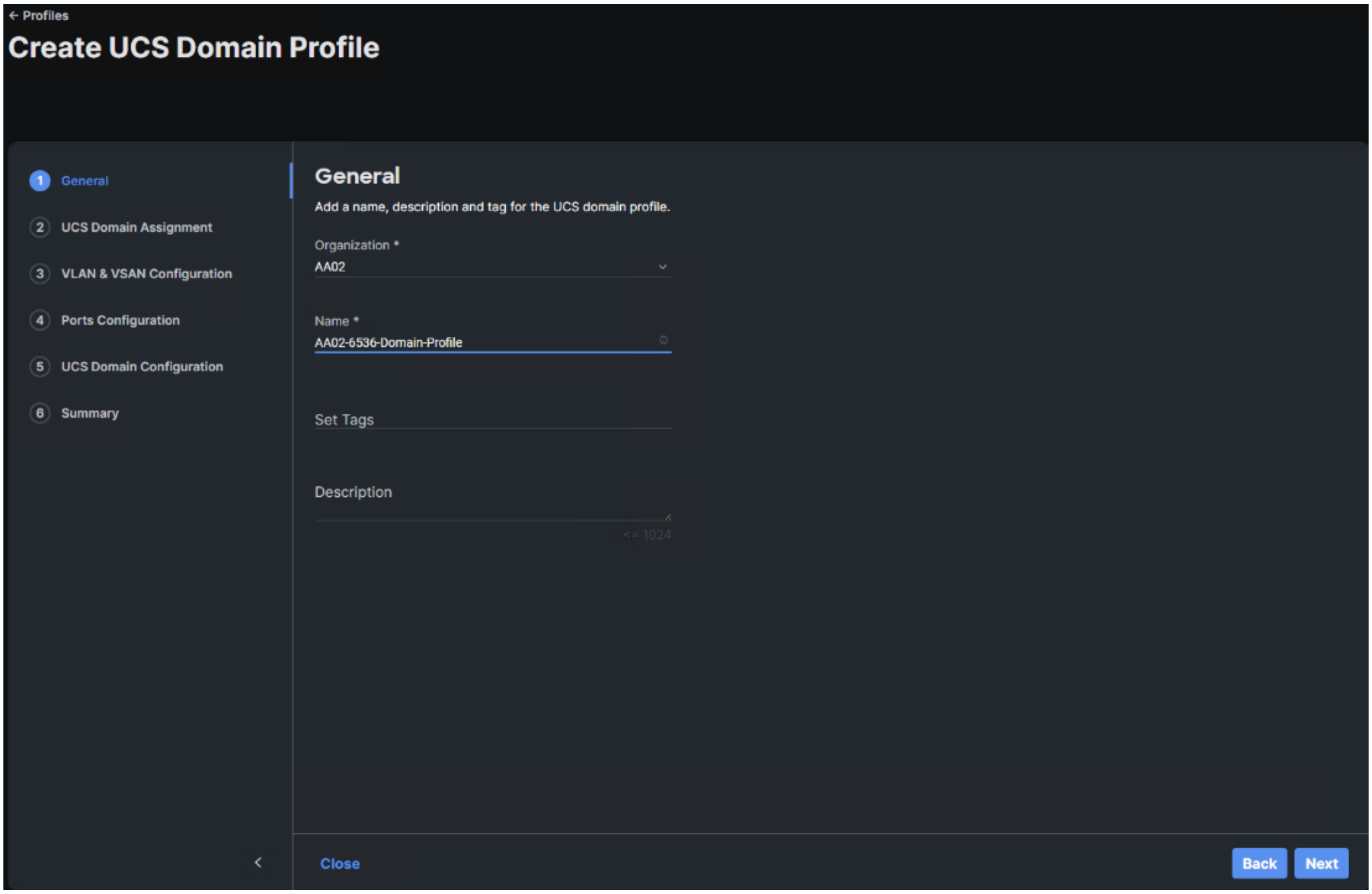
□ Do not show this page again

Procedure 10. General Configuration

Step 1. Select the organization from the drop-down list (for example, AA02).

Step 2. Provide a name for the domain profile (for example, AA02-6536-Domain-Profile).

Step 3. Provide an optional Description.



General

Add a name, description and tag for the UCS domain profile.

Organization * AA02

Name * AA02-6536-Domain-Profile

Set Tags

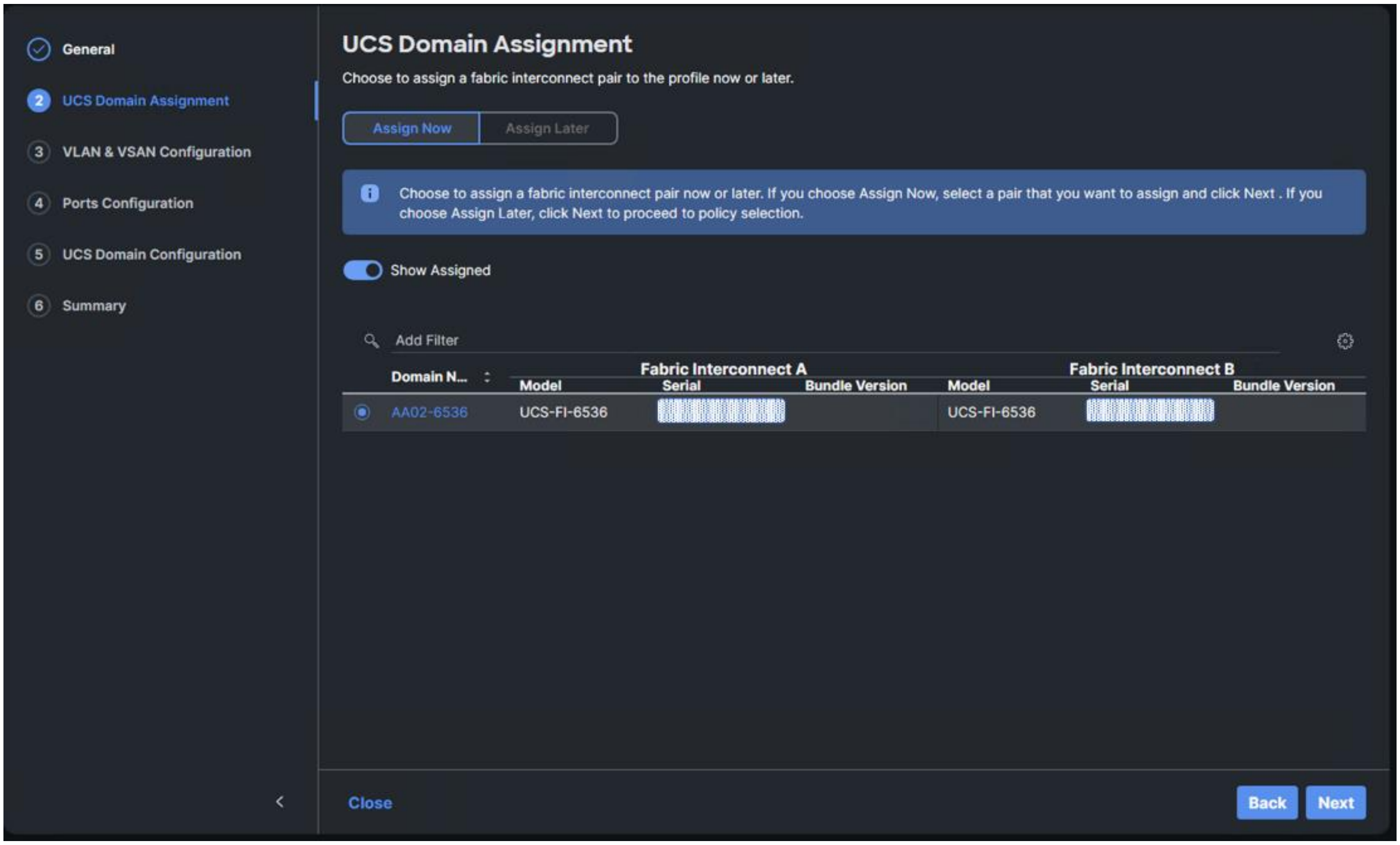
Description

<= 1024

Step 4. Click **Next.**

Procedure 11. Cisco UCS Domain Assignment

Step 1. Assign the Cisco UCS domain to this new domain profile by clicking **Assign Now** and selecting the previously added Cisco UCS domain (for example, AA02-6536).



UCS Domain Assignment

Choose to assign a fabric interconnect pair to the profile now or later.

Choose to assign a fabric interconnect pair now or later. If you choose Assign Now, select a pair that you want to assign and click Next . If you choose Assign Later, click Next to proceed to policy selection.

Show Assigned

		Fabric Interconnect A			Fabric Interconnect B		
	Domain N...	Model	Serial	Bundle Version	Model	Serial	Bundle Version
●	AA02-6536	UCS-FI-6536	[redacted]		UCS-FI-6536	[redacted]	

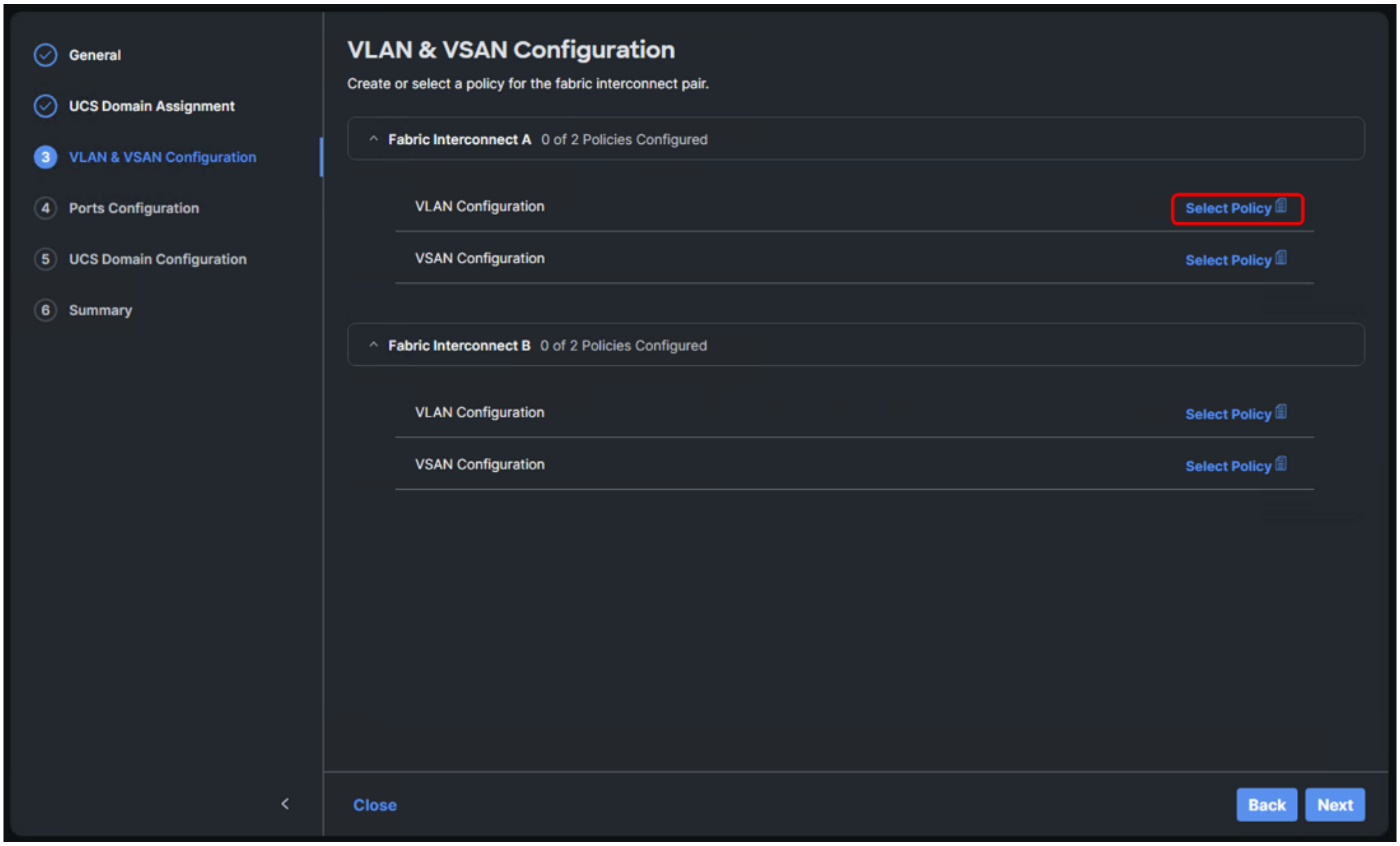
Step 2. Click **Next.**

VLAN and VSAN Configuration

In this procedure, a single VLAN policy is created for both fabric interconnects and two individual VSAN policies are created because the VSAN IDs are unique for each fabric interconnect.

Procedure 1. Create and Apply VLAN Policy

Step 1. Click **Select Policy** next to VLAN Configuration under Fabric Interconnect A.



VLAN & VSAN Configuration

Create or select a policy for the fabric interconnect pair.

Fabric Interconnect A 0 of 2 Policies Configured

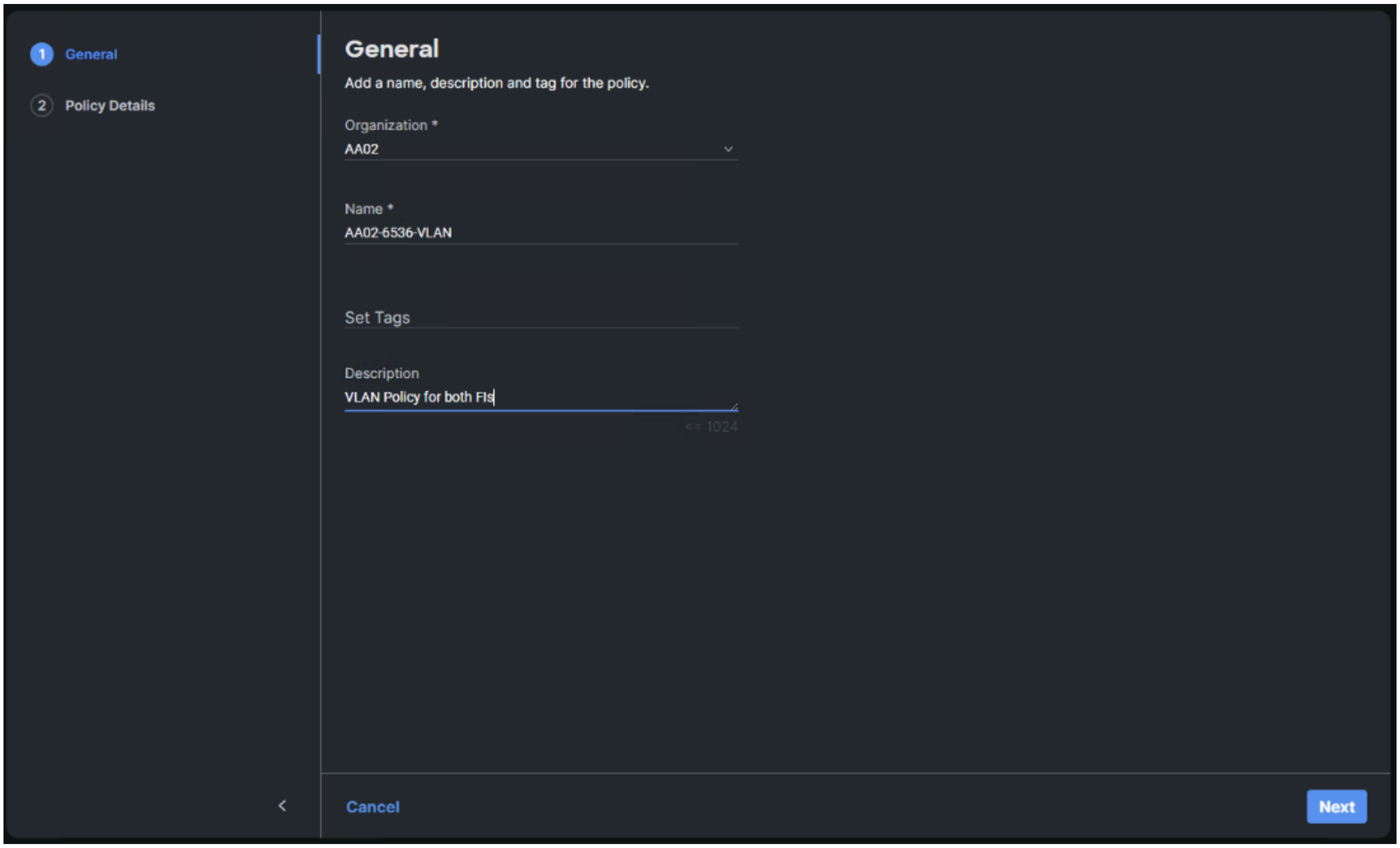
VLAN Configuration	Select Policy
VSAN Configuration	Select Policy

Fabric Interconnect B 0 of 2 Policies Configured

VLAN Configuration	Select Policy
VSAN Configuration	Select Policy

Step 2. In the pane on the right, click **Create New**.

Step 3. Verify the correct organization is selected from the drop-down list (for example, AA02) and provide a name for the policy (for example, AA02-6536-VLAN).



General

Add a name, description and tag for the policy.

Organization *
AA02

Name *
AA02-6536-VLAN

Set Tags

Description
VLAN Policy for both FIs

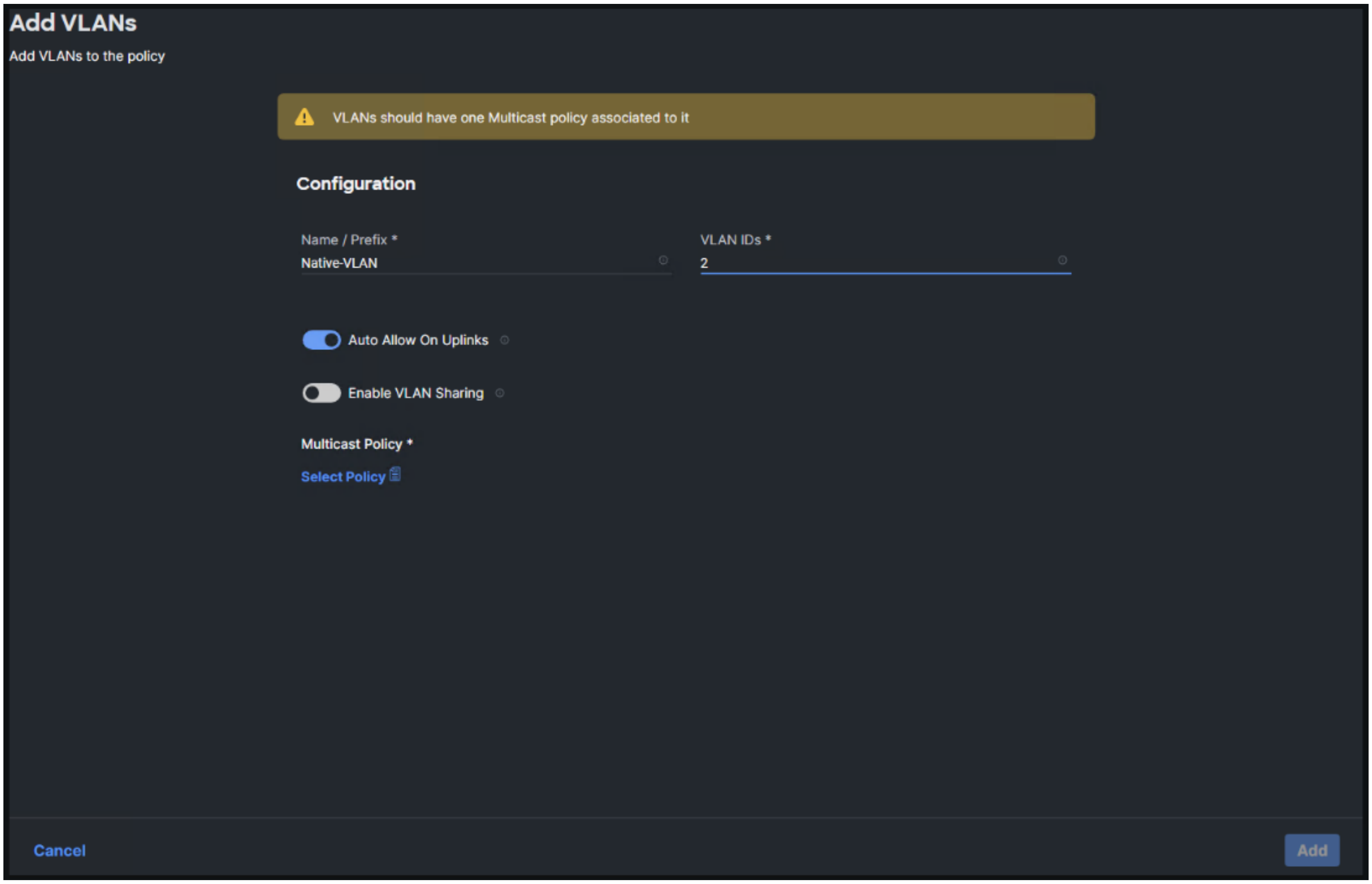
Step 4. Click **Next.**

Step 5. Click **Add VLANs**.

Step 6. Provide a name and VLAN ID for the native VLAN.

Step 7. Make sure **Auto Allow On** Uplinks is enabled.

Step 8. To create the required Multicast policy, under Multicast, click **Select Policy**.



Add VLANs

Add VLANs to the policy

VLANs should have one Multicast policy associated to it

Configuration

Name / Prefix * Native-VLAN

VLAN IDs * 2

Auto Allow On Uplinks (enabled)

Enable VLAN Sharing

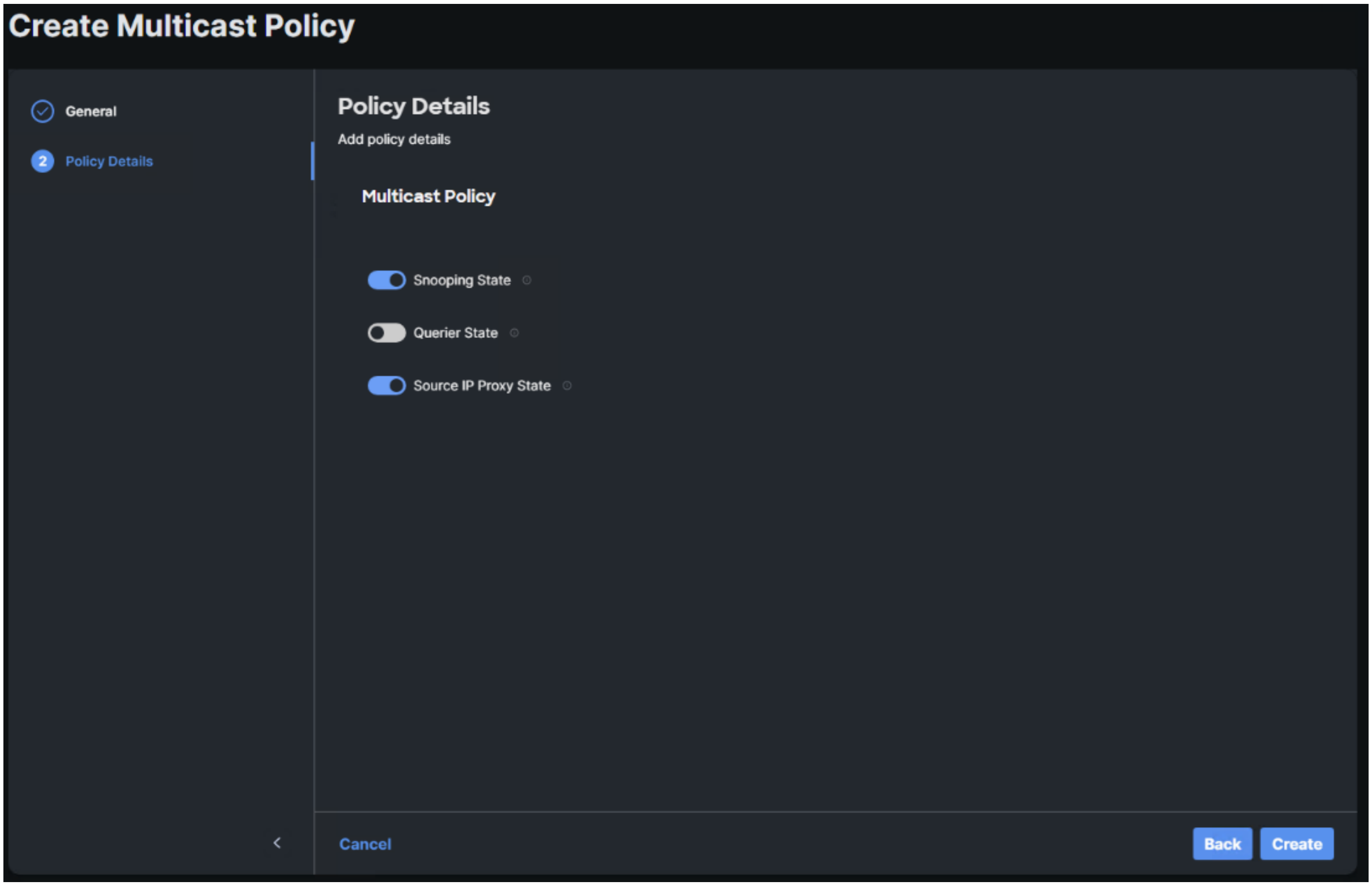
Multicast Policy *

Step 9. In the window on the right, click **Create New** to create a new Multicast Policy.

Step 10. Provide a Name for the Multicast Policy (for example, AA02-MCAST).

Step 11. Provide an optional Description and click **Next.**

Step 12. Leave the default settings and click **Create**.



Create Multicast Policy

Policy Details

Add policy details

Multicast Policy

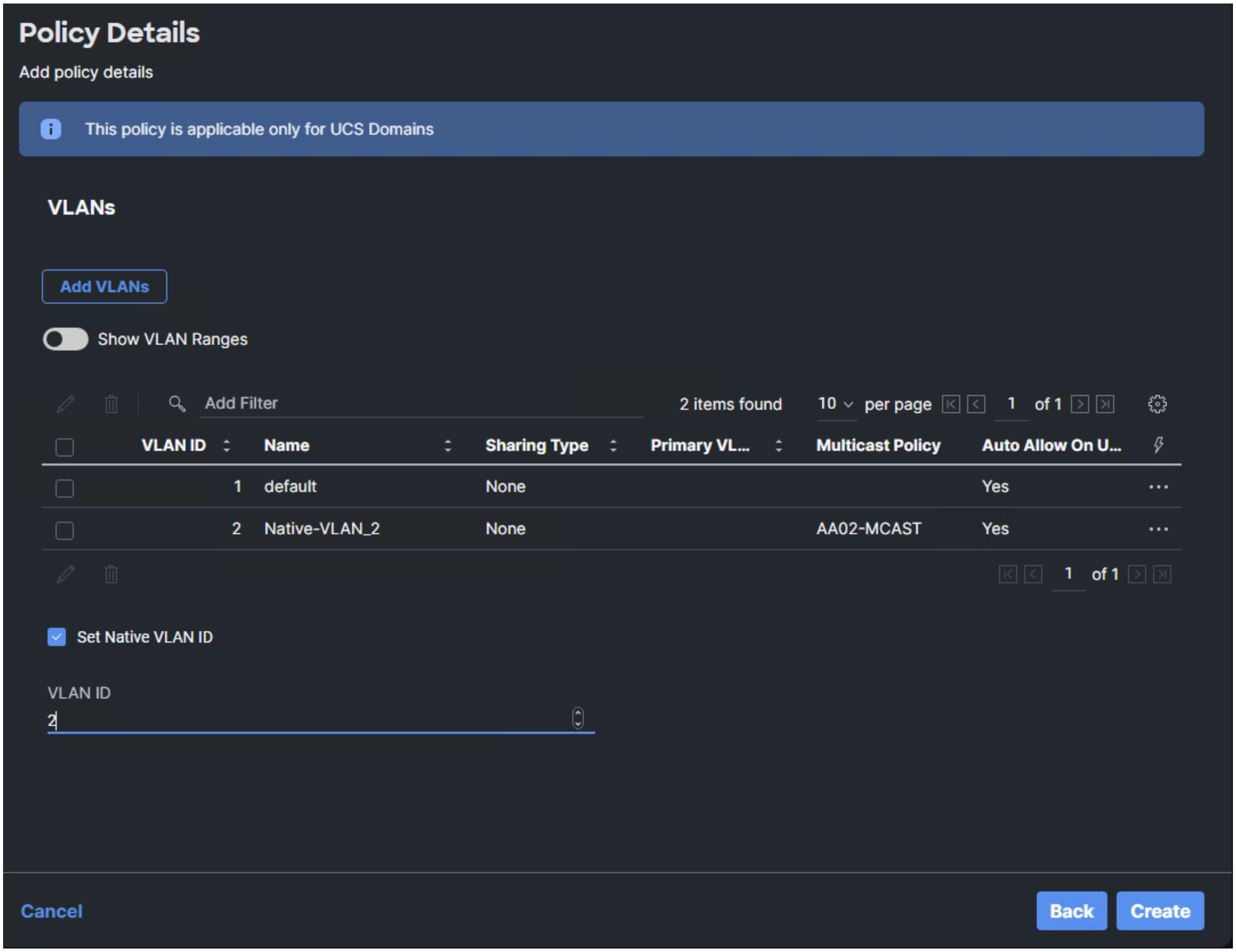
☑ Snooping State

□ Querier State

☑ Source IP Proxy State

Step 13. Click **Add VLANs** to add the VLAN.

Step 14. Select **Set Native VLAN ID** and enter the VLAN number (for example, 2) under VLAN ID.



Policy Details

Add policy details

This policy is applicable only for UCS Domains

VLANs

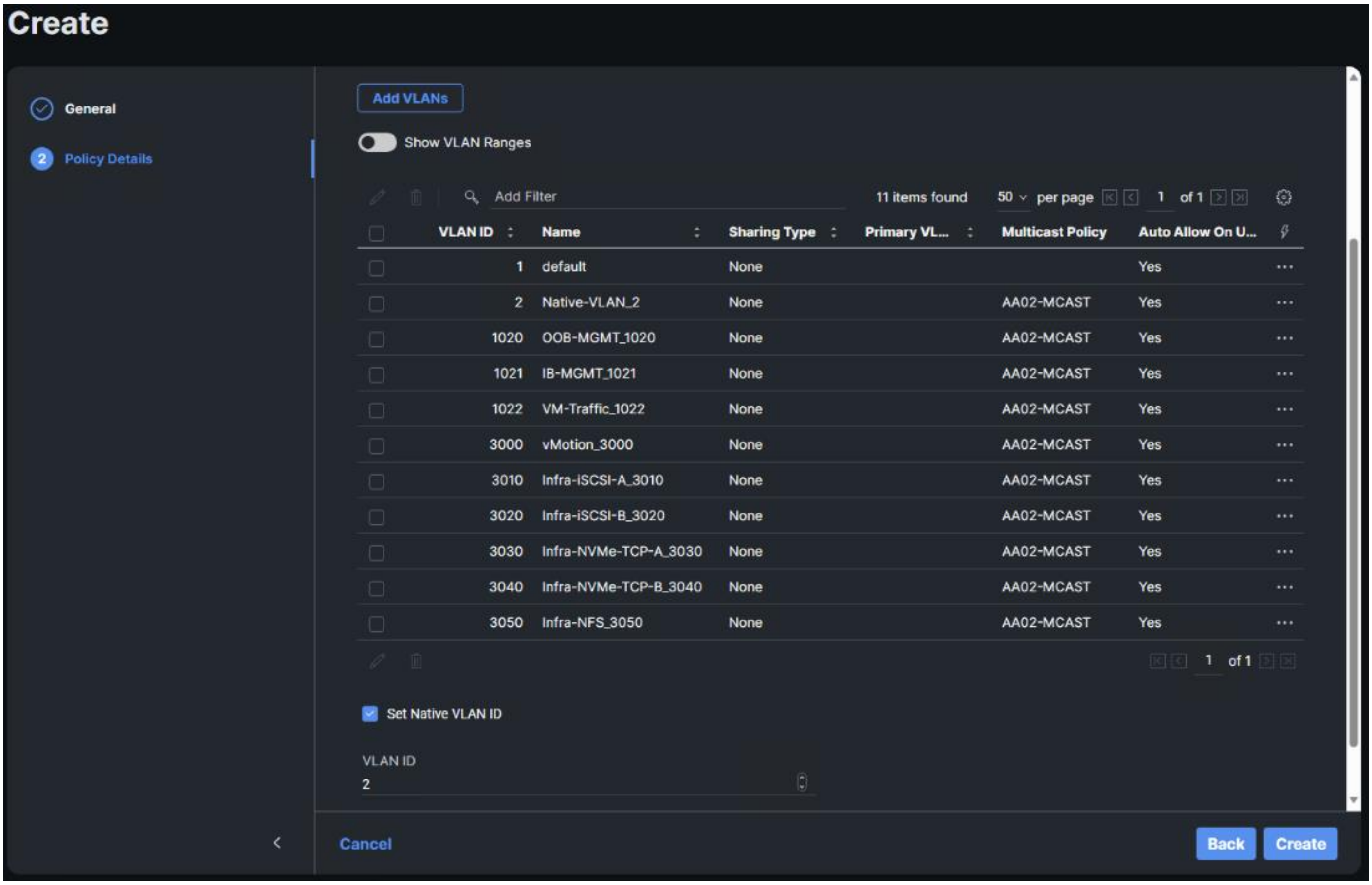
VLAN ID	Name	Sharing Type	Primary VL...	Multicast Policy	Auto Allow On U...
1	default	None			Yes
2	Native-VLAN_2	None		AA02-MCAST	Yes

☑ Set Native VLAN ID

VLAN ID: 2

Step 15. Add the remaining VLANs for FlexPod by clicking **Add VLANs** and entering the VLANs one by one. Reuse the previously created multicast policy for all the VLANs.

The VLANs created during this validation are shown below:



☐	VLAN ID	Name	Sharing Type	Primary VL...	Multicast Policy	Auto Allow On U...
☐	1	default	None			Yes
☐	2	Native-VLAN_2	None		AA02-MCAST	Yes
☐	1020	OOB-MGMT_1020	None		AA02-MCAST	Yes
☐	1021	IB-MGMT_1021	None		AA02-MCAST	Yes
☐	1022	VM-Traffic_1022	None		AA02-MCAST	Yes
☐	3000	vMotion_3000	None		AA02-MCAST	Yes
☐	3010	Infra-iSCSI-A_3010	None		AA02-MCAST	Yes
☐	3020	Infra-iSCSI-B_3020	None		AA02-MCAST	Yes
☐	3030	Infra-NVMe-TCP-A_3030	None		AA02-MCAST	Yes
☐	3040	Infra-NVMe-TCP-B_3040	None		AA02-MCAST	Yes
☐	3050	Infra-NFS_3050	None		AA02-MCAST	Yes

☑ Set Native VLAN ID

VLAN ID
2

Note: The iSCSI and NVMe-TCP VLANs shown in the screen image above are only needed when iSCSI and NVME-TCP are configured in the environment.

Step 16. Click **Create** to finish creating the VLAN policy and associated VLANs.

Step 17. Click **Select Policy** next to VLAN Configuration for Fabric Interconnect B and select the same VLAN policy.

Procedure 2. Create and Apply VSAN Policy (FC configuration only)

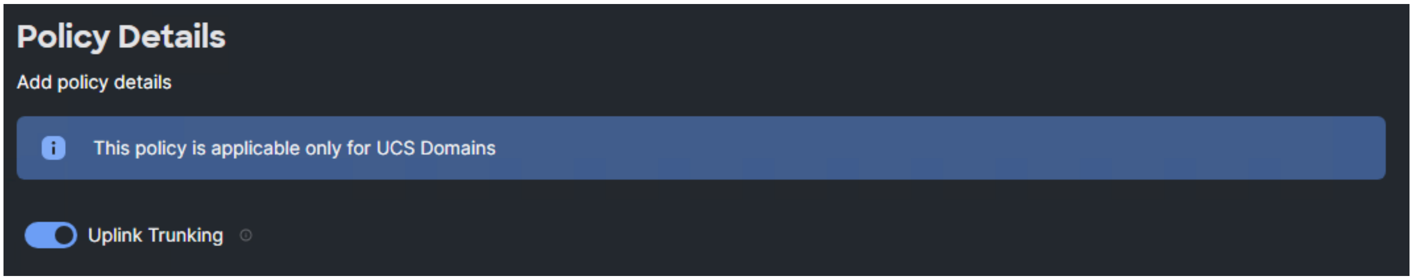
Step 1. Click **Select Policy** next to VSAN Configuration under Fabric Interconnect A and click **Create New**.

Step 2. Verify the correct organization is selected from the drop-down list (for example, AA02) and provide a name for the policy (for example, AA02-6536-VSAN-Pol-A).

Note: A separate VSAN-Policy is created for each fabric interconnect.

Step 3. Click **Next**.

Step 4. Optional: enable **Uplink Trunking**.

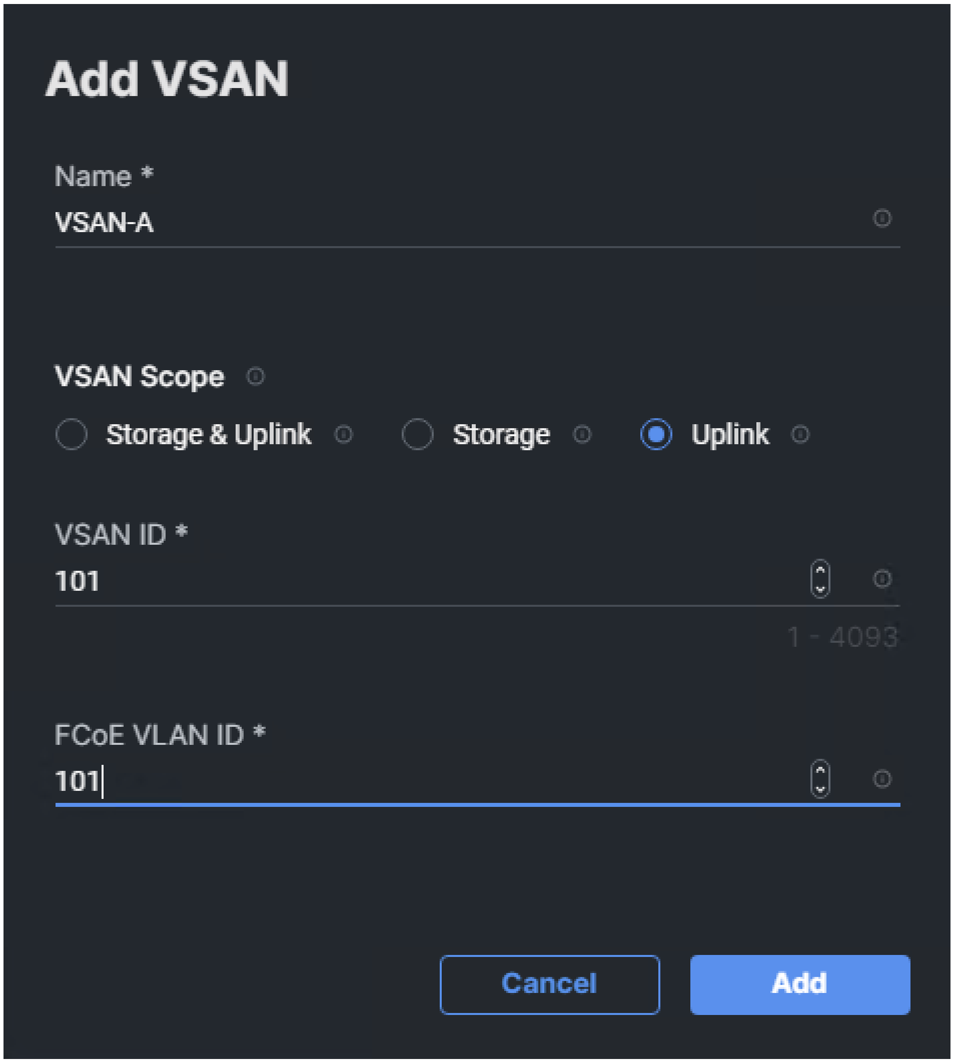


This policy is applicable only for UCS Domains

Uplink Trunking

Step 5. Click **Add VSAN** and provide a name (for example, VSAN-A), VSAN ID (for example, 101), and associated Fibre Channel over Ethernet (FCoE) VLAN ID (for example, 101) for SAN A.

Step 6. Set VLAN Scope as **Uplink**.



Add VSAN

Name *
VSAN-A

VSAN Scope

○ Storage & Uplink ○ Storage ● Uplink

VSAN ID *
101
1 - 4093

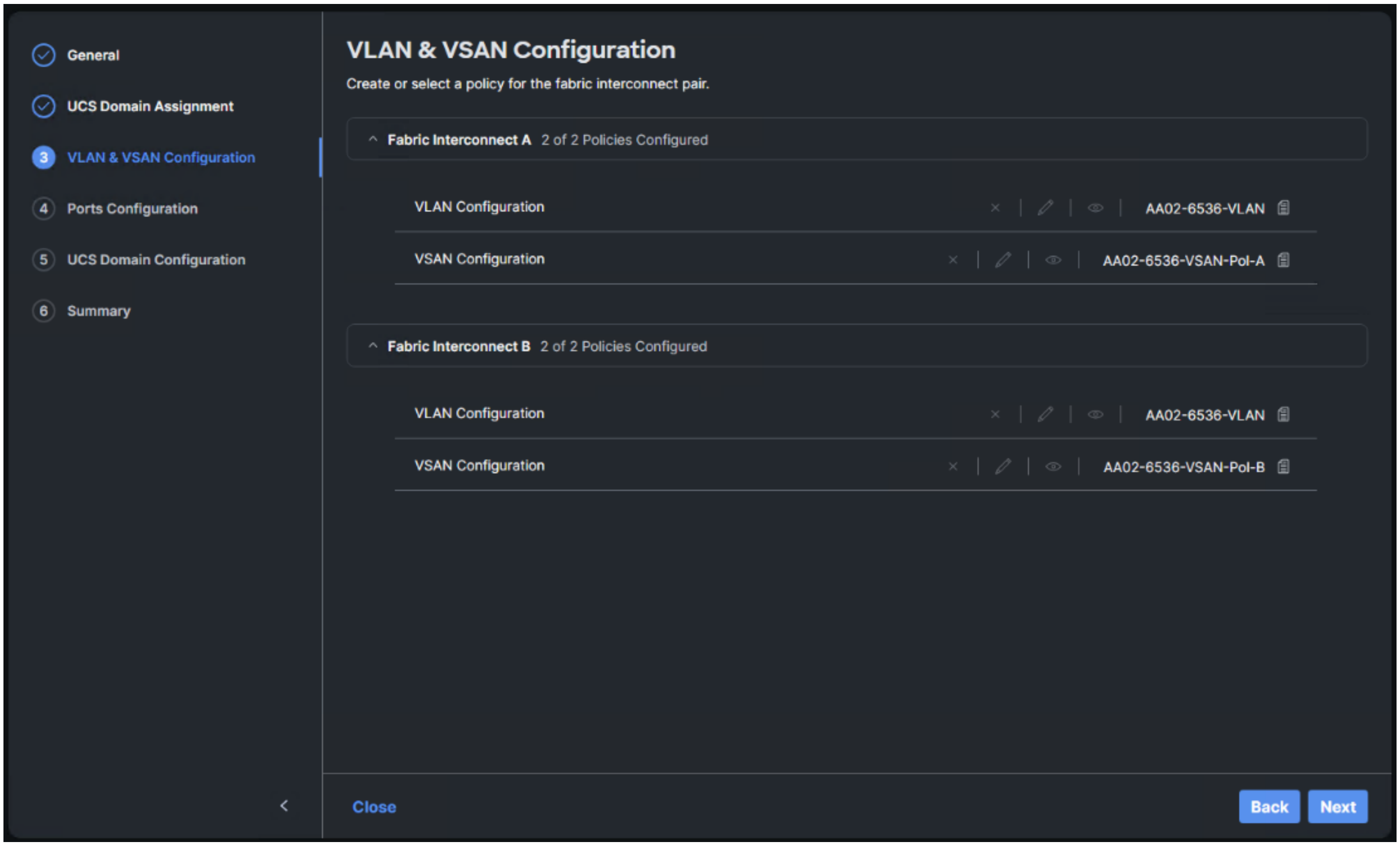
FCoE VLAN ID *
101

Step 7. Click **Add**.

Step 8. Click **Create** to finish creating VSAN policy for fabric A.

Step 9. Repeat steps 1 - 8 to create a new VSAN policy for SAN-B. Name the policy to identify the SAN-B configuration (for example, AA02-6536-VSAN-Pol-B) and use appropriate VSAN and FCoE VLAN (for example, 102).

Step 10. Verify that a common VLAN policy and two unique VSAN policies are associated with the two fabric interconnects.



VLAN & VSAN Configuration

Create or select a policy for the fabric interconnect pair.

Fabric Interconnect A 2 of 2 Policies Configured

VLAN Configuration	AA02-6536-VLAN
VSAN Configuration	AA02-6536-VSAN-Pol-A

Fabric Interconnect B 2 of 2 Policies Configured

VLAN Configuration	AA02-6536-VLAN
VSAN Configuration	AA02-6536-VSAN-Pol-B

Step 11. Click **Next.**

Procedure 3. Ports Configuration

Step 1. Click **Select Policy** for Fabric Interconnect A.

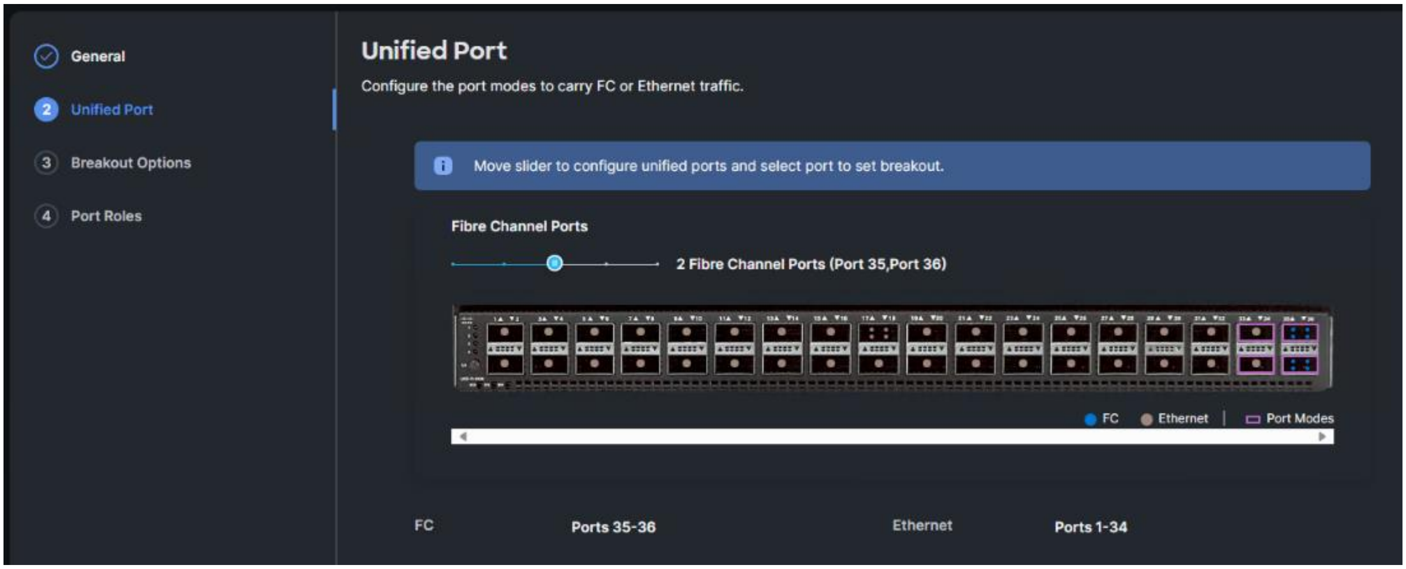
Step 2. Click **Create New** in the pane on the right to define a new port configuration policy.

Note: Use two separate port policies for the fabric interconnects. Using separate policies provide flexibility when port configuration (port numbers or speed) differs between the two FIs. When configuring Fibre Channel, two port policies are required because each fabric interconnect uses a unique Fibre Channel VSAN ID.

Step 3. Verify correct organization is selected from the drop-down list (for example, AA02) and provide a name for the policy (for example, AA02-6536-PortPol-A). Select the UCS-FI-6536 Switch Model.

Step 4. Click **Next.**

Step 5. Move the slider to set up unified ports. In this deployment, the last two ports were selected as Fibre Channel ports as 4x32G breakouts. Click **Next**.



Unified Port

Configure the port modes to carry FC or Ethernet traffic.

Move slider to configure unified ports and select port to set breakout.

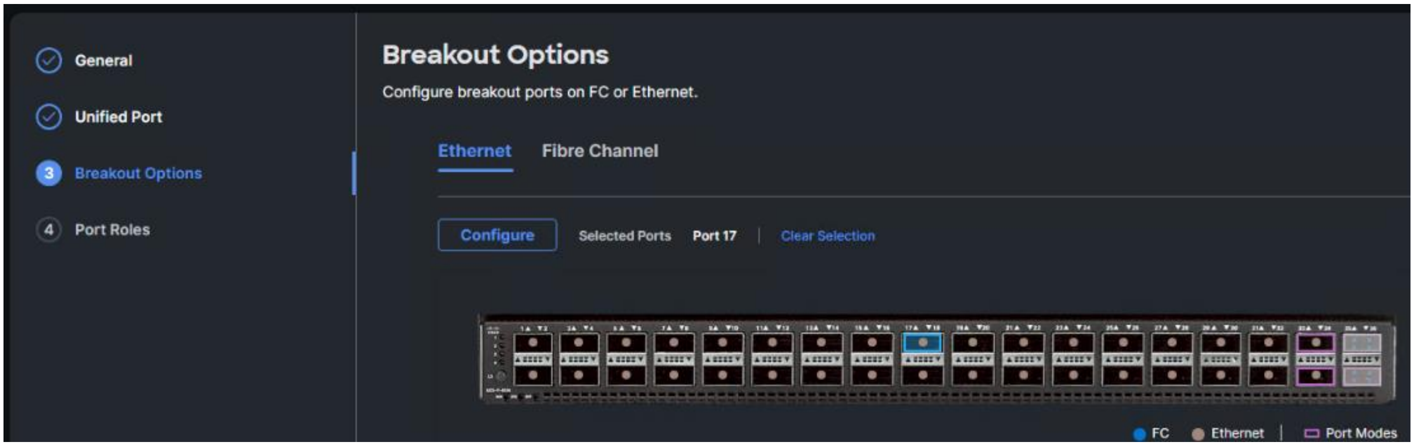
Fibre Channel Ports

2 Fibre Channel Ports (Port 35,Port 36)

FC Ports 35-36

Ethernet Ports 1-34

Step 6. If any ethernet ports need to be configured as breakouts, either 4x25G or 4x10G, for connecting Cisco UCS C-Series servers or a Cisco UCS 5108 chassis, configure them here. In the list, select the checkbox next to any ports that need to be configured as breakout or select the ports on the graphic. When all ports are selected, click **Configure**.

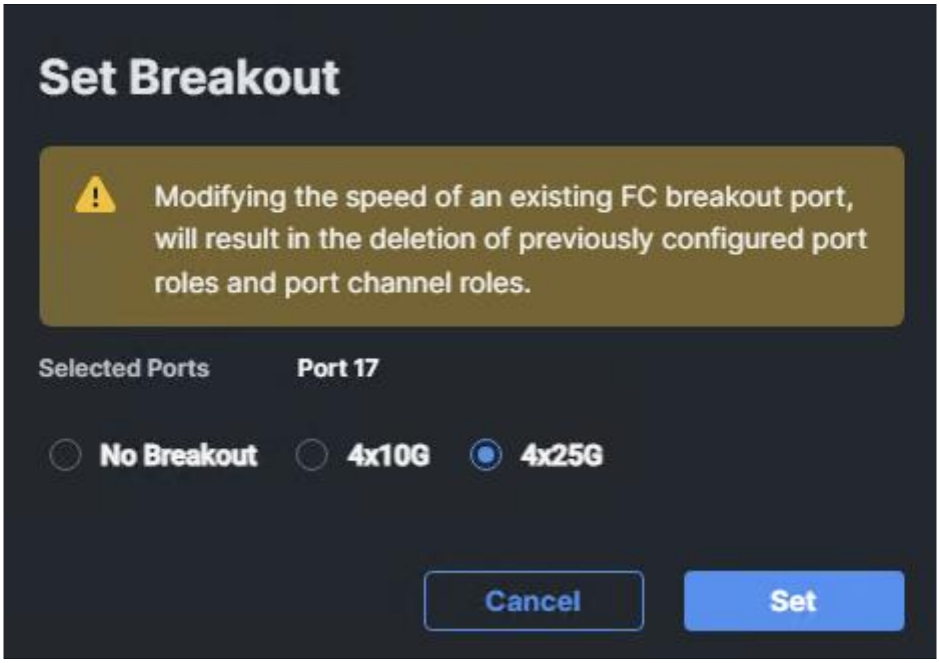


Breakout Options

Configure breakout ports on FC or Ethernet.

Selected Ports Port 17 | Clear Selection

Step 7. In the Set Breakout popup, select either 4x10G or 4x25G and click **Set**.



Set Breakout

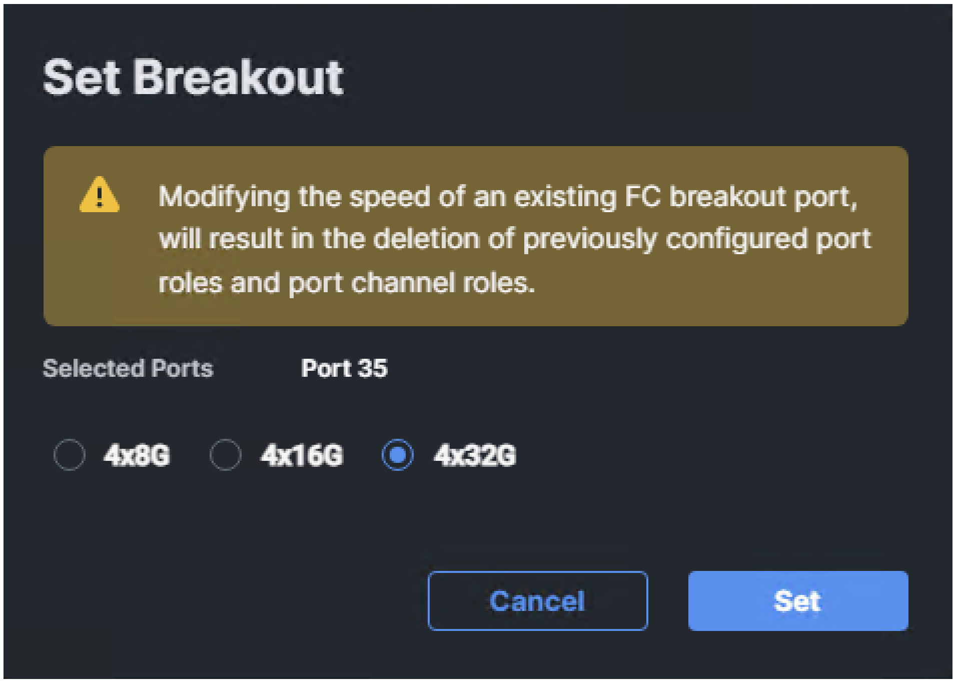
Modifying the speed of an existing FC breakout port, will result in the deletion of previously configured port roles and port channel roles.

Selected Ports Port 17

○ No Breakout ○ 4x10G ● 4x25G

Step 8. Under Breakout Options, select **Fibre Channel**. Select any ports that need the speed changed from 16G to 32G and click **Configure**.

Step 9. In the Set Breakout popup, select 4x32G and click **Set**.



Set Breakout

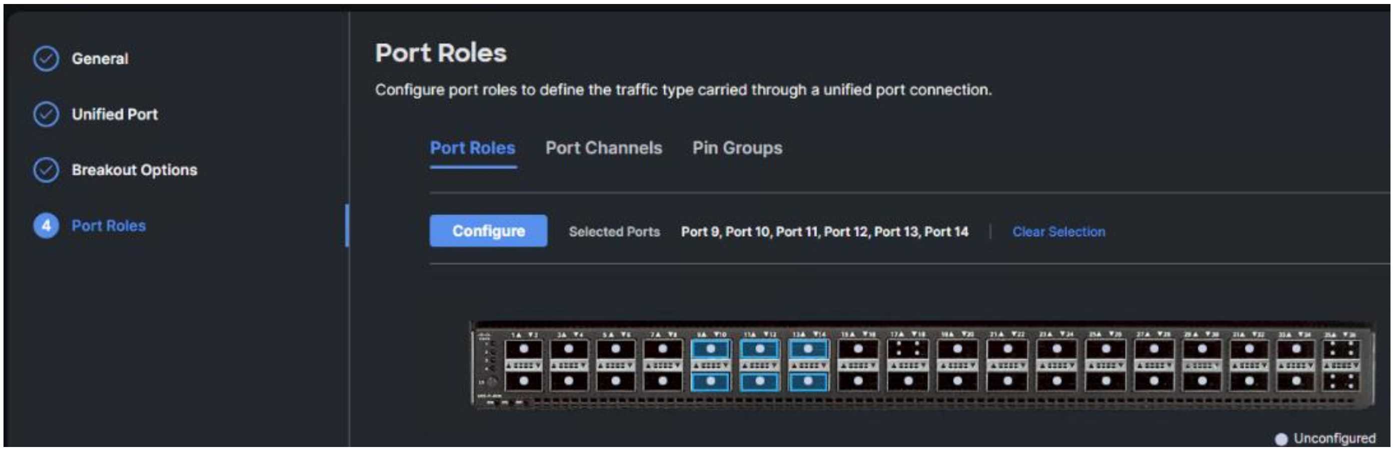
Modifying the speed of an existing FC breakout port, will result in the deletion of previously configured port roles and port channel roles.

Selected Ports Port 35

○ 4x8G ○ 4x16G ● 4x32G

Step 10. Click **Next**.

Step 11. From the list, check the box next to any ports that need to be configured as server ports, including ports connected to chassis or Cisco UCS C-Series servers. Ports can also be selected on the graphic. When all ports are selected, click **Configure**. Breakout and non-breakout ports cannot be configured together. If you need to configure breakout and non-breakout ports, do this configuration in two steps.

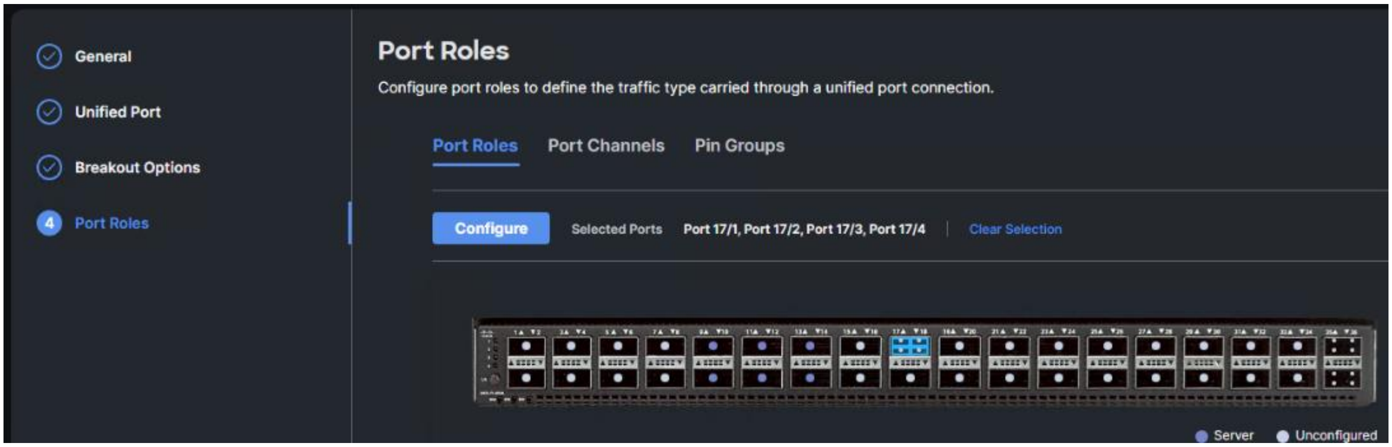


Port Roles

Configure port roles to define the traffic type carried through a unified port connection.

Selected Ports Port 9, Port 10, Port 11, Port 12, Port 13, Port 14

● Unconfigured



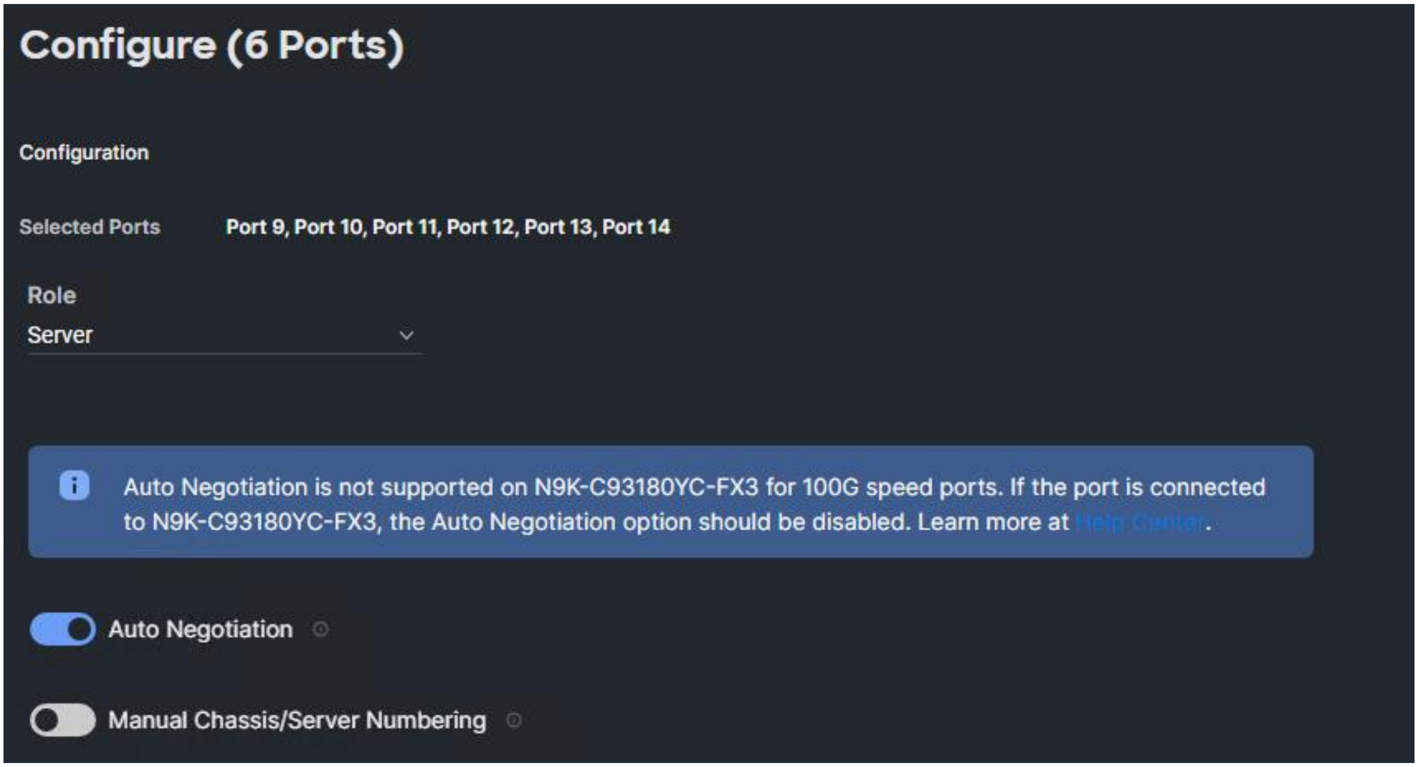
Port Roles

Configure port roles to define the traffic type carried through a unified port connection.

Selected Ports Port 17/1, Port 17/2, Port 17/3, Port 17/4

● Server ● Unconfigured

Step 12. From the drop-down list, select **Server** as the role. Also, unless you are using a Cisco Nexus 93360YC-FX23 as a FEX, leave Auto Negotiation enabled. If you need to do manual number of chassis or Cisco UCS C-Series Servers, enable **Manual Chassis/Server Numbering**.



Configure (6 Ports)

Configuration

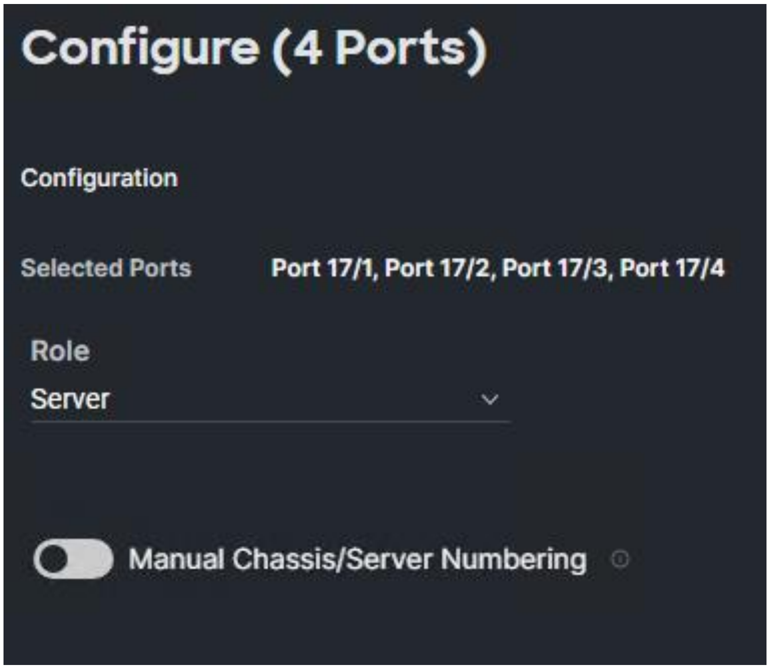
Selected Ports Port 9, Port 10, Port 11, Port 12, Port 13, Port 14

Role: Server

Auto Negotiation is not supported on N9K-C93180YC-FX3 for 100G speed ports. If the port is connected to N9K-C93180YC-FX3, the Auto Negotiation option should be disabled. Learn more at Help Center.

Auto Negotiation: on

Manual Chassis/Server Numbering: off



Configure (4 Ports)

Configuration

Selected Ports: Port 17/1, Port 17/2, Port 17/3, Port 17/4

Role: Server

Step 13. Click **Save**.

Step 14. Configure the Ethernet uplink port channel by selecting **Port Channels** in the main pane and then clicking **Create Port Channel**.

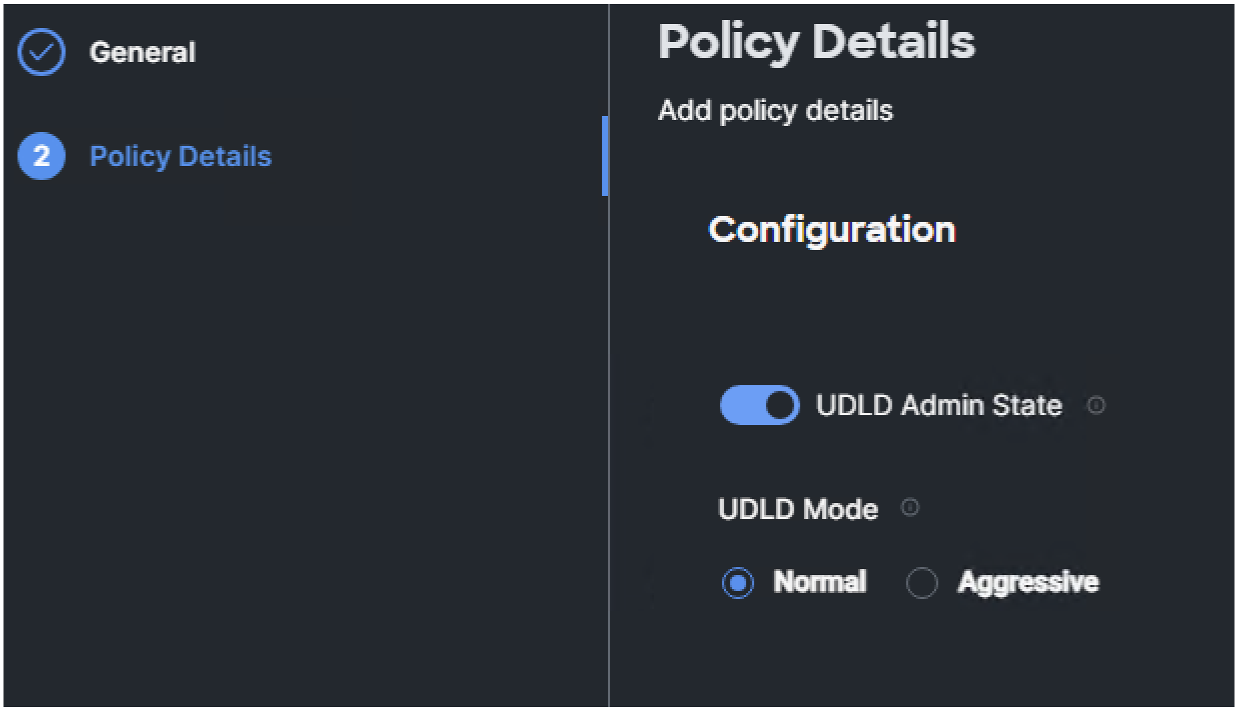
Step 15. Select **Ethernet Uplink Port Channel** as the role, provide a port-channel ID (for example, 131), and select a value for Admin Speed from drop-down list (for example, Auto).

Note: You can create the Ethernet Network Group, Flow Control, Link Aggregation for defining disjoint Layer-2 domain or fine tune port-channel parameters. These policies were not used in this deployment and system default values were utilized.

Step 16. Under Link Control, click **Select Policy** then click **Create New**.

Step 17. Verify the correct organization is selected from the drop-down list (for example, AA02) and provide a name for the policy (for example, AA02-UDLD-Link-Control). Click **Next**.

Step 18. Leave the default values selected and click **Create**.



Policy Details

Add policy details

Configuration

UDLD Admin State: enabled

UDLD Mode

● Normal ○ Aggressive

Step 19. Scroll down and select uplink ports from the list of available ports (for example, port 31 and 32)

Step 20. Click **Save**.

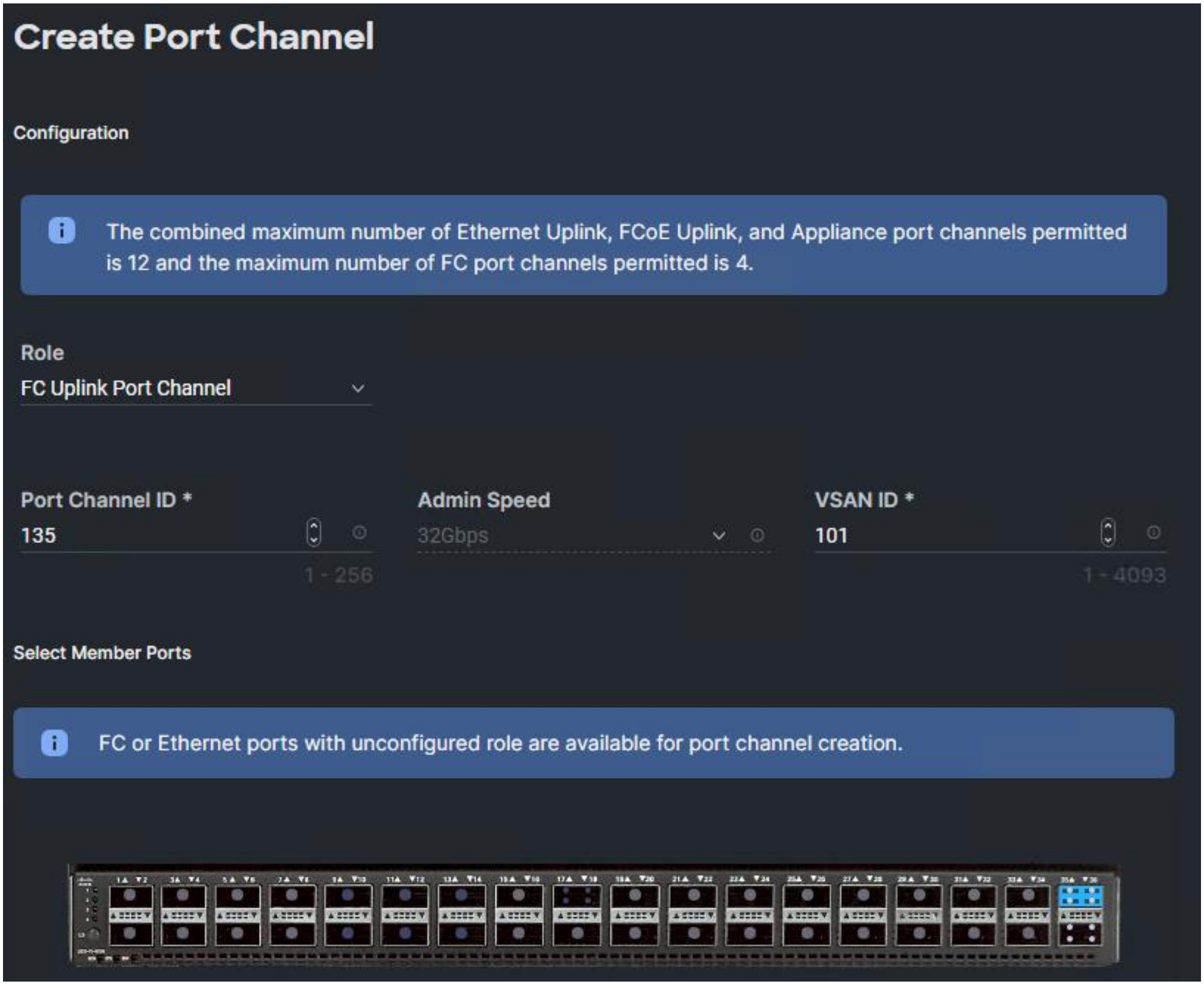
Procedure 4. Configure FC Port Channel (FC configuration only)

Note: FC uplink port channels are only needed when configuring FC SAN and can be skipped for IP-only (iSCSI) storage access.

Step 1. Configure a Fibre Channel Port Channel by selecting the **Port Channel** in the main pane again and clicking **Create Port Channel**.

Step 2. From the Role drop-down list, select **FC Uplink Port Channel**.

Step 3. Provide a port-channel ID (for example, 135), select a value for Admin Speed (for example, 32Gbps), and provide a VSAN ID (for example, 101).



Create Port Channel

Configuration

The combined maximum number of Ethernet Uplink, FCoE Uplink, and Appliance port channels permitted is 12 and the maximum number of FC port channels permitted is 4.

Role: FC Uplink Port Channel

Port Channel ID *: 135 (1 - 256)

Admin Speed: 32Gbps

VSAN ID *: 101 (1 - 4093)

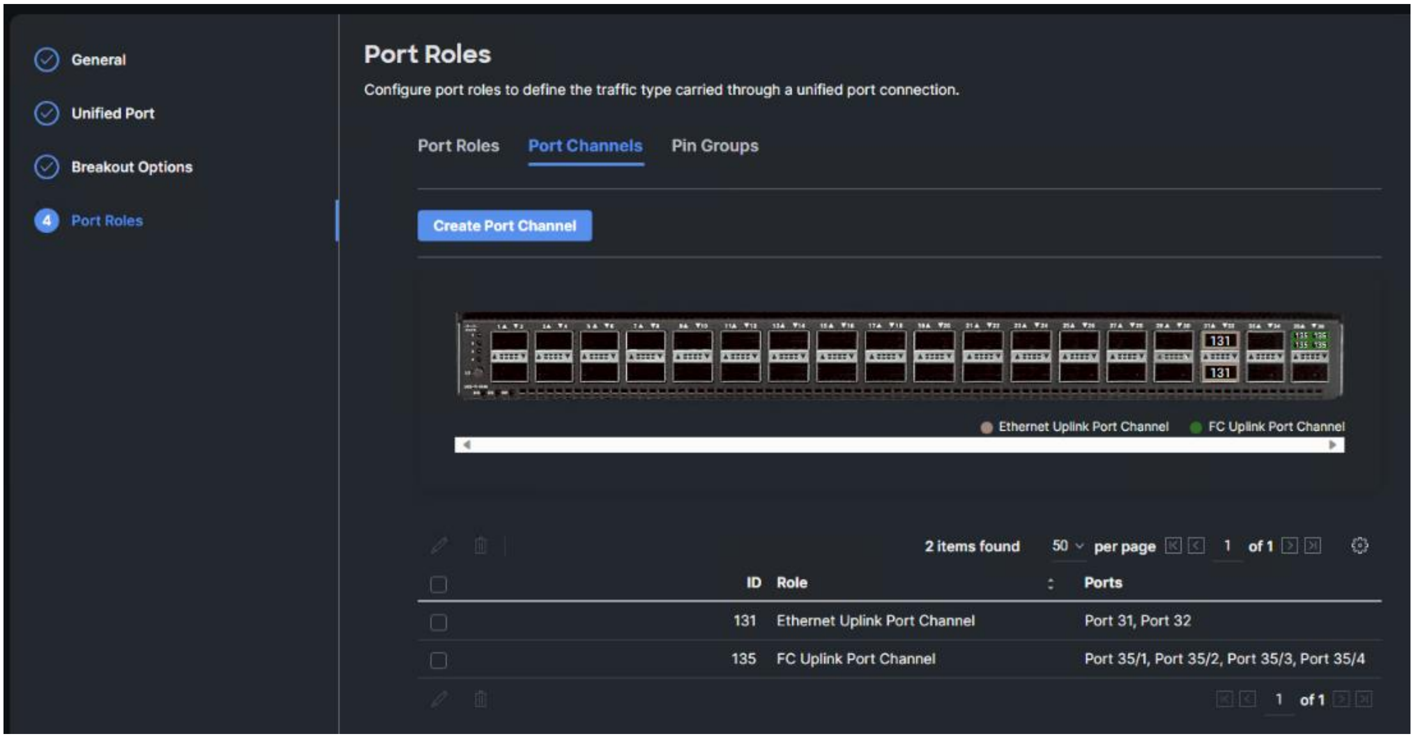
Select Member Ports

FC or Ethernet ports with unconfigured role are available for port channel creation.

Step 4. Select ports (for example, 35/1,35/2,35/3,35/4).

Step 5. Click **Save**.

Step 6. Verify the port-channel IDs and ports after both the Ethernet uplink port channel and the Fibre Channel uplink port channel have been created.



Port Roles

Configure port roles to define the traffic type carried through a unified port connection.

ID	Role	Ports
131	Ethernet Uplink Port Channel	Port 31, Port 32
135	FC Uplink Port Channel	Port 35/1, Port 35/2, Port 35/3, Port 35/4

Step 7. Click **Save** to create the port policy for Fabric Interconnect A.

Note: Use the summary screen to verify that the ports were selected and configured correctly.

Procedure 5. Port Configuration for Fabric Interconnect B

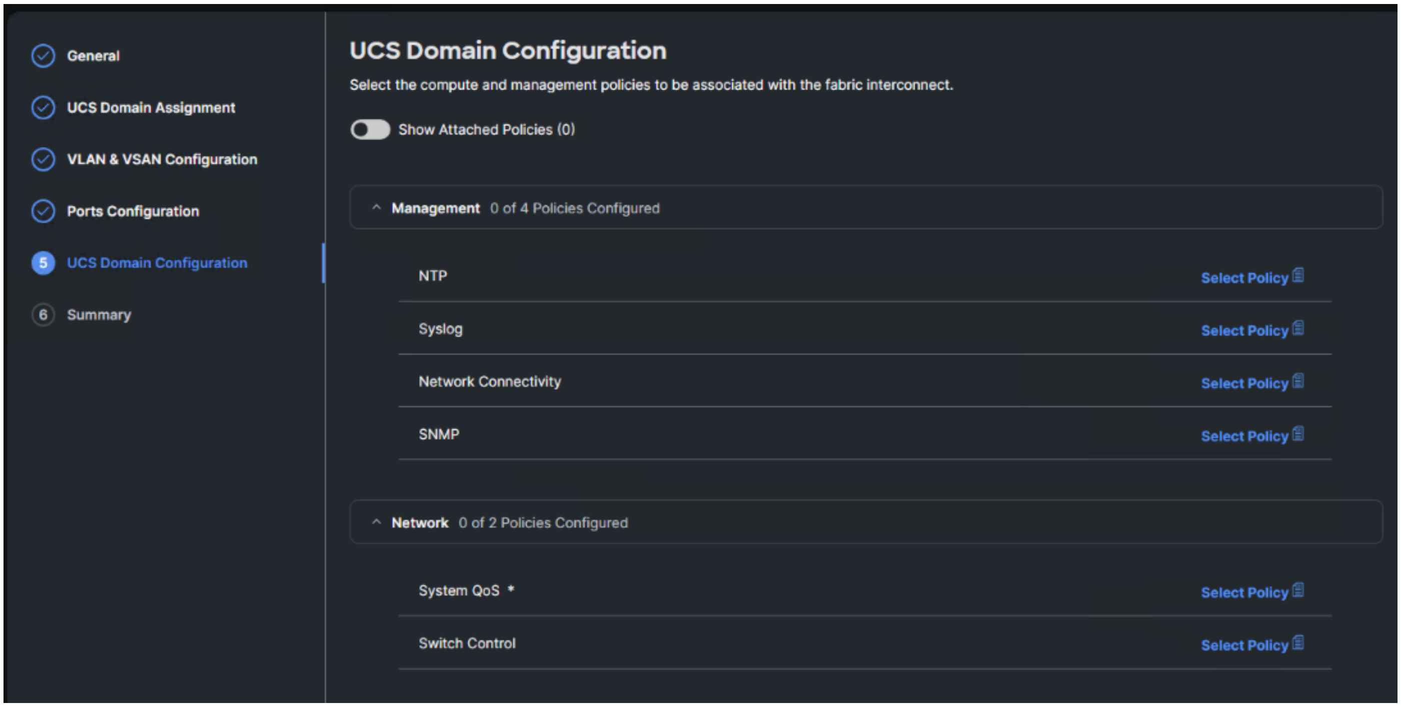
Step 1. Repeat the steps in Ports Configuration and Configure FC Port Channel to create the port policy for Fabric Interconnect B including the Ethernet port-channel and the FC port-channel (if configuring SAN). Use the following values for various parameters:

- Name of the port policy: AA02-PortPol-B
- Ethernet port-Channel ID: 132
- FC port-channel ID: 135
- FC VSAN ID: 102

Step 2. When the port configuration for both fabric interconnects is complete and looks good, click **Next.**

Procedure 6. UCS Domain Configuration

Under UCS domain configuration, additional policies can be configured to setup NTP, Syslog, DNS settings, SNMP, QoS and UCS operating mode (end host or switch mode). For this deployment, four policies (NTP, Network Connectivity, SNMP, and System QoS) will be configured, as shown below:



UCS Domain Configuration

Select the compute and management policies to be associated with the fabric interconnect.

Show Attached Policies (0)

Management 0 of 4 Policies Configured

NTP	Select Policy
Syslog	Select Policy
Network Connectivity	Select Policy
SNMP	Select Policy

Network 0 of 2 Policies Configured

System QoS *	Select Policy
Switch Control	Select Policy

Procedure 7. Configure NTP Policy

Step 1. Click **Select Policy** next to NTP and then, in the pane on the right, click **Create New**.

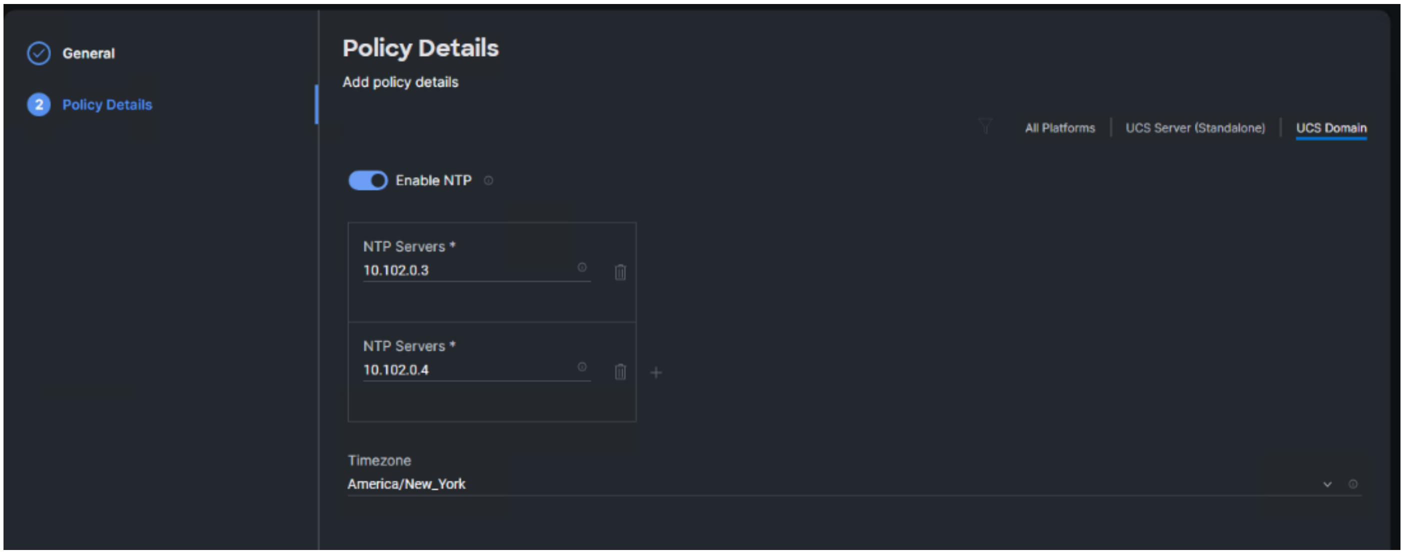
Step 2. Verify correct organization is selected from the drop-down list (for example, AA02) and provide a name for the policy (for example, AA02-NTP).

Step 3. Click **Next**.

Step 4. Enable NTP, provide the first NTP server IP address, and select the time zone from the drop-down list.

Step 5. Add a second NTP server by clicking **+** next to the first NTP server IP address.

Note: The NTP server IP addresses should be Nexus switch management IPs. NTP distribution was configured in the Cisco Nexus switches.



Policy Details

Add policy details

Enable NTP

NTP Servers * 10.102.0.3

NTP Servers * 10.102.0.4

Timezone America/New_York

Step 6. Click **Create**.

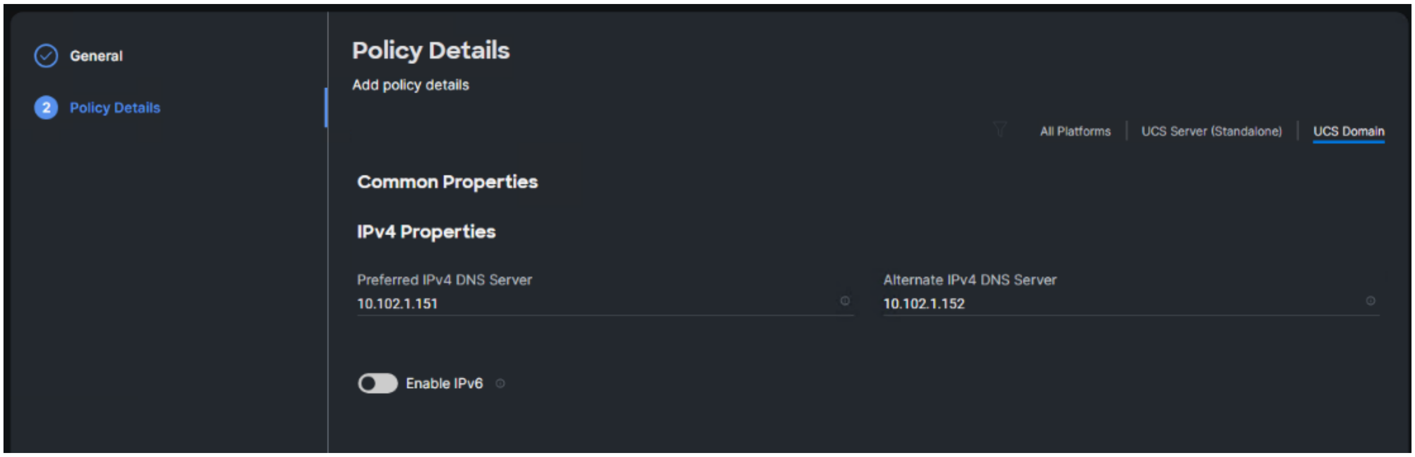
Procedure 8. Configure Network Connectivity Policy

Step 1. Click **Select Policy** next to Network Connectivity and then, in the pane on the right, click **Create New**.

Step 2. Verify correct organization is selected from the drop-down list (for example, AA02) and provide a name for the policy (for example, AA02-NetConn).

Step 3. Click **Next**.

Step 4. Provide DNS server IP addresses for Cisco UCS (for example, 10.102.1.151 and 10.102.1.152).



Policy Details

Add policy details

Common Properties

IPv4 Properties

Preferred IPv4 DNS Server: 10.102.1.151

Alternate IPv4 DNS Server: 10.102.1.152

Enable IPv6

Step 5. Click **Create**.

Procedure 9. Configure SNMP Policy

Step 1. Click **Select Policy** next to SNMP and then, in the pane on the right, click **Create New**.

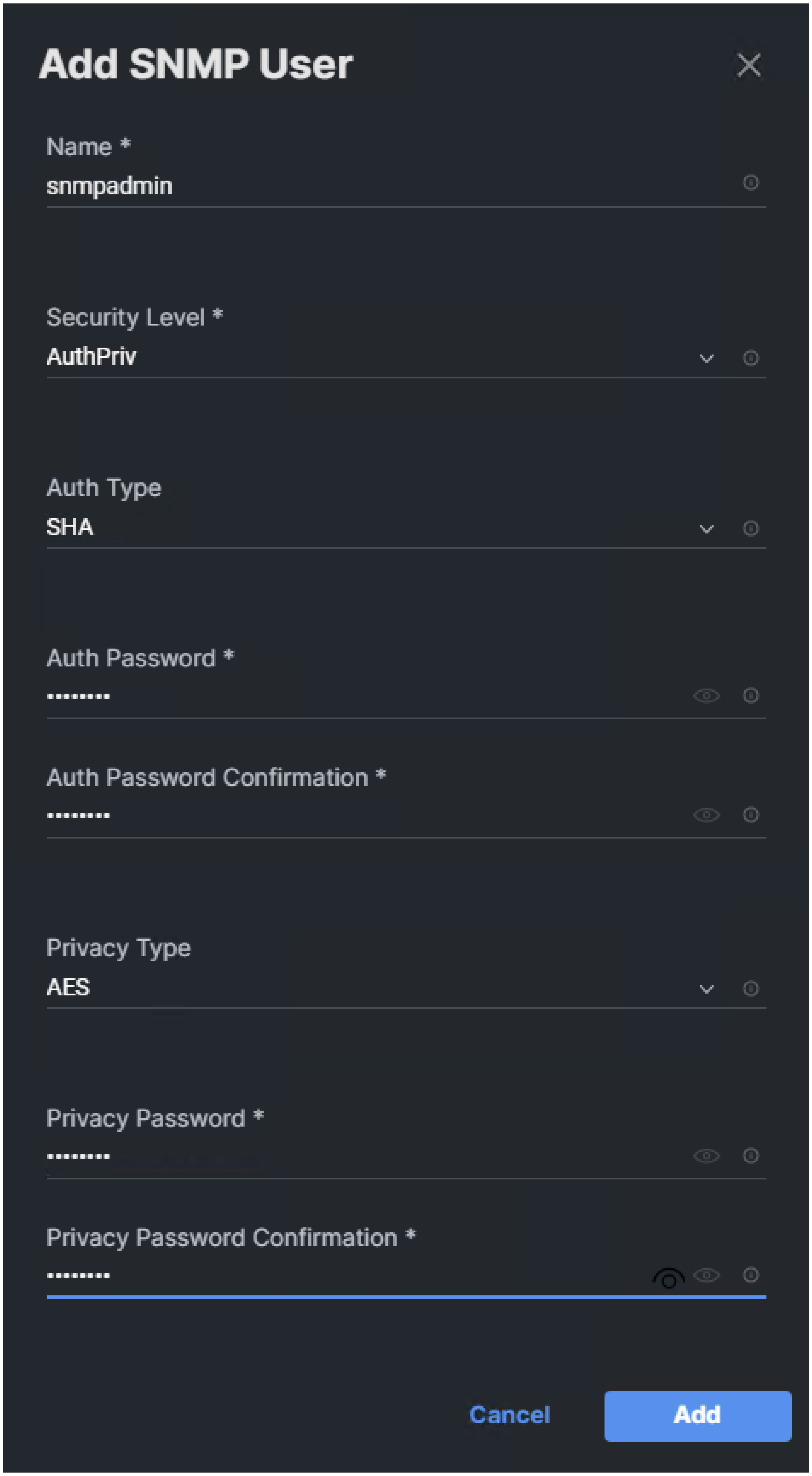
Step 2. Verify correct organization is selected from the drop-down list (for example, AA02) and provide a name for the policy (for example, AA02-SNMP).

Step 3. Click **Next**.

Step 4. Provide a System Contact email address, a System Location, and optional Community Strings.

Step 5. Under SNMP Users, click **Add SNMP User**.

Step 6. This user id will be used for Cisco DCNM SAN to query the UCS Fabric Interconnects. Fill in a user name (for example, snmpadmin), Auth Type SHA, an Auth Password with confirmation, Privacy Type AES, and a Privacy Password with confirmation. Click **Add**.



Add SNMP User

Name *
snmpadmin

Security Level *
AuthPriv

Auth Type
SHA

Auth Password *
•••••••••

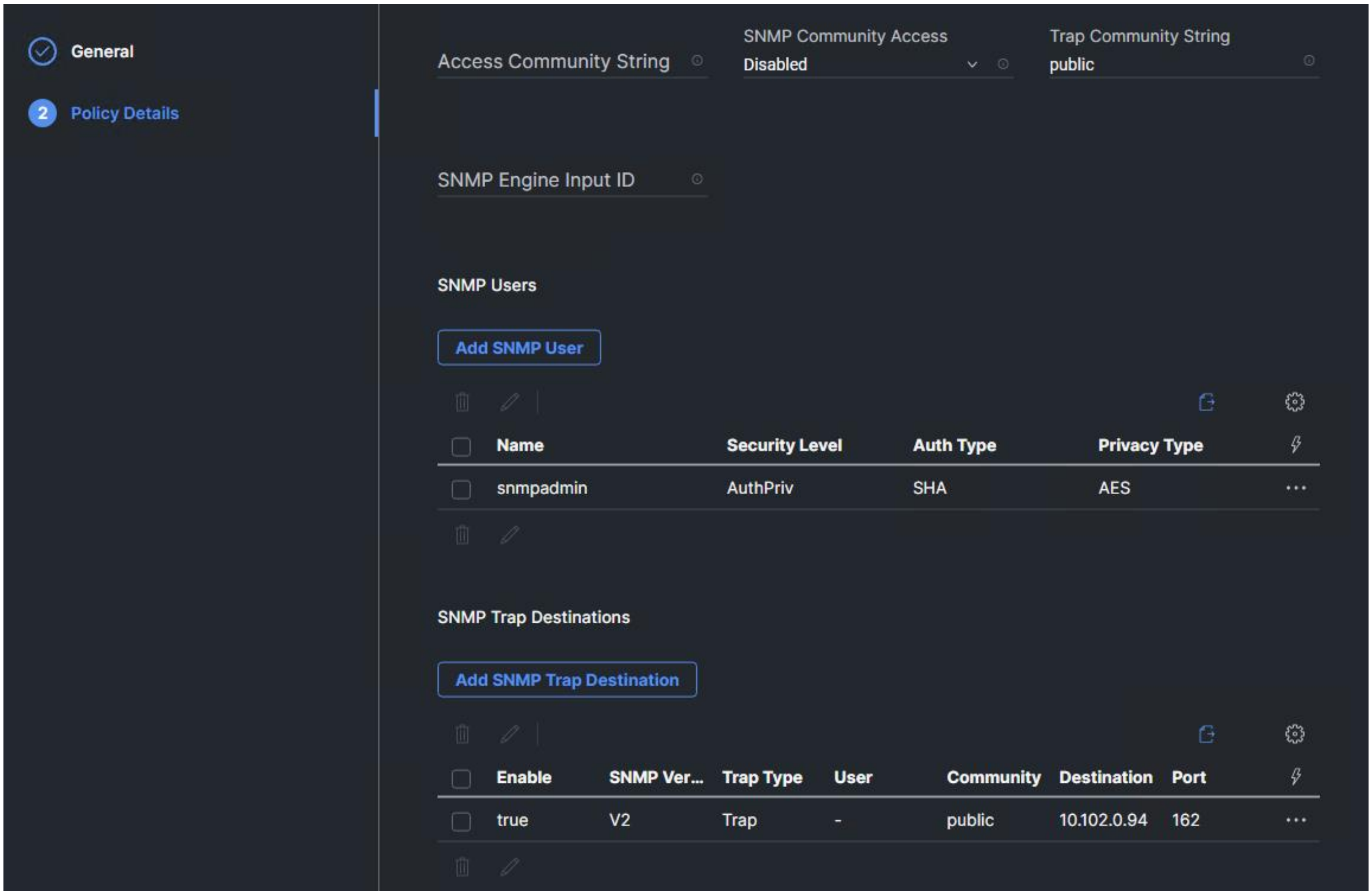
Auth Password Confirmation *
•••••••••

Privacy Type
AES

Privacy Password *
•••••••••

Privacy Password Confirmation *
•••••••••

Step 7. Optional: Add an SNMP Trap Destination (for example, the DCNM SAN IP Address). If the SNMP Trap Destination is V2, you must add Trap Community String.



Access Community String

SNMP Community Access: Disabled

Trap Community String: public

SNMP Engine Input ID

SNMP Users

	Name	Security Level	Auth Type	Privacy Type
□	snmpadmin	AuthPriv	SHA	AES

SNMP Trap Destinations

	Enable	SNMP Ver...	Trap Type	User	Community	Destination	Port
□	true	V2	Trap	-	public	10.102.0.94	162

Step 8. Click **Create.**

Procedure 10. Configure System QoS Policy

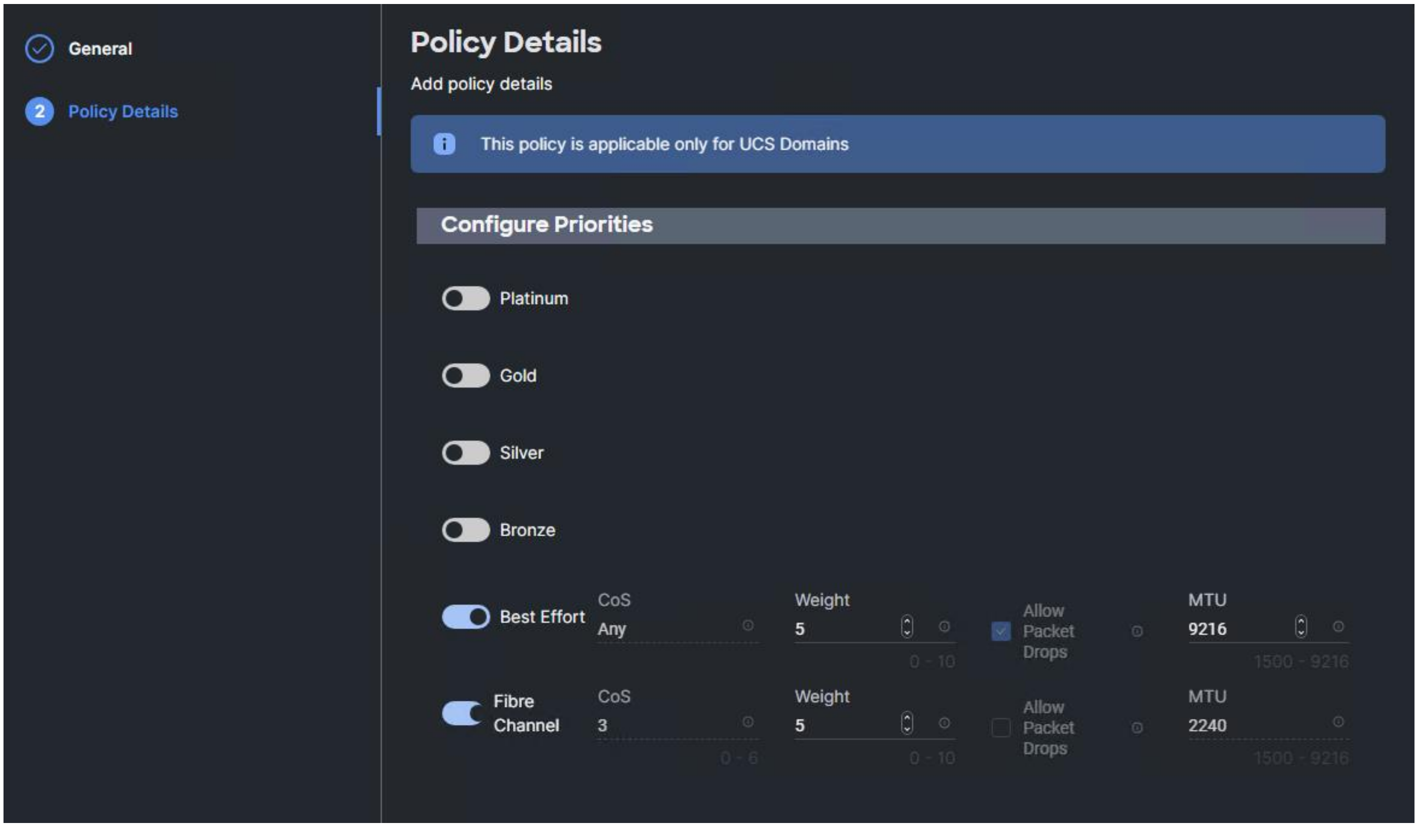
Step 1. Click **Select Policy** next to System QoS* and in the pane on the right, click **Create New.**

Step 2. Verify correct organization is selected from the drop-down list (for example, AA02) and provide a name for the policy (for example, AA02-QoS).

Step 3. Click **Next.**

Step 4. Change the MTU for Best Effort class to **9216.**

Step 5. Keep the default selections or change the parameters if necessary.



Policy Details

Add policy details

This policy is applicable only for UCS Domains

Configure Priorities

Platinum

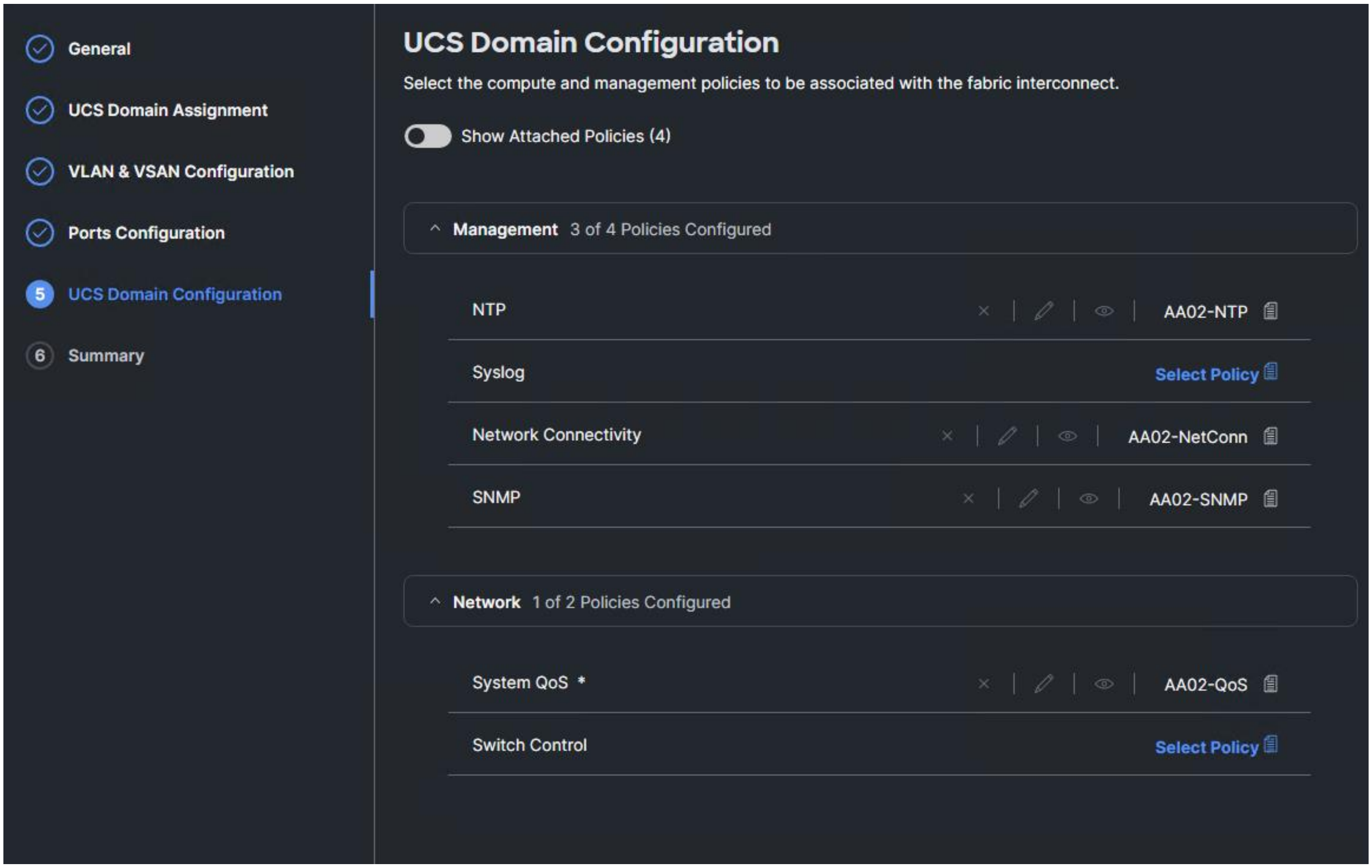
Gold

Silver

Bronze

	CoS	Weight		MTU
Best Effort	Any	5 0 - 10	☑ Allow Packet Drops	9216 1500 - 9216
Fibre Channel	3 0 - 6	5 0 - 10	□ Allow Packet Drops	2240 1500 - 9216

Step 6. Click **Create.**



UCS Domain Configuration

Select the compute and management policies to be associated with the fabric interconnect.

Show Attached Policies (4)

Management 3 of 4 Policies Configured

NTP	AA02-NTP
Syslog	Select Policy
Network Connectivity	AA02-NetConn
SNMP	AA02-SNMP

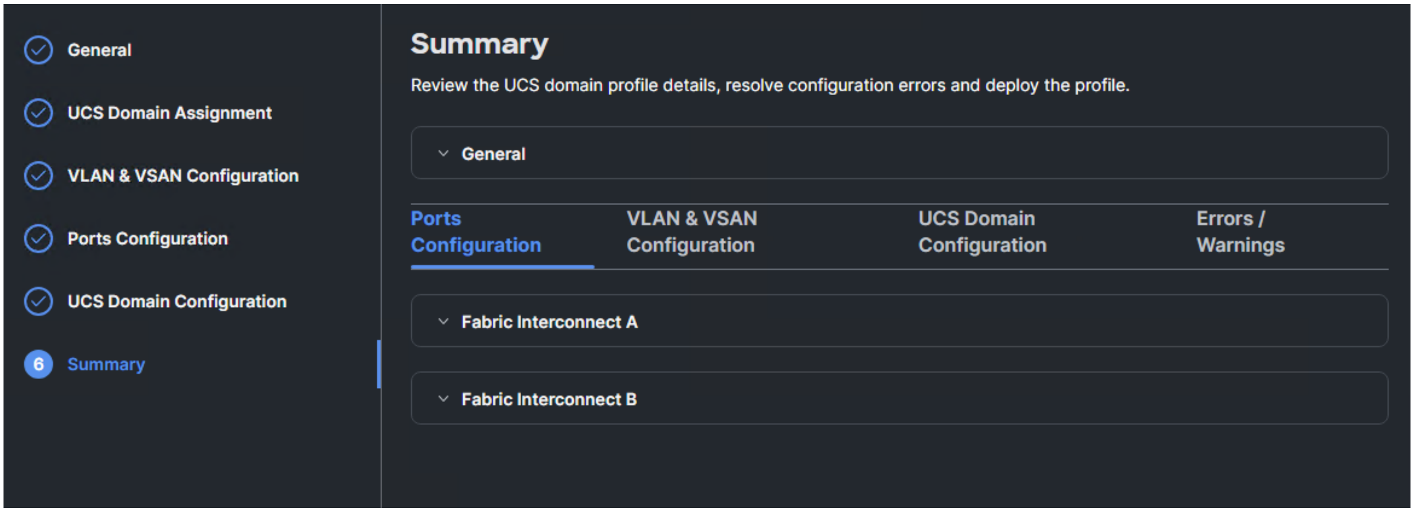
Network 1 of 2 Policies Configured

System QoS *	AA02-QoS
Switch Control	Select Policy

Step 7. Click **Next.**

Procedure 11. Summary

Step 1. Verify all the settings including the fabric interconnect settings, by expanding the settings and make sure that the configuration is correct.



Procedure 12. Deploy the Cisco UCS Domain Profile

Step 1. From the UCS domain profile Summary view, click **Deploy**.

Step 2. Acknowledge any warnings and click **Deploy** again.

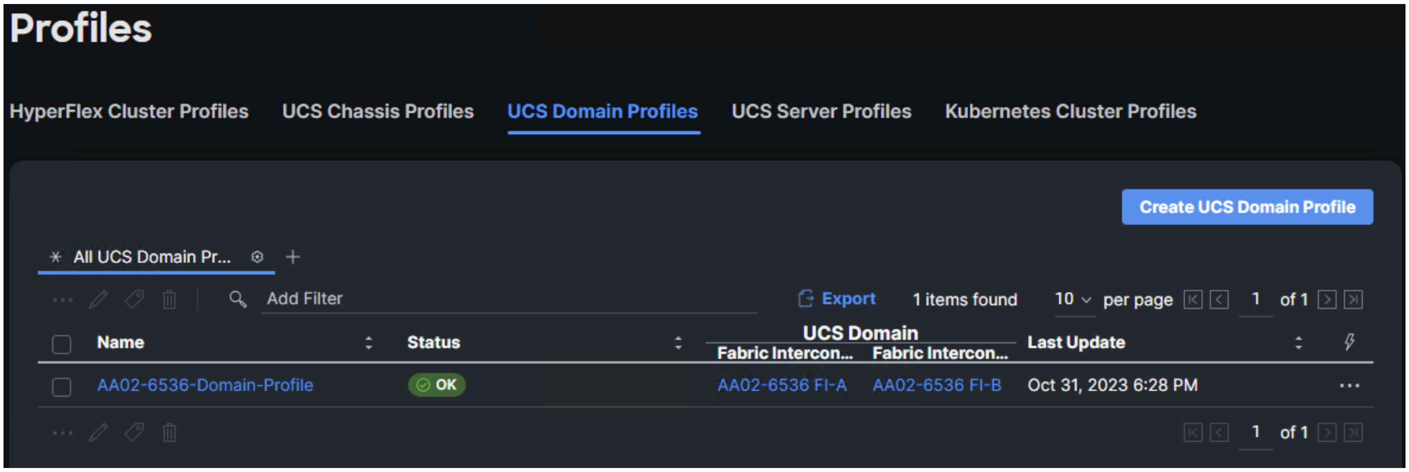
Note: The system will take some time to validate and configure the settings on the fabric interconnects. Log into the fabric interconnect serial console servers to see when the Cisco UCS fabric interconnects have finished configuration and are successfully rebooted.

Procedure 13. Verify Cisco UCS Domain Profile Deployment

When the Cisco UCS domain profile has been successfully deployed, the Cisco UCS chassis and the blades should be successfully discovered.

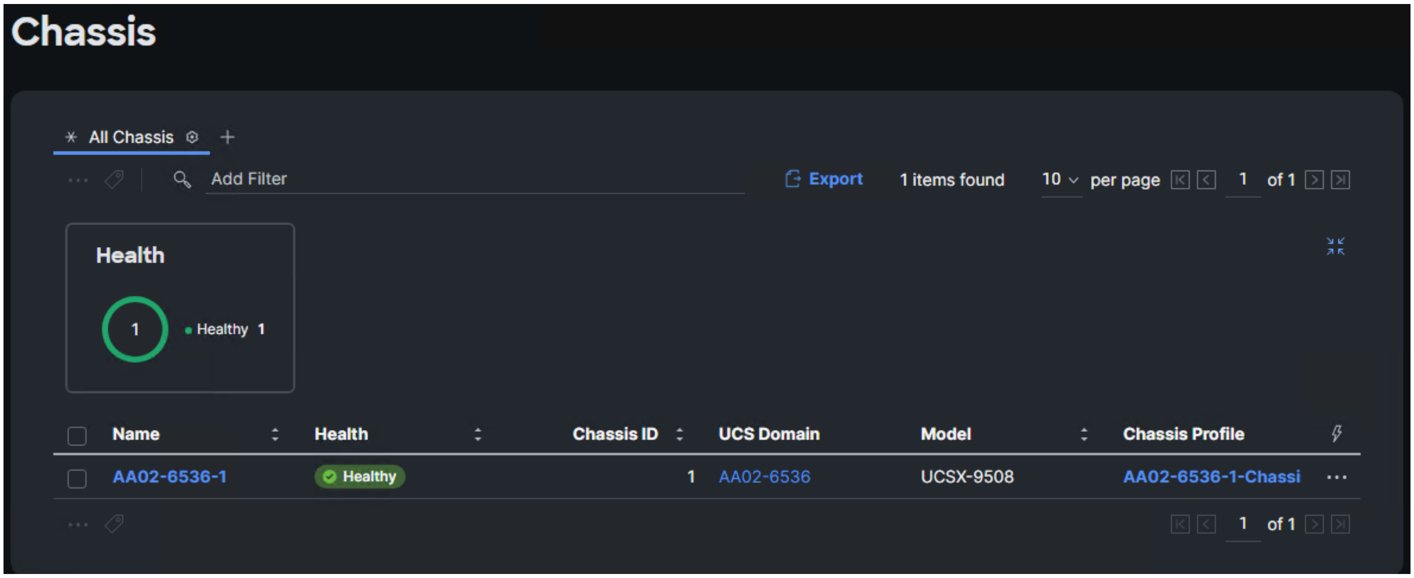
Note: It takes a while to discover the blades and rackmounts for the first time. Watch the number of outstanding requests in Cisco Intersight.

Step 1. Log into Cisco Intersight. Under **Infrastructure Service > Configure > Profiles > UCS Domain Profiles**, verify that the domain profile has been successfully deployed.



Name	Status	UCS Domain Fabric Intercon...	 Fabric Intercon...	Last Update
AA02-6536-Domain-Profile	OK	AA02-6536 FI-A	AA02-6536 FI-B	Oct 31, 2023 6:28 PM

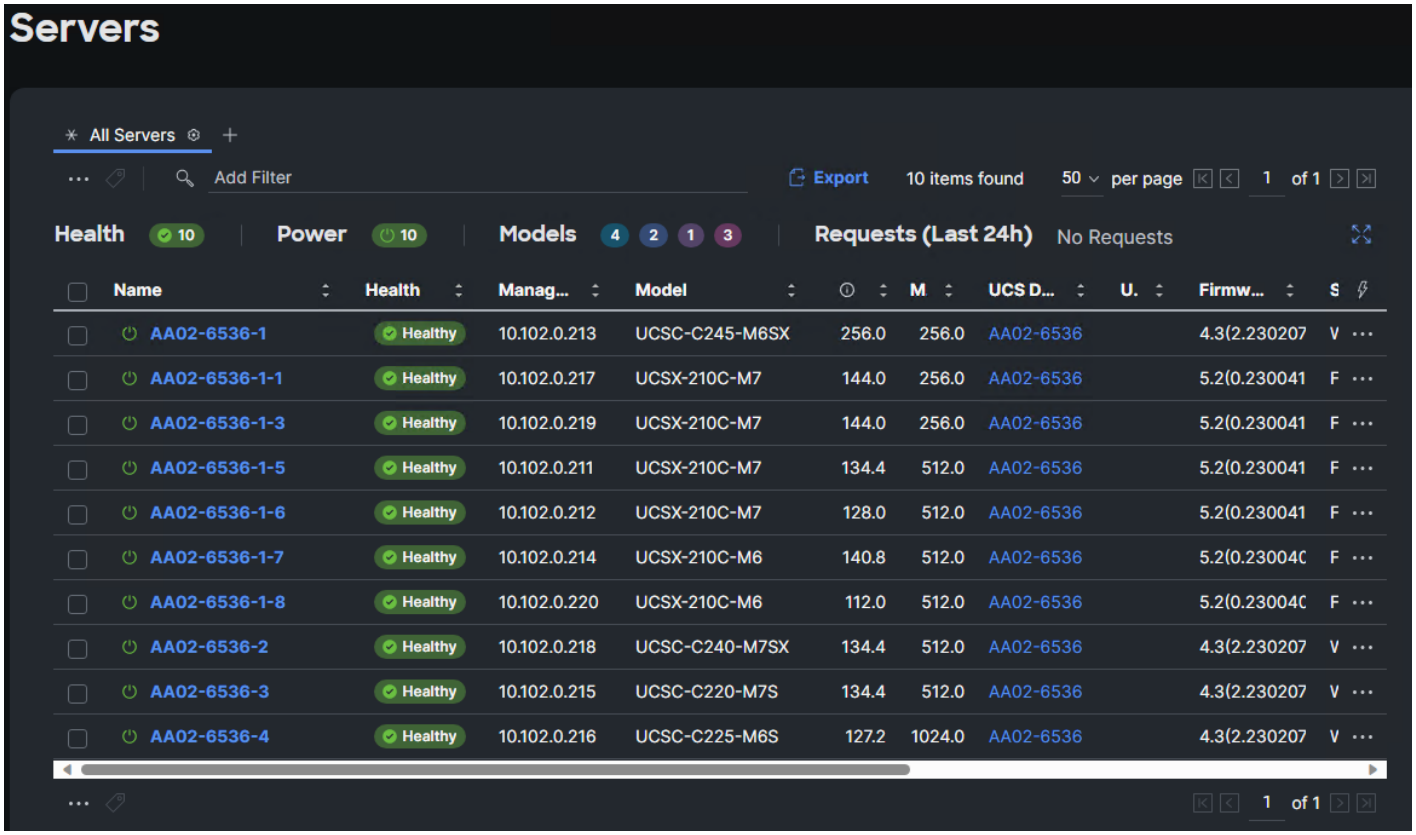
Step 2. Verify that the chassis (either UCSX-9508 or UCS 5108 chassis) has been discovered and is visible under **Infrastructure Service > Operate** > **Chassis**.



Chassis

Name	Health	Chassis ID	UCS Domain	Model	Chassis Profile
AA02-6536-1	Healthy	1	AA02-6536	UCSX-9508	AA02-6536-1-Chassi

Step 3. Verify that the servers have been successfully discovered and are visible under **Infrastructure Service > Operate** > **Servers**.



Servers

Name	Health	Manag...	Model	ⓘ	M.	UCS D...	U.	Firmw...	S
AA02-6536-1	Healthy	10.102.0.213	UCSC-C245-M6SX	256.0	256.0	AA02-6536		4.3(2.230207	V
AA02-6536-1-1	Healthy	10.102.0.217	UCSX-210C-M7	144.0	256.0	AA02-6536		5.2(0.230041	F
AA02-6536-1-3	Healthy	10.102.0.219	UCSX-210C-M7	144.0	256.0	AA02-6536		5.2(0.230041	F
AA02-6536-1-5	Healthy	10.102.0.211	UCSX-210C-M7	134.4	512.0	AA02-6536		5.2(0.230041	F
AA02-6536-1-6	Healthy	10.102.0.212	UCSX-210C-M7	128.0	512.0	AA02-6536		5.2(0.230041	F
AA02-6536-1-7	Healthy	10.102.0.214	UCSX-210C-M6	140.8	512.0	AA02-6536		5.2(0.23004C	F
AA02-6536-1-8	Healthy	10.102.0.220	UCSX-210C-M6	112.0	512.0	AA02-6536		5.2(0.23004C	F
AA02-6536-2	Healthy	10.102.0.218	UCSC-C240-M7SX	134.4	512.0	AA02-6536		4.3(2.230207	V
AA02-6536-3	Healthy	10.102.0.215	UCSC-C220-M7S	134.4	512.0	AA02-6536		4.3(2.230207	V
AA02-6536-4	Healthy	10.102.0.216	UCSC-C225-M6S	127.2	1024.0	AA02-6536		4.3(2.230207	V

Procedure 14. Configure a Cisco UCS Chassis Profile

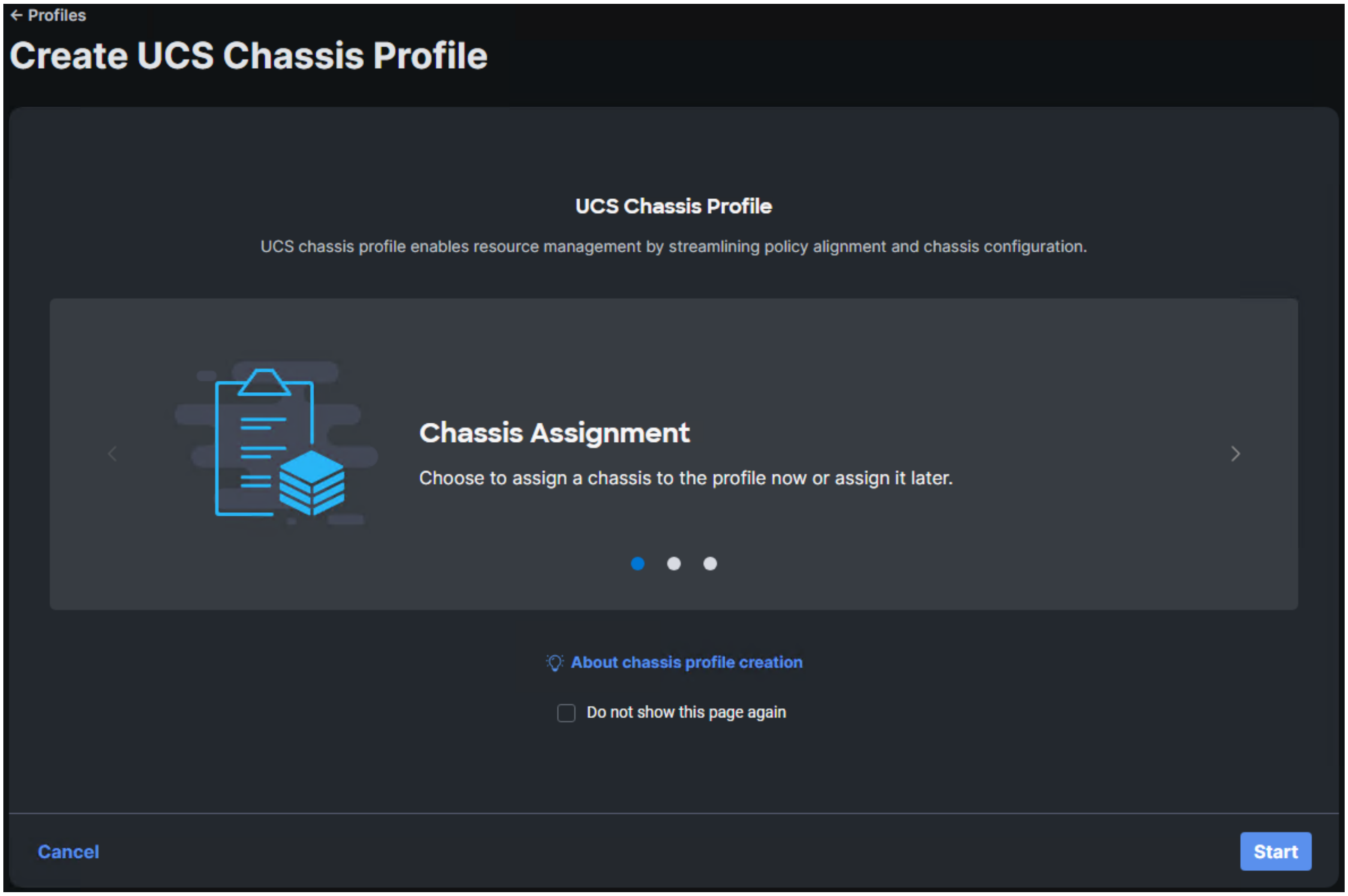
Note: A Cisco UCS chassis profile configures either a UCS X9508 or UCS 5108 chassis through reusable policies. It defines the characteristics of power distribution and fan configuration in the chassis. One Cisco UCS chassis profile can be assigned to one chassis.

Step 1. Log into the Cisco Intersight portal.

Step 2. From the drop-down list, select **Infrastructure Service**, then under Configure select **Profiles**.

Step 3. In the main window, select UCS Chassis Profiles and click Create UCS Chassis Profile.

Step 4. From the Create UCS Chassis Profile screen, click **Start**.



← Profiles

Create UCS Chassis Profile

UCS Chassis Profile

UCS chassis profile enables resource management by streamlining policy alignment and chassis configuration.

Chassis Assignment

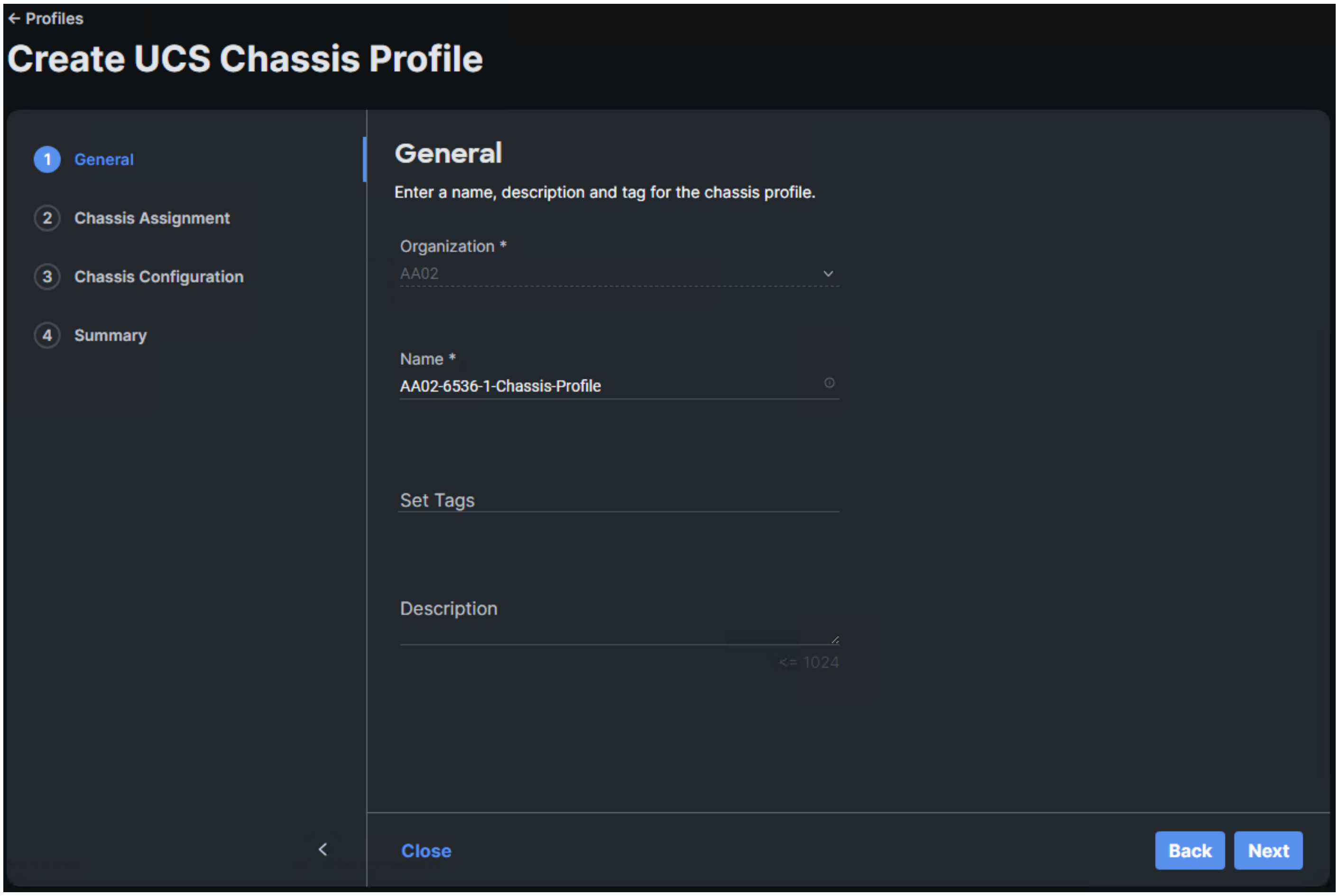
Choose to assign a chassis to the profile now or assign it later.

Procedure 15. UCS Chassis Profile General Configuration

Step 1. Select the organization from the drop-down list (for example, AA02).

Step 2. Provide a name for the domain profile (for example, AA02-6536-1-Chassis-Profile).

Step 3. Provide an optional Description.



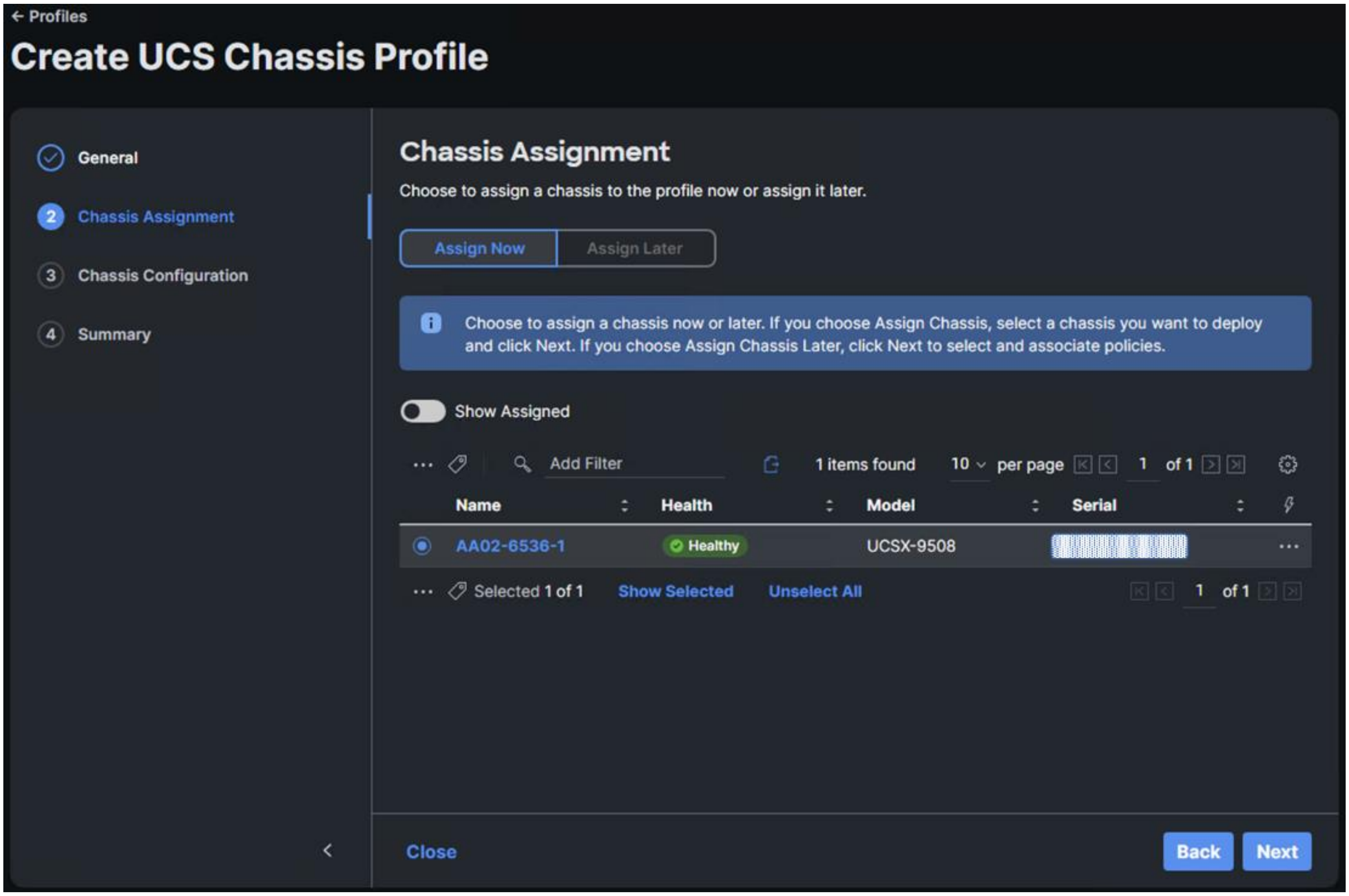
Organization * AA02

Name * AA02-6536-1-Chassis-Profile

Step 4. Click **Next.**

Procedure 16. Cisco UCS Chassis Assignment

Step 1. Assign the Cisco UCS chassis to this new chassis profile by clicking **Assign Now** and selecting a Cisco UCS chassis (for example, AA02-6536-1).



Create UCS Chassis Profile

Chassis Assignment

Choose to assign a chassis to the profile now or assign it later.

Choose to assign a chassis now or later. If you choose Assign Chassis, select a chassis you want to deploy and click Next. If you choose Assign Chassis Later, click Next to select and associate policies.

Name	Health	Model	Serial
AA02-6536-1	Healthy	UCSX-9508	[redacted]

Step 2. Click **Next.**

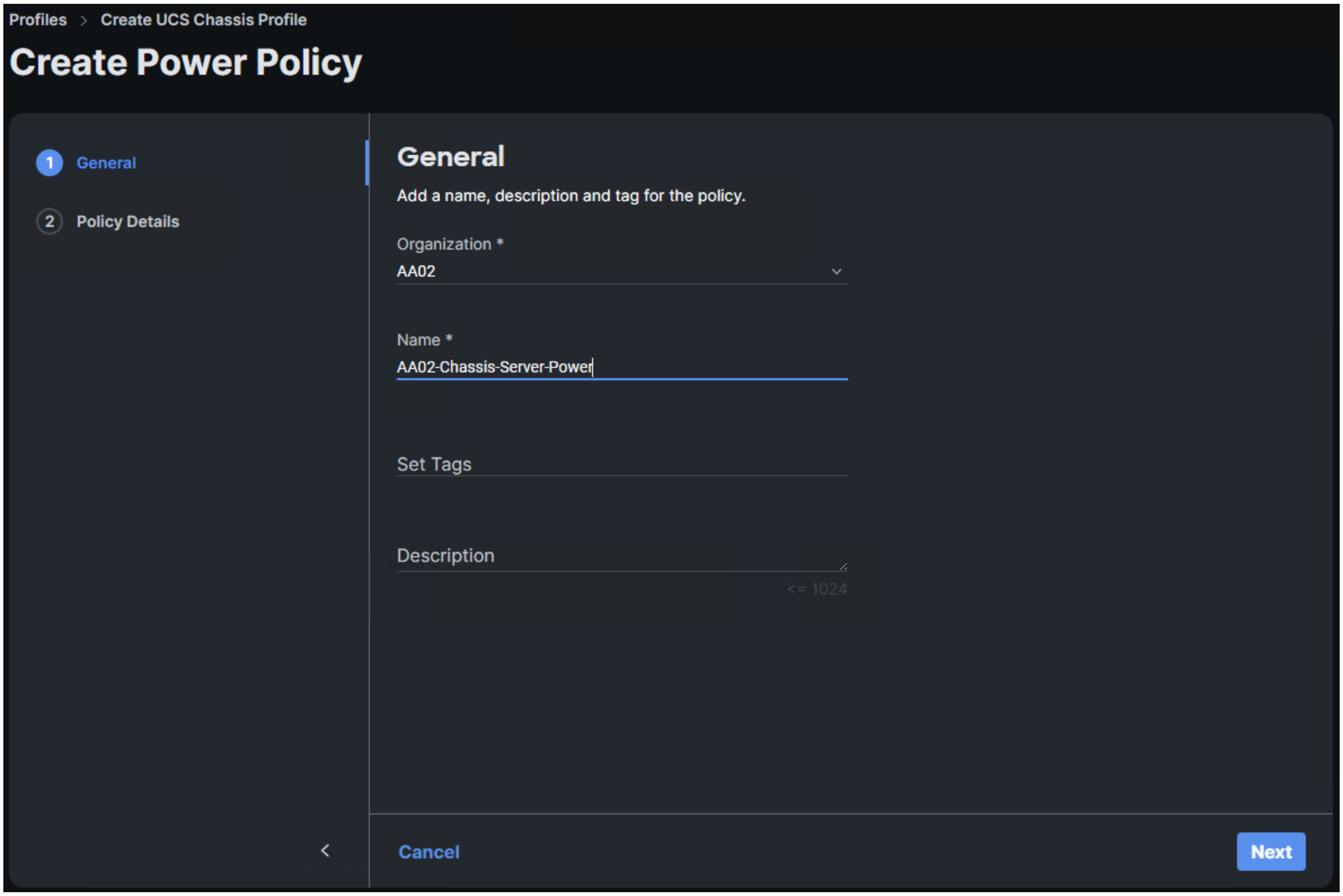
Procedure 17. Create and Apply Power Policy

Step 1. Click **Select Policy** next to Power.

Step 2. Click **Create New** to create a new policy.

Step 3. Make sure the correct Organization (for example, AA02) is selected.

Step 4. Enter a Name for the policy (for example, AA02-Chassis-Server-Power). Optionally, enter a Description.



General

Add a name, description and tag for the policy.

Organization *
AA02

Name *
AA02-Chassis-Server-Power

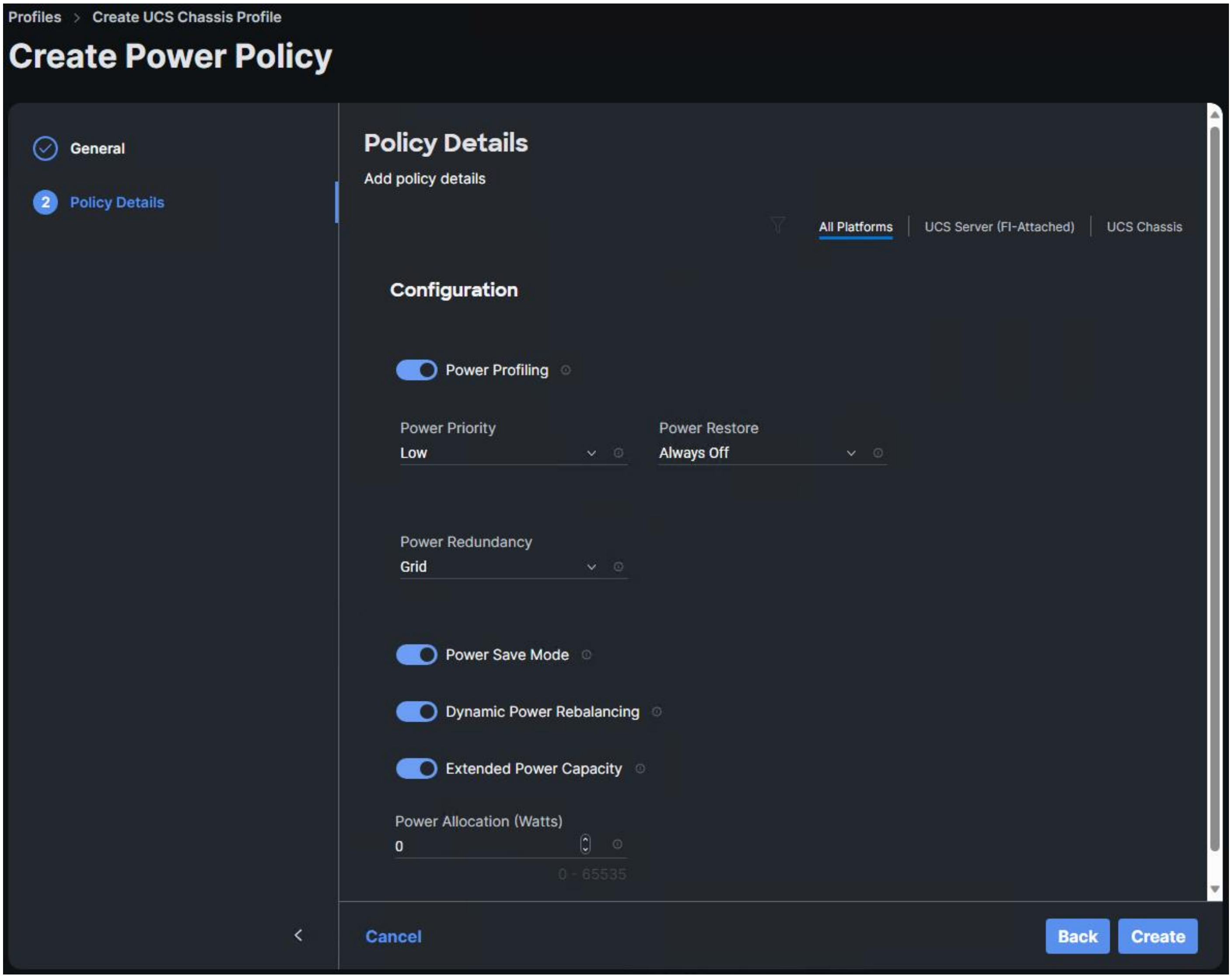
Set Tags

Description

<= 1024

Step 5. Click **Next.**

Step 6. Select **All Platforms.** It is recommended to leave all settings at their defaults, but the settings can be adjusted later according to performance and sustainability requirements.



Power Profiling: on

Power Priority: Low

Power Restore: Always Off

Power Redundancy: Grid

Power Save Mode: on

Dynamic Power Rebalancing: on

Extended Power Capacity: on

Power Allocation (Watts): 0 (0 - 65535)

Step 7. Click **Create** to create the power policy.

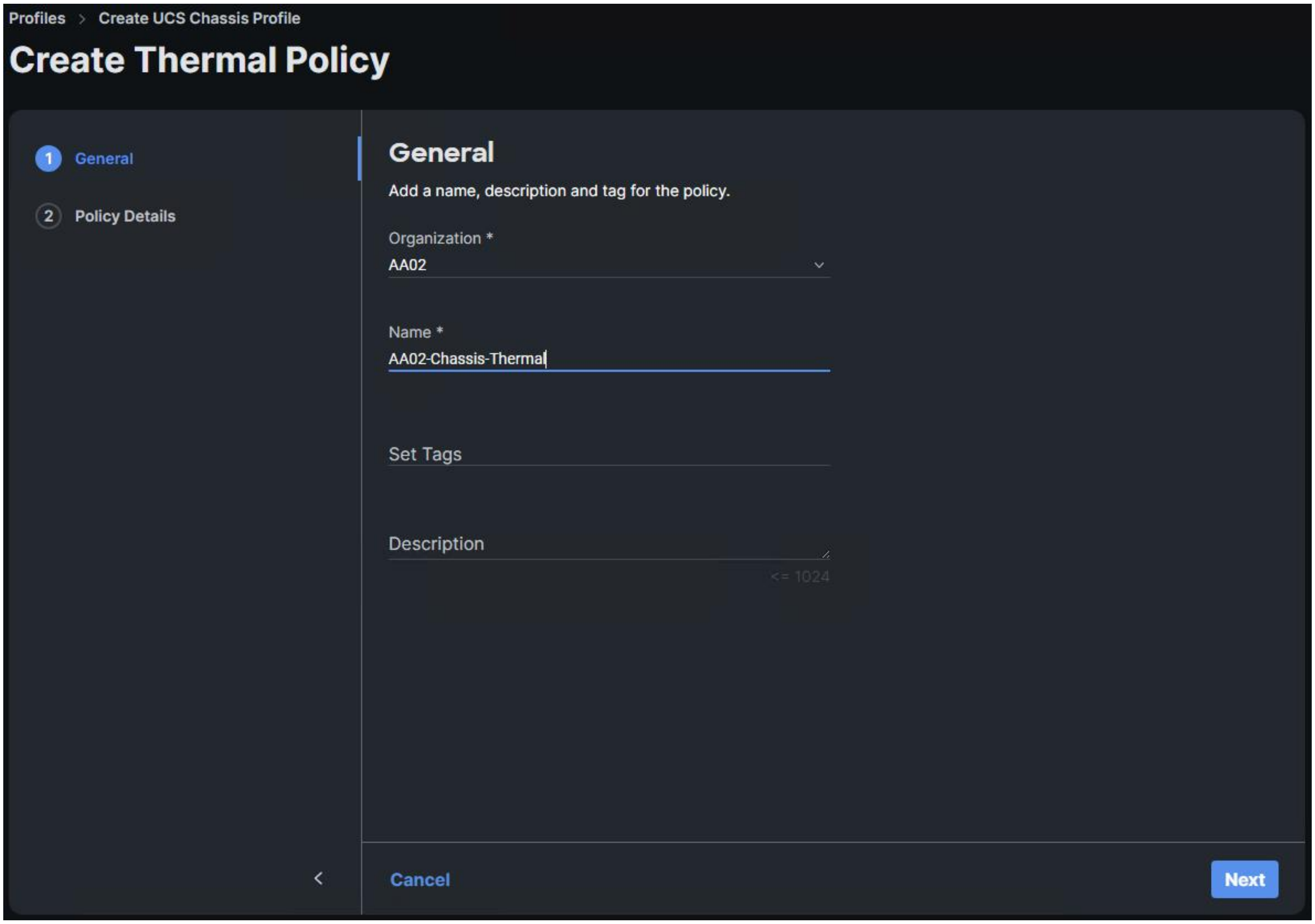
Procedure 18. Create and Apply Thermal Policy

Step 1. Click **Select Policy** next to Thermal.

Step 2. Click **Create New** to create a new policy.

Step 3. Make sure the correct Organization (for example, AA02) is selected.

Step 4. Enter a Name for the policy (for example, AA02-Chassis-Thermal). Optionally, enter a Description.


Profiles > Create UCS Chassis Profile

Create Thermal Policy

General

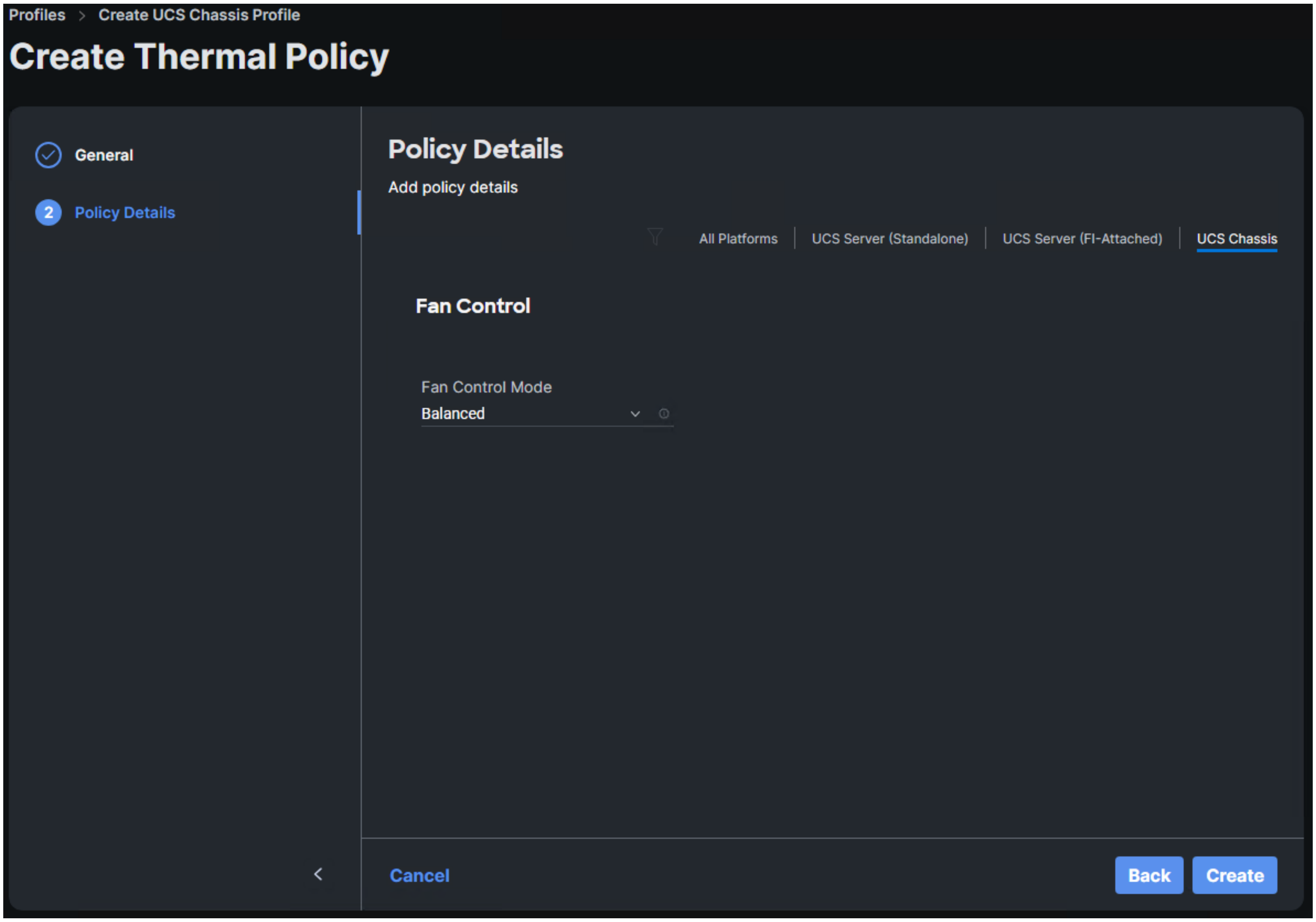
Add a name, description and tag for the policy.

Organization *
AA02

Name *
AA02-Chassis-Thermal

Step 5. Click **Next.**

Note: It is recommended to leave all settings at their defaults, but the settings can be adjusted later according to performance and sustainability requirements.



Profiles > Create UCS Chassis Profile

Create Thermal Policy

Policy Details

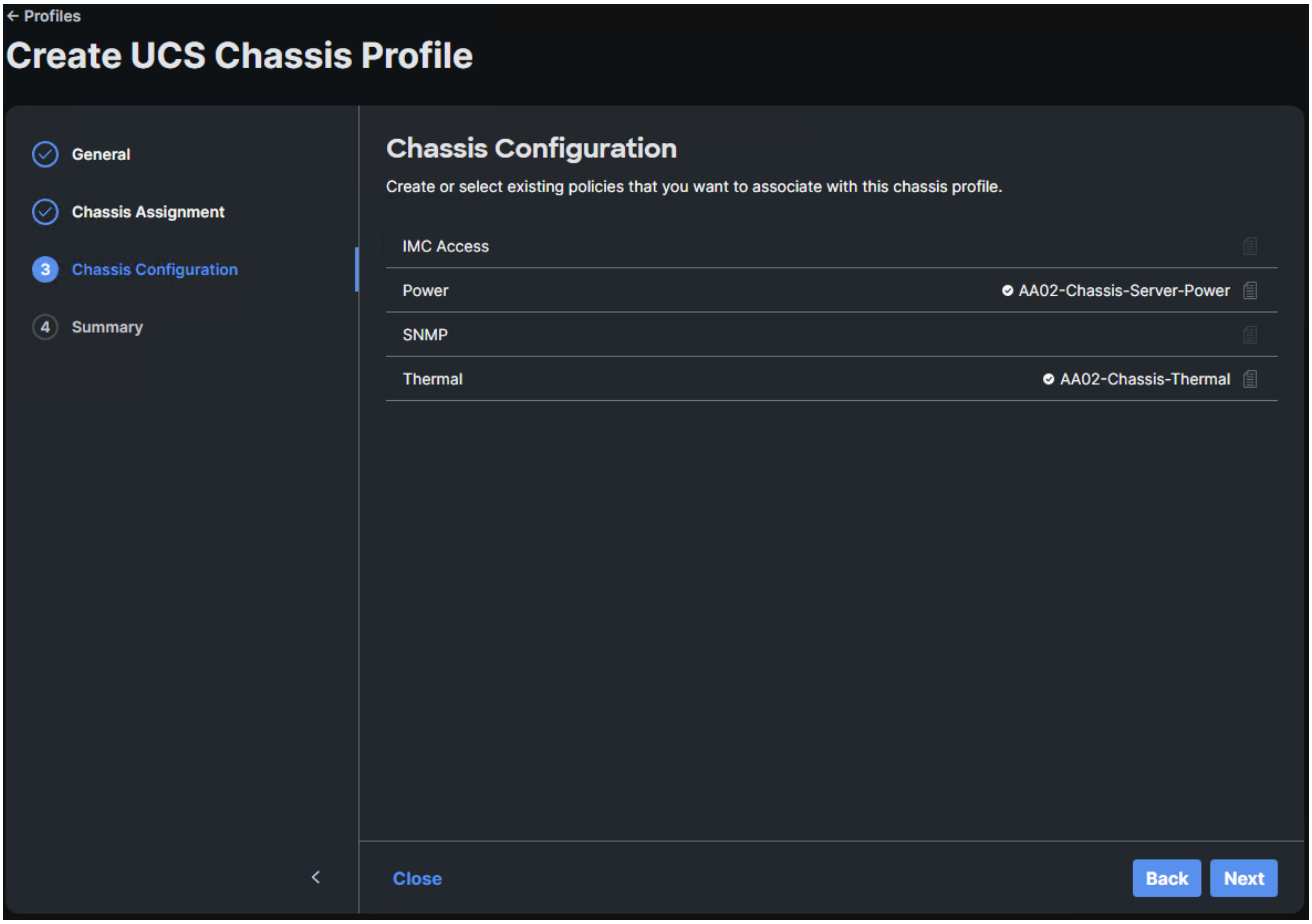
Add policy details

All Platforms | UCS Server (Standalone) | UCS Server (FI-Attached) | UCS Chassis

Fan Control

Fan Control Mode: Balanced

Step 6. Click **Create** to create the thermal policy.



← Profiles

Create UCS Chassis Profile

Chassis Configuration

Create or select existing policies that you want to associate with this chassis profile.

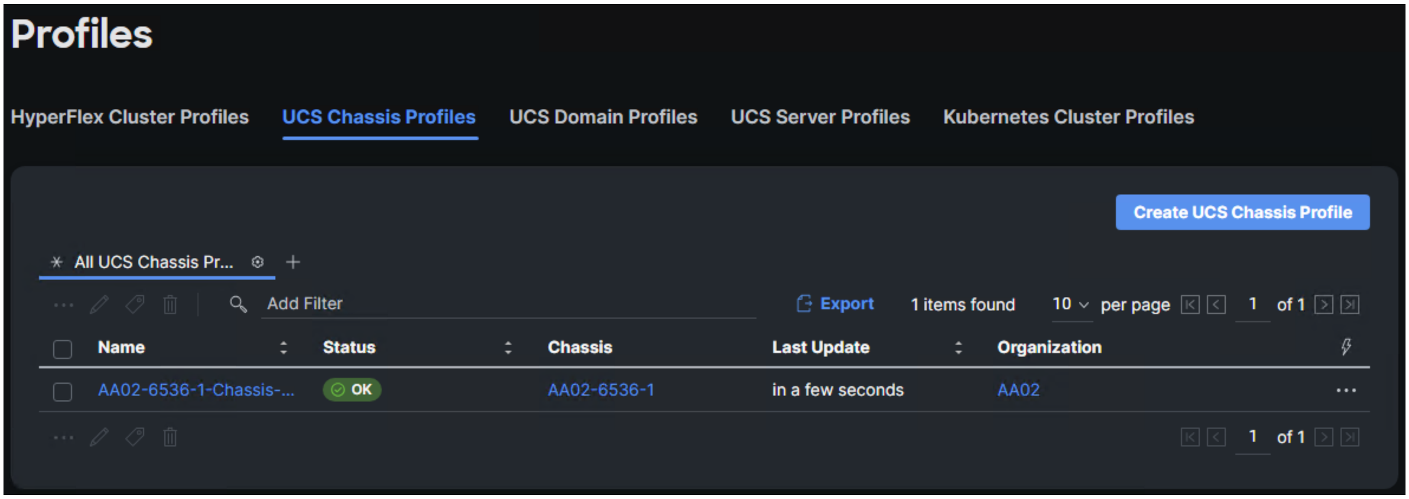
IMC Access	
Power	AA02-Chassis-Server-Power
SNMP	
Thermal	AA02-Chassis-Thermal

Step 7. Click **Next.**

Procedure 19. Complete UCS Chassis Profile and Deploy

Step 1. Review the UCS Chassis Profile Summary and click **Deploy**. Click **Deploy** again to deploy the profile.

Step 2. When deployment is complete, the profile Status will show OK.



Profiles

1 items found 10 per page 1 of 1

Name	Status	Chassis	Last Update	Organization
AA02-6536-1-Chassis-...	OK	AA02-6536-1	in a few seconds	AA02

Note: This set of procedures can be used to create profiles for additional chassis. In these additional chassis profiles, the power and thermal policies can be reused as needed.

Procedure 20. Ansible Cisco UCS IMM Configuration

To configure the Cisco UCS from the Ansible management workstation, follow the steps in this procedure. The group_vars/ucs.yml file contains two important variables:

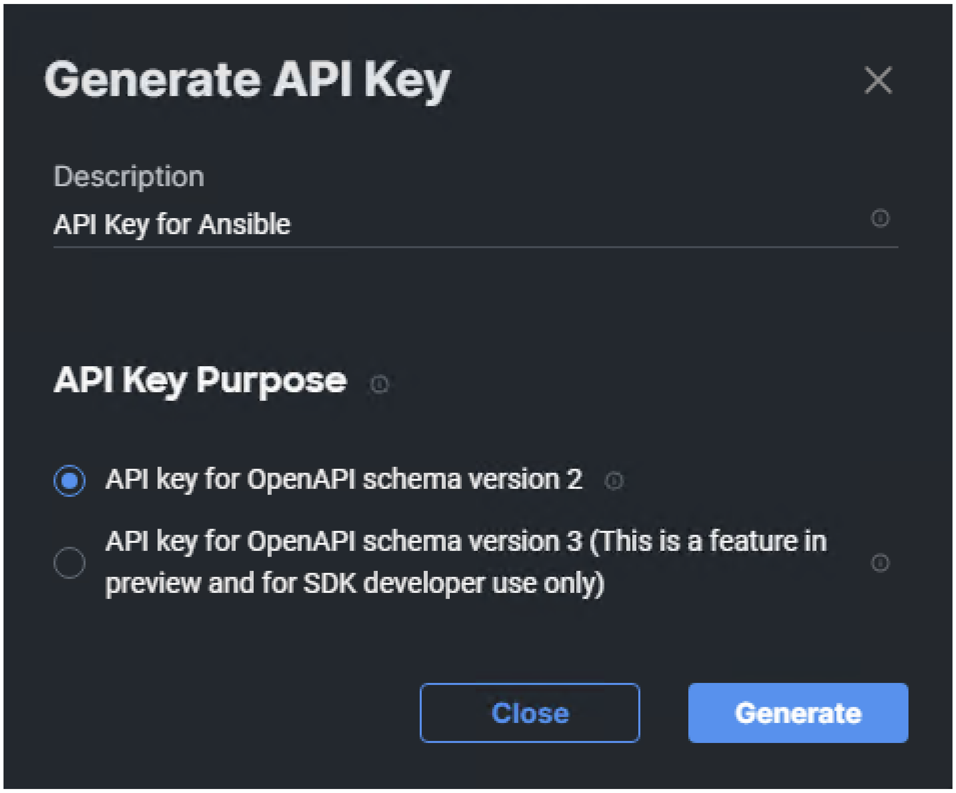
- server_cpu_type – Intel or AMD – the type of CPU in the server
- vic_type – 4G or 5G – 5G is the latest 15000-series VICs while 4G is all previous generations

Step 1. To execute the playbooks against your Intersight account, you need to create an API key and save a SecretKey.txt file from your Cisco Intersight account:

a. In Cisco Intersight, select **System** > **Settings** > **API** > **API Keys**.

b. Click Generate API Key.

c. Under Generate API Key, enter a Description (for example, API Key for Ansible) and select API key for OpenAPI schema version 2. Click **Generate**.



Generate API Key

Description

API Key for Ansible

API Key Purpose

● API key for OpenAPI schema version 2

○ API key for OpenAPI schema version 3 (This is a feature in preview and for SDK developer use only)

d. In the Generate API Key window, click the upper 📋 icon to copy the API Key ID to the clipboard. Paste this key into the api_key_id variable in the FlexPod-IMM-VMware/FlexPod-IMM-VMware/group_vars/ucs.yml variable file and save it.

e. Using an editor, open the FlexPod-IMM-VMware/FlexPod-IMM-VMware/SecretKey.txt file and clear all text from the file. Then click the lower 📋 icon in the Generate API Key window and paste the Secret Key into the SecretKey.txt file and save it.

Step 2. Edit the following variable files to ensure proper UCS variables are entered:

- FlexPod-IMM-VMware/FlexPod-IMM-VMware/group_vars/secrets.yml

- FlexPod-IMM-VMware/FlexPod-IMM-VMware/group_vars/all.yml
- FlexPod-IMM-VMware/FlexPod-IMM-VMware/group_vars/ucs.yml
- FlexPod-IMM-VMware/FlexPod-IMM-VMware/roles/UCS-IMM/create_pools/defaults/main.yml
- FlexPod-IMM-VMware/FlexPod-IMM-VMware/roles/UCS-IMM/create_server_policies/defaults/main.yml
- FlexPod-IMM-VMware/FlexPod-IMM-VMware/roles/UCS-IMM/create_server_profile_template/defaults/main.yml

Note: It is critical when entering values in the variable files that either the FC and FC-NVMe NetApp LIF WWPNs or Infrastructure SVM iSCSI IQN be entered into the all.yml file so that UCS SAN boot and MDS device alias can be properly configured. LIF WWPNs can be queried by connecting to the NetApp cluster CLI interface and running "network interface show -vserver <svm-name>." If iSCSI SAN boot is being configured, the Infrastructure SVM's iSCSI IQN can be queried by running "vserver iscsi show -vserver <svm-name>."

Note: The /home/admin/FlexPod-IMM-VMware/FlexPod-IMM-VMware directory contains three Ansible playbooks to set up Cisco UCS IMM server profile templates: Create_IMM_Pools.yml, Create_IMM_Server_Policies.yml, and Create_IMM_Server_Profile_Templates.yml. Run Create_IMM_Pools.yml only once. Then Create_IMM_Server_Policies.yml and Create_IMM_Server_Profile_Templates.yml are designed to be run more than once with different combinations of server_cpu_type andvic_type. It is important when Create_IMM_Server_Policies.yml is run that Create_IMM_Server_Profiles_Templates.yml is run before changing the server_cpu_type and vic_type variables. Many of the policies and templates will be assigned unique names according to these variables. Since the UCS-IMM Ansible playbooks connect to the Cisco Intersight API website instead of hardware components, the use of the inventory file is not needed.

Step 3. To set up the Cisco Intersight IMM pools, policies, and server profile templates, run the following:

```
ansible-playbook ./Setup_IMM_Pools.yml
ansible-playbook ./Setup_IMM_Server_Policies.yml
ansible-playbook ./Setup_IMM_Server_Profile_Templates.yml
```

Note: Server Profiles will be generated from the Server Profile Templates and assigned to servers after the Cisco UCS IMM Ansible Configuration.

Cisco UCS IMM Setup Completion

Complete the following procedures whether performing an Ansible configuration or a Manual configuration of the FlexPod.

Procedure 1. Clone Server Profile Templates

Cisco UCS Power policies can only be applied to blade servers and Thermal policies can only be applied to rack mount servers. If you have both blades and rack mounts in your environment, it is necessary to clone existing Server Profile Templates to have a copy for each type of server. The original template can be used for blades and the copy for rack mounts.

Step 1. Go to **Infrastructure Service** > **Configure** > **Templates**, select a template (for example, AA02-M7-Intel-5G-VIC-iSCSI-Boot-Template), click **...** to the right on the same line, and click **Clone.**

Step 2. Leave the Number of Clones set to 1 and click **Next.**

Step 3. Enter a new Clone Name (for example AA02-CM7-Intel-5G-VIC-iSCSI-Boot-Template) and click **Clone**.

Step 4. Select the newly cloned template, click ... to the right on the same line, and select **Edit.**

Step 5. Click **Next.** To the right of Thermal, click **Select Policy**.

Step 6. Either select the existing Thermal policy or click Create New and create a new Thermal policy with desired parameters for rack mount server fans.

Step 7. Once the policy is added, click Close at the bottom of the screen to save the edited template.

Procedure 2. Derive Server Profiles

Step 1. Go to **Infrastructure Service** > **Configure** > **Templates**, for any template that will be used for blades (either X-Series or B-Series), select the template (for example, AA02-M7-Intel-5G-VIC-iSCSI-Boot-Template), click **...** to the right on the same line, and select **Edit**.

Step 2. Click **Next** and then click **Select Policy**.

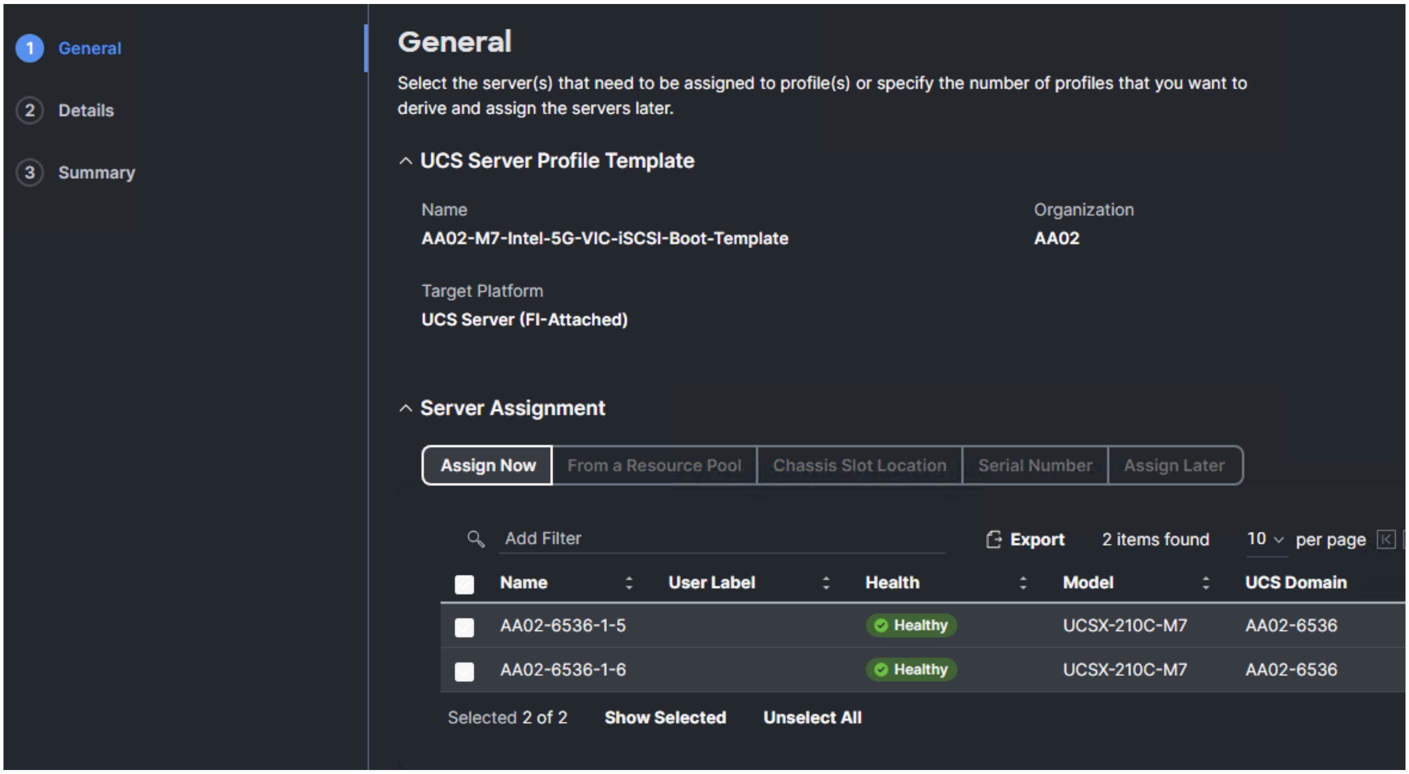
Step 3. Either select the existing Power policy or click Create New and create a new Power policy with desired parameters for blade servers.

Step 4. Once the policy is added, click **Close** to save the edited template.

Step 5. Repeat steps 1 - 4 for all templates that will be used with server blades.

Step 6. Go to **Infrastructure Service** > **Configure** > **Templates**, select the desired template (for example, AA02-M7-Intel-5G-VIC-iSCSI-Boot-Template), click **...** to the right on the same line, and select **Derive Profiles**.

Step 7. Under the Server Assignment, select **Assign Now** and select server(s) that match the template configuration. You can select one or more servers depending on the number of profiles to be deployed.



General

Select the server(s) that need to be assigned to profile(s) or specify the number of profiles that you want to derive and assign the servers later.

UCS Server Profile Template

Name: AA02-M7-Intel-5G-VIC-iSCSI-Boot-Template

Organization: AA02

Target Platform: UCS Server (FI-Attached)

Server Assignment

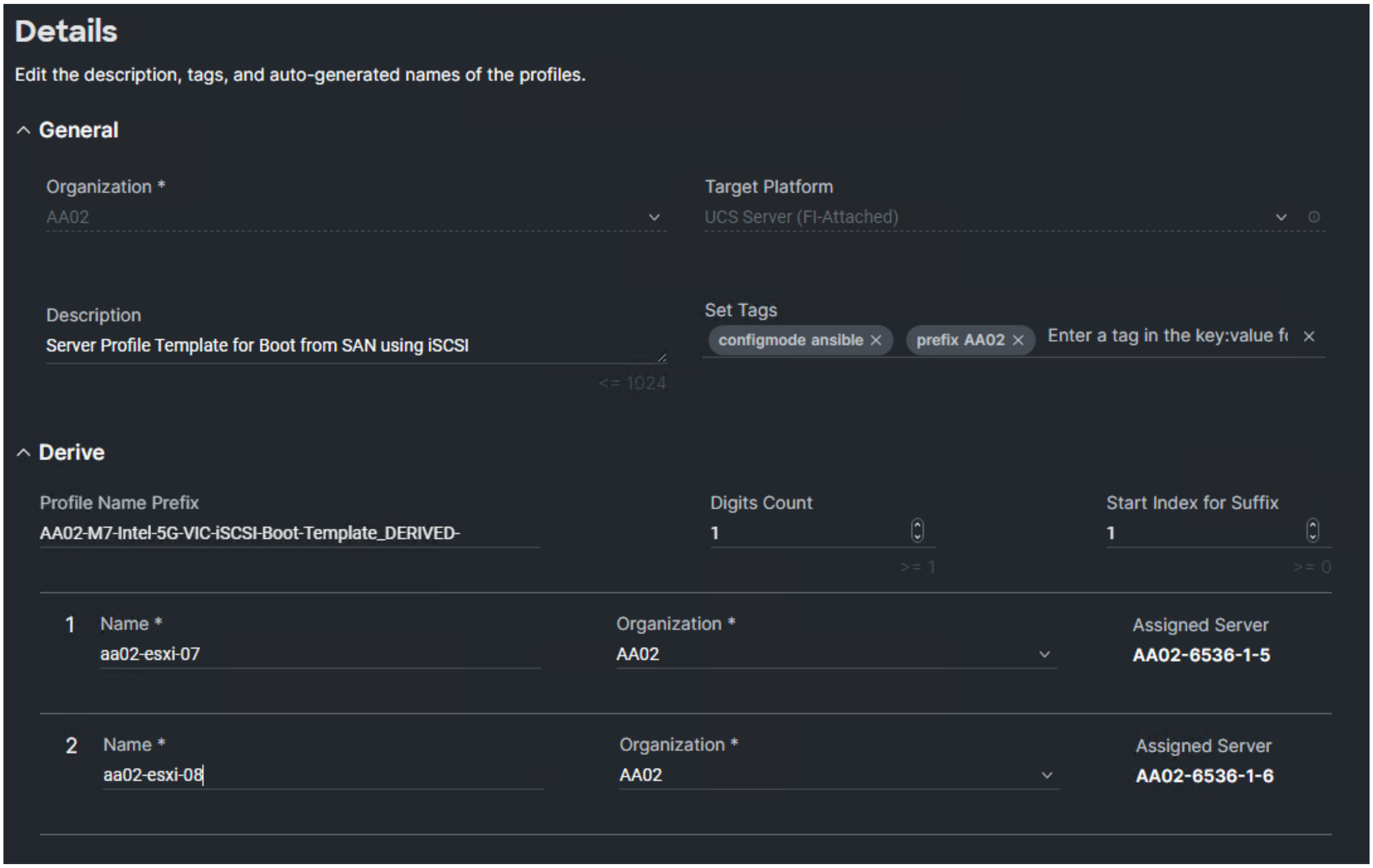
☑	Name	User Label	Health	Model	UCS Domain
☑	AA02-6536-1-5		Healthy	UCSX-210C-M7	AA02-6536
☑	AA02-6536-1-6		Healthy	UCSX-210C-M7	AA02-6536

Selected 2 of 2 **Show Selected** **Unselect All**

Step 8. Click **Next.**

Note: Cisco Intersight will fill in default information for the number of servers selected (2 in this case).

Step 9. Adjust the fields as needed. It is recommended to use the server hostname for the Server Profile name.



Details

Edit the description, tags, and auto-generated names of the profiles.

General

Organization * AA02

Target Platform UCS Server (FI-Attached)

Description Server Profile Template for Boot from SAN using iSCSI

<= 1024

Set Tags configmode ansible ✕ prefix AA02 ✕ Enter a tag in the key:value f ✕

Derive

Profile Name Prefix AA02-M7-Intel-5G-VIC-iSCSI-Boot-Template_DERIVED-

Digits Count 1 (>= 1)

Start Index for Suffix 1 (>= 0)

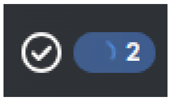
	Name *	Organization *	Assigned Server
1	aa02-esxi-07	AA02	AA02-6536-1-5
2	aa02-esxi-08	AA02	AA02-6536-1-6

Step 10. Click **Next.**

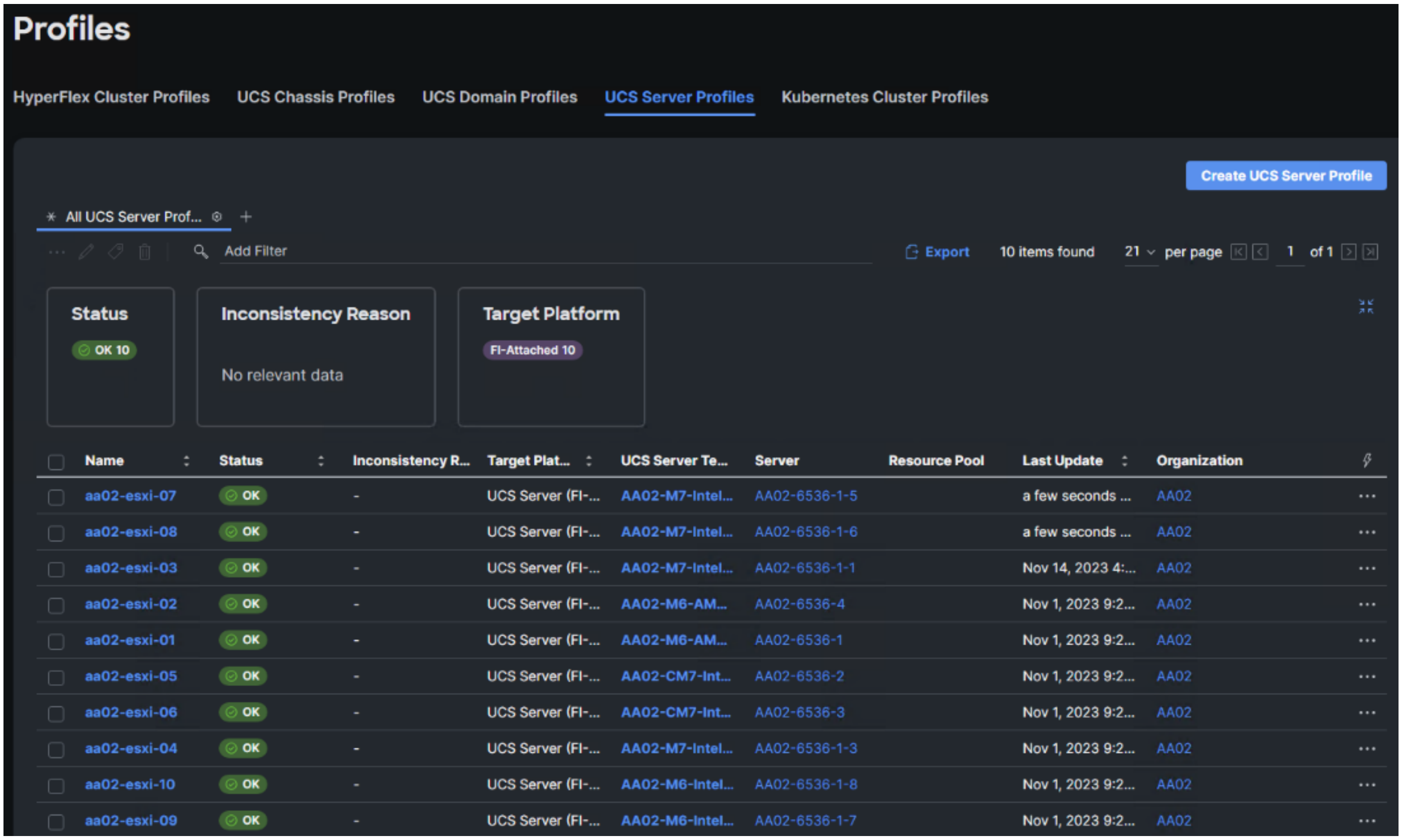
Step 11. Verify the information and click **Derive** to create the Server Profile(s).

Step 12. From the Infrastructure **Service** > **Configure** > **Profiles** > **UCS Server Profiles** list, select the profile(s) just created and click the **...** at the top of the column and select **Deploy**. Click **Deploy** to confirm.

Step 13. Cisco Intersight will start deploying the server profile(s) and will take some time to apply all the policies. Use the Requests tab at the top right-hand corner of the window to see the progress.



When the Server Profile(s) are deployed successfully, they will appear under the Server Profiles with the status of OK.



Name	Status	Inconsistency R...	Target Plat...	UCS Server Te...	Server	Resource Pool	Last Update	Organization
aa02-esxi-07	OK	-	UCS Server (FI-...	AA02-M7-Intel...	AA02-6536-1-5		a few seconds ...	AA02
aa02-esxi-08	OK	-	UCS Server (FI-...	AA02-M7-Intel...	AA02-6536-1-6		a few seconds ...	AA02
aa02-esxi-03	OK	-	UCS Server (FI-...	AA02-M7-Intel...	AA02-6536-1-1		Nov 14, 2023 4:...	AA02
aa02-esxi-02	OK	-	UCS Server (FI-...	AA02-M6-AM...	AA02-6536-4		Nov 1, 2023 9:2...	AA02
aa02-esxi-01	OK	-	UCS Server (FI-...	AA02-M6-AM...	AA02-6536-1		Nov 1, 2023 9:2...	AA02
aa02-esxi-05	OK	-	UCS Server (FI-...	AA02-CM7-Int...	AA02-6536-2		Nov 1, 2023 9:2...	AA02
aa02-esxi-06	OK	-	UCS Server (FI-...	AA02-CM7-Int...	AA02-6536-3		Nov 1, 2023 9:2...	AA02
aa02-esxi-04	OK	-	UCS Server (FI-...	AA02-M7-Intel...	AA02-6536-1-3		Nov 1, 2023 9:2...	AA02
aa02-esxi-10	OK	-	UCS Server (FI-...	AA02-M6-Intel...	AA02-6536-1-8		Nov 1, 2023 9:2...	AA02
aa02-esxi-09	OK	-	UCS Server (FI-...	AA02-M6-Intel...	AA02-6536-1-7		Nov 1, 2023 9:2...	AA02

Step 14. Derive and Deploy all needed servers for your FlexPod environment.

Step 15. Select **Infrastructure Service** > **Servers**, select all Servers that have a Server Profile assigned. Click **...** at either the top or bottom of the table and select **Power** > **Power On**.

SAN Switch Configuration

This chapter contains the following:

- Physical Connectivity
- FlexPod Cisco MDS Base

This chapter explains how to configure the Cisco MDS 9000s for use in a FlexPod environment. The configuration covered in this section is only needed when configuring Fibre Channel and FC-NVMe storage access.

Note: If FC connectivity is not required in the FlexPod deployment, this section can be skipped.

Note: If the Cisco Nexus 93360YC-FX2 switches are being used for SAN switching in this FlexPod Deployment, refer to section FlexPod with Cisco Nexus 93360YC-FX2 SAN Switching Configuration – Part 2 in the Appendix of this document.

Physical Connectivity

Follow the physical connectivity guidelines for FlexPod as explained in Physical Topology section.

FlexPod Cisco MDS Base

The following procedures describe how to configure the Cisco MDS switches for use in a base FlexPod environment. This procedure assumes you are using the Cisco MDS 9132T with NX-OS 9.3(2).

Procedure 1. Set up Cisco MDS 9132T A and 9132T B

Note: On initial boot and connection to the serial or console port of the switch, the NX-OS setup should automatically start and attempt to enter Power on Auto Provisioning. Enter y to get to the System Admin Account Setup.

Step 1. Configure the switch using the command line:

```
         ---- System Admin Account Setup ----


Do you want to enforce secure password standard (yes/no) [y]: Enter

Enter the password for "admin": <password>
Confirm the password for "admin": <password>

Would you like to enter the basic configuration dialog (yes/no): yes

Create another login account (yes/no) [n]: Enter

Configure read-only SNMP community string (yes/no) [n]: Enter

Configure read-write SNMP community string (yes/no) [n]: Enter

Enter the switch name : <mds-A-hostname>

Continue with Out-of-band (mgmt0) management configuration? (yes/no) [y]: Enter

Mgmt0 IPv4 address : <mds-A-mgmt0-ip>

Mgmt0 IPv4 netmask : <mds-A-mgmt0-netmask>

Configure the default gateway? (yes/no) [y]: Enter

IPv4 address of the default gateway : <mds-A-mgmt0-gw>

Configure advanced IP options? (yes/no) [n]: Enter

Enable the ssh service? (yes/no) [y]: Enter
```

```
Type of ssh key you would like to generate (dsa/rsa) [rsa]: Enter

Number of rsa key bits <1024-2048> [1024]: Enter

Enable the telnet service? (yes/no) [n]: Enter

Configure congestion/no_credit drop for fc interfaces? (yes/no)     [y]: Enter

Enter the type of drop to configure congestion/no_credit drop? (con/no) [c]: Enter

Enter milliseconds in multiples of 10 for congestion-drop for logical-type edge
in range (<200-500>/default), where default is 500.  [d]: Enter

Enable the http-server? (yes/no) [y]: Enter

Configure clock? (yes/no) [n]: Enter

Configure timezone? (yes/no) [n]: Enter

Configure summertime? (yes/no) [n]: Enter

Configure the ntp server? (yes/no) [n]: Enter

Configure default switchport interface state (shut/noshut) [shut]: Enter

Configure default switchport trunk mode (on/off/auto) [on]: auto

Configure default switchport port mode F (yes/no) [n]: y

Configure default zone policy (permit/deny) [deny]: Enter

Enable full zoneset distribution? (yes/no) [n]: y

Configure default zone mode (basic/enhanced) [basic]: Enter
```

Step 2. Review the configuration.

```
Would you like to edit the configuration? (yes/no) [n]: Enter
Use this configuration and save it? (yes/no) [y]: Enter
```

Step 3. To avoid possible timing errors with Ansible, perform a no shutdown on the FC interfaces connected to the Cisco UCS fabric interconnects.

```
config t
int fc1/5-6
no shutdown
copy r s
exit
```

Step 4. To set up the initial configuration of the Cisco MDS B switch, repeat steps 1-3 with the appropriate host and IP address information.

Procedure 2. FlexPod Cisco MDS Switch Ansible Configuration

Step 1. Add MDS switch ssh keys to **/home/admin/.ssh/known_hosts**. Adjust known_hosts as necessary if errors occur.

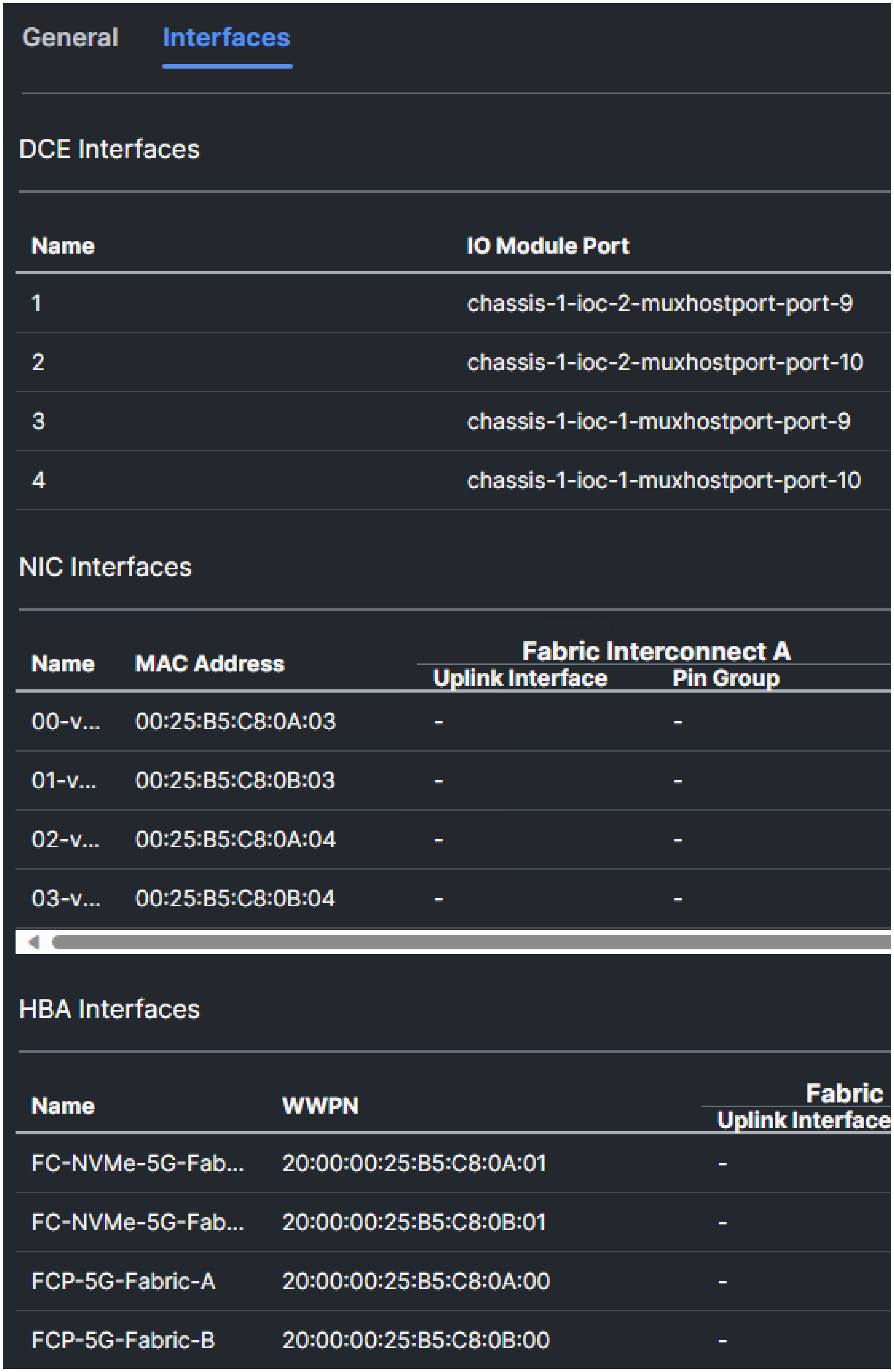
```
ssh admin@<mds-A-mgmt0-ip>
exit
ssh admin@<mds-B-mgmt0-ip>
exit
```

Step 2. Edit the following variable files to ensure proper MDS variables are entered.

- FlexPod-IMM-VMware/FlexPod-IMM-VMware/group_vars/secrets.yml
- FlexPod-IMM-VMware/FlexPod-IMM-VMware/inventory
- FlexPod-IMM-VMware/FlexPod-IMM-VMware/group_vars/all.yml
- FlexPod-IMM-VMware/FlexPod-IMM-VMware/host_vars/mdsA.yml

- FlexPod-IMM-VMware/FlexPod-IMM-VMware/host_vars/mdsB.yml
- FlexPod-IMM-VMware/FlexPod-IMM-VMware/roles/MDSconfig/defaults/main.yml

Note: The FC and FC-NVMe NetApp LIF WWPNs should have already been entered into the all.yml file so that the UCS IMM Boot Order Policies could be built. The Cisco UCS server initiator WWPNs for both FC and FC-NVMe should also be entered into all.yml. To query these WWPNs, log into Cisco Intersight and select each of the Server Profiles by going to **Infrastructure Service** > **Configure** > **Profiles** > **UCS Server Profiles** > **Profile** > **Inventory** > **Network Adapters** > **Adapter** > **Interfaces** > **vHBA Interfaces**. The needed WWPNs can be found under the vHBA Interfaces.



DCE Interfaces

Name	IO Module Port
1	chassis-1-ioc-2-muxhostport-port-9
2	chassis-1-ioc-2-muxhostport-port-10
3	chassis-1-ioc-1-muxhostport-port-9
4	chassis-1-ioc-1-muxhostport-port-10

NIC Interfaces

Name	MAC Address	Fabric Interconnect A	
		Uplink Interface	Pin Group
00-v...	00:25:B5:C8:0A:03	-	-
01-v...	00:25:B5:C8:0B:03	-	-
02-v...	00:25:B5:C8:0A:04	-	-
03-v...	00:25:B5:C8:0B:04	-	-

HBA Interfaces

Name	WWPN	Fabric
		Uplink Interface
FC-NVMe-5G-Fab...	20:00:00:25:B5:C8:0A:01	-
FC-NVMe-5G-Fab...	20:00:00:25:B5:C8:0B:01	-
FCP-5G-Fabric-A	20:00:00:25:B5:C8:0A:00	-
FCP-5G-Fabric-B	20:00:00:25:B5:C8:0B:00	-

Step 3. From FlexPod-IMM-VMware/FlexPod-IMM-VMware, run the Setup_MDS.yml Ansible playbook.

```
ansible-playbook ./Setup_MDS.yml -i inventory
```

Step 4. When the Ansible playbook has been run and configured both switches, it is important to configure the local time so that logging time alignment and any backup schedules are correct. For more information on configuring the timezone and daylight savings time or summertime, see the Cisco MDS 9000 Series Fundamentals Configuration Guide, Release 9.x. Sample clock commands for the United States Eastern timezone are:

```
clock timezone EST -5 0
clock summer-time EDT 2 Sunday March 02:00 1 Sunday November 02:00 60
copy running-config startup-config
```

Step 5. SSH into each switch and execute the following commands.

```
clock timezone <timezone> <hour-offset> <minute-offset>
clock summer-time <timezone> <start-week> <start-day> <start-month> <start-time> <end-week> <end-day> <end-
month> <end-time> <offset-minutes>
copy running-config startup-config
```

Step 6. Smart licensing should be setup in the MDS switches. For more information see: Cisco MDS 9000 Series Licensing Guide, Release 9.x.

Storage Configuration – ONTAP Boot Storage Setup

This chapter contains the following:

- Ansible ONTAP Storage Configuration Part 2

This configuration requires information from the Cisco UCS server profiles and NetApp storage system. After creating the boot LUNs, initiator groups, and appropriate mappings between the two, Cisco UCS server profiles will be able to see the boot disks hosted on NetApp controllers.

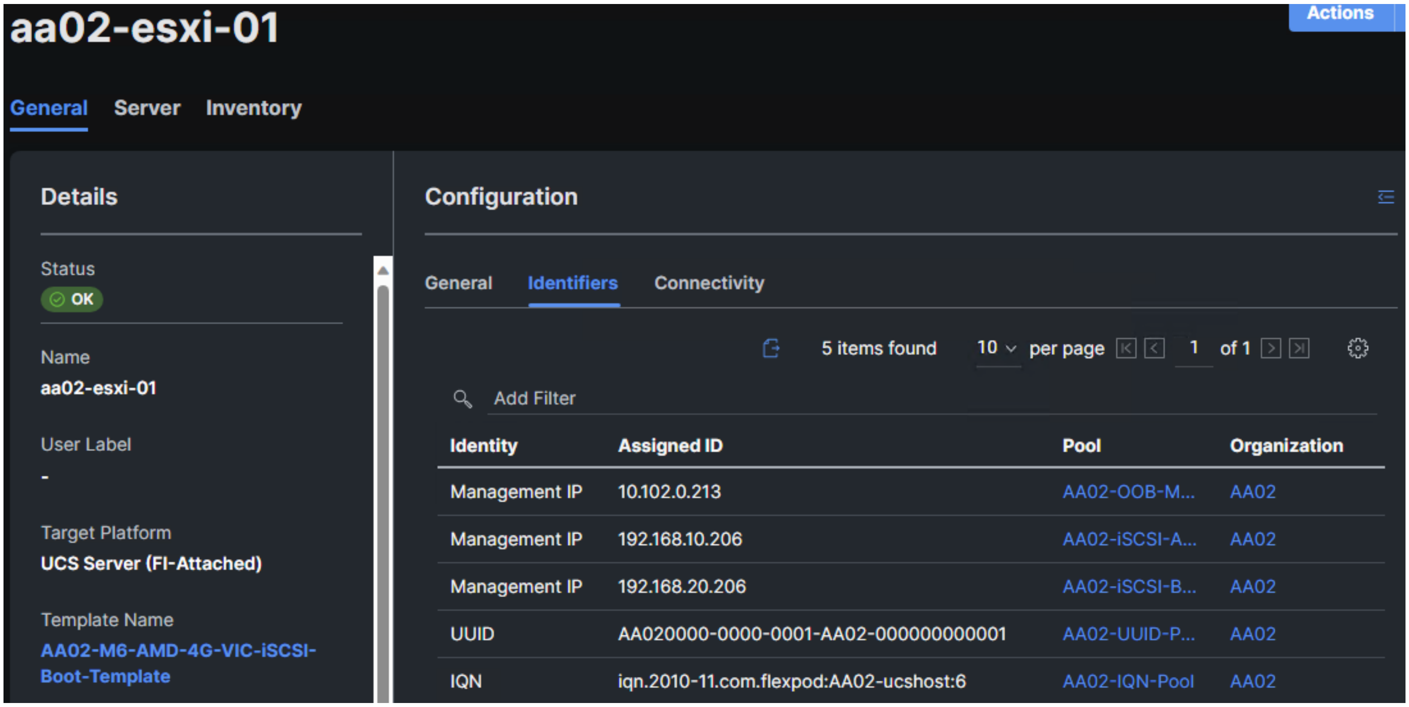
Ansible ONTAP Storage Configuration Part 2

Procedure 1. Obtain the WWPNs for UCS Server Profiles (required only for FC configuration)

Step 1. This was done in the previous section (FlexPod Cisco MDS Base).

Procedure 2. Obtain the IQNs for UCS Server Profiles (required only for iSCSI configuration)

Step 1. From the UCS Intersight account page, go to **Infrastructure Service** > **Configure** > **Profiles** > **UCS Server Profiles** > **Profile** > **General** > **Configuration** > **Identifiers**. The required IQN can be found to the right of IQN.



aa02-esxi-01

Status: OK

Name: aa02-esxi-01

User Label: -

Target Platform: UCS Server (FI-Attached)

Template Name: AA02-M6-AMD-4G-VIC-iSCSI-Boot-Template

5 items found 10 per page 1 of 1

Identity	Assigned ID	Pool	Organization
Management IP	10.102.0.213	AA02-OOB-M...	AA02
Management IP	192.168.10.206	AA02-iSCSI-A...	AA02
Management IP	192.168.20.206	AA02-iSCSI-B...	AA02
UUID	AA020000-0000-0001-AA02-000000000001	AA02-UUID-P...	AA02
IQN	iqn.2010-11.com.flexpod:AA02-ucshost:6	AA02-IQN-Pool	AA02

Procedure 3. Configure ONTAP Boot Storage using Ansible

Step 1. Edit the following variable files to ensure the proper ONTAP Boot Storage variables are entered:

- FlexPod-IMM-VMware/FlexPod-IMM-VMware/group_vars/all.yml
- FlexPod-IMM-VMware/FlexPod-IMM-VMware/vars/ontap_main.yml

Step 2. Update the **boot_luns_iscsi** and **boot_luns_fcp** variables under vars/ontap_main.yml file for ISCSi and FCP boot storage configuration. Update the initiator **IQNs** and **WWPNs** related variables in group_vars/all.yml file. Initiator IQNs and WWPNs are for ISCSi and FCP igroups.

Step 3. From FlexPod-IMM-VMware/FlexPod-IMM-VMware, invoke the ansible scripts for this section using the following command:

```
ansible-playbook -i inventory Setup_ONTAP.yml -t ontap_config_part_2
```

VMware vSphere 8.0 Setup

This chapter contains the following:

VMware ESXi 8.0

This section provides detailed instructions for installing VMware ESXi 8.0 in a FlexPod environment. On successful completion of these steps, multiple ESXi hosts will be provisioned and ready to be added to VMware vCenter.

Several methods exist for installing ESXi in a VMware environment. These procedures focus on how to use the built-in keyboard, video, mouse (KVM) console and virtual media features in Cisco Intersight to map remote installation media to individual servers.

Download ESXi 8.0 from VMware

Procedure 1. Download VMware ESXi ISO

Step 1. Click the following link: Cisco Custom Image for ESXi 8.0 Install CD.

Note: You will need a VMware user id and password on vmware.com to download this software.

Step 2. Download the **.iso** file.

Cisco Intersight-based VMware ESXi 8.0 Install

VMware ESXi 8.0 can now be installed and initially configured using Cisco Intersight. This feature requires the Intersight Advantage license to be installed and in use. The Intersight-based OS install makes use of the latest release of the Cisco UCS Server Configuration Utility (SCU).

Procedure 2. Download Cisco UCS SCU

Step 1. Click the following link: Cisco UCS SCU 6.3(2a).

Note: You will need a Cisco id and password to download this software.

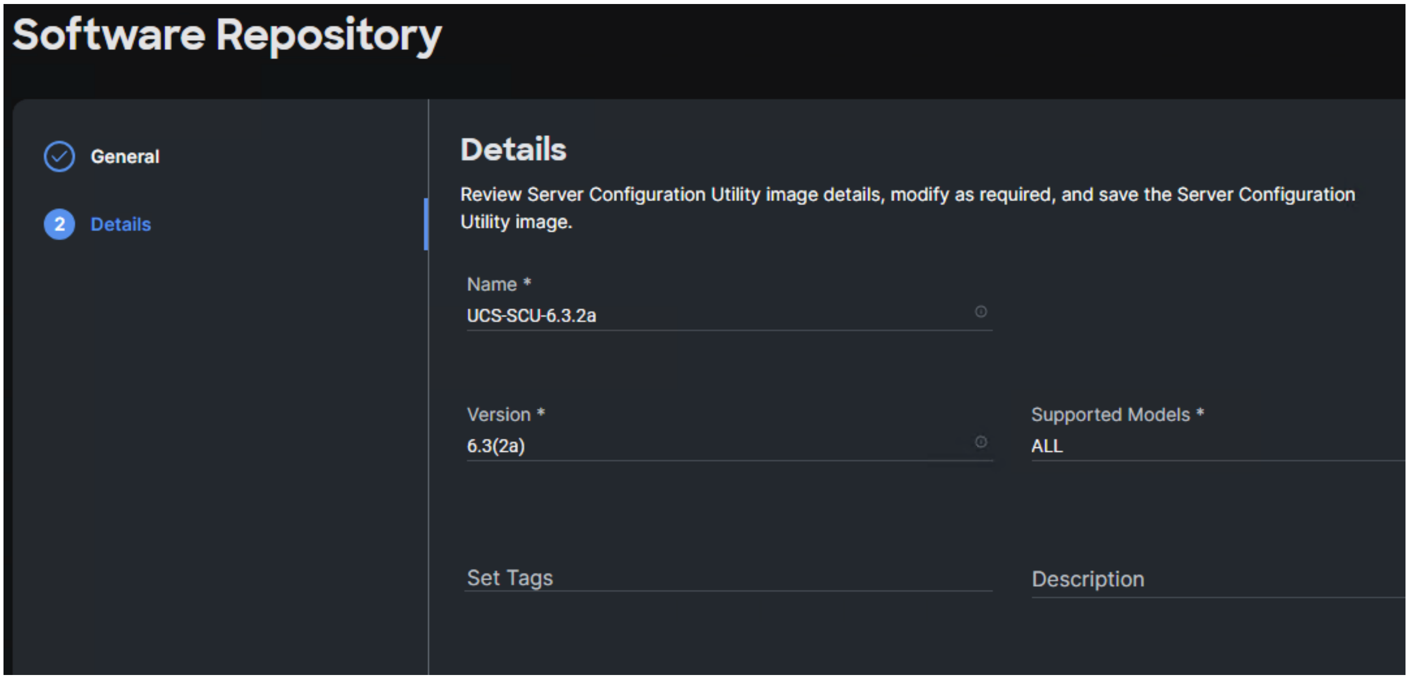
Step 2. Download the **.iso** file.

Step 3. Place both the downloaded SCU ISO and the downloaded Cisco Custom Image for ESXi 8.0 ISO downloaded above on an https server.

Note: It is critical that these files are placed on an https (not http) server for the OS installation to complete. These files can also be placed on a CIFS or NFS server if that is more convenient. This procedure assumes use of https, but CIFS or NFS are supported and can also be used. In Cisco Intersight, go to **System** > **Software Repository** > **SCU Links** and click **Add SCU Link**.

Step 4. Select the correct Organization (for example, AA02) and **HTTP/S**. Input the File Location URL using https://. Click **Next**.

Step 5. Provide a Name for the SCU link (for example, UCS-SCU-6.3.2a), a Version (for example, 6.3(2a), and Supported Models (for example, ALL). Click **Add**.



Software Repository

Details

Review Server Configuration Utility image details, modify as required, and save the Server Configuration Utility image.

Name *
UCS-SCU-6.3.2a

Version *
6.3(2a)

Supported Models *
ALL

Set Tags

Description

Step 6. In Cisco Intersight, go to **System** > **Software Repository** > **OS Image** Links and click **Add OS Image Link**.

Step 7. Select the correct Organization (for example, AA02) and **HTTP/S**. Input the File Location URL using https://. Click **Next**.

Step 8. Provide a Name for the OS Image link (for example, ESXi 8.0 Cisco Custom), a Vendor (for example, VMware), and a Version (for example, ESXi 8.0). Click **Add**.

Step 9. In Cisco Intersight, go to **Infrastructure Service** > **Servers**. On the left, select the checkbox next to each server that will have VMware ESXi 8.0 installed. At the top of bottom of the list, click **...** and select **Install Operating System**.

Step 10. Under **General**, the servers should already be selected. Select the checkboxes to install ESXi 8.0 on any other servers. Click **Next**.

Step 11. Select the radio button for the ESXi 8.0 Cisco Custom OS Image Link added above. Click **Next**.

Step 12. Leave Cisco selected as the Configuration Source. For each server, fill in all required fields. **Click Next**.

Note: Since the IB-MGMT VLAN was configured as the native VLAN for the vSwitch0 vNICs, it is not necessary to fill in a VLAN ID.

Step 13. Click **Continue** on the warning about Secure Boot.

Step 14. Select the radio button for the SCU Link added above. Click **Next**.

Step 15. For each server, select the boot protocol (Fibre Channel or iSCSI), then fill in the appropriate information, including LUN ID 0. Click **Next**.

Note: For Fibre Channel boot, the Initiator WWPN can be obtained by opening a duplicate tab of the web browser window for Intersight and selecting Servers. Click the Server Name link. Click Inventory > Network Adapters > <Adapter> > Interfaces > vHBA Interfaces. Copy the WWPN to the right of FCP-Fabric-A. The Target WWPN can be obtained by connecting to the storage cluster with ssh and typing "network interface show -vserver <Infra-SVM name>". Copy the WWPN for LIF fcp-lif-01a.

Note: For iSCSI boot, the VNIC MAC address can be obtained by opening a duplicate tab of the web browser window for Intersight and selecting Servers. Click the Server Name link. Click Inventory > Network Adapters > <Adapter> > Interfaces > NIC Interfaces. Copy the MAC Address to the right of 04-iSCSI-A. The iSCSI Target IQN can be obtained by connecting to the storage cluster with ssh and typing "iscsi show -vserver <Infra-SVM name>".

Step 16. Review all of the relevant information and click **Install** then click **Install** again to begin the OS Installation. The installation can take up to 45 minutes. The installation can be monitored using the Requests pane.

Step 17. When the OS Installation completes, you can skip down to (Optional) Reset VMware ESXi Host VMkernel Port MAC Address.

Access Cisco Intersight and Launch KVM

If Intersight Managed OS installation is not used, the Cisco Intersight vKVM enables the administrators to begin the installation of the operating system (OS) through a vMedia connection to the Cisco Custom ISO.

Procedure 1. Log into Intersight and Launch KVM

In this procedure, the KVM-mapped Cisco Custom ISO can be used to mount the Cisco Custom ISO and install VMware ESXi.

Step 1. Log into **Cisco Intersight**.

Step 2. Go to **Infrastructure Service** > **Servers** > <**Server**>.

Step 3. Click the **...** to the right of the server and select **Launch vKVM**. Click **Load KVM Certificate**. Navigate the security prompts to launch the console.

Step 4. Launch **vKVM consoles** for all servers being provisioned.

Step 5. In each vKVM console, select **Virtual Media** > **vKVM-Mapped DVD**. Click **Browse** and browse to the downloaded VMware ESXi 8.0 Cisco Custom ISO. Click **Open**. Click **Map Drive**.

Step 1. In each vKVM console, go to **Power** > **Reset System** and click **Confirm**.

Set up VMware ESXi Installation

Procedure 1. Prepare the Server for the OS Installation

Note: Follow this step on **each** ESXi host.

Step 1. Monitor the server boot process in the vKVM. The server should find the boot LUNs and begin to load the ESXi installer.

Note: If the ESXi installer fails to load because the software certificates cannot be validated, reset the server, and when prompted, press F2 to go into BIOS and set the system time and date to current. The ESXi installer should load properly.

Install VMware ESXi

Procedure 1. Install VMware ESXi onto the bootable LUN of the UCS Servers

Note: Follow these steps on **each** host.

Step 1. After the ESXi installer is finished loading (from the last step), press **Enter** to continue with the installation.

Step 2. Read and accept the end-user license agreement (EULA). Press **F11** to accept and continue.

Note: It may be necessary to map function keys as User Defined Macros under the Macros menu in the KVM console.

Step 3. Select the NetApp boot LUN that was previously set up as the installation disk for ESXi and press **Enter** to continue with the installation.

Step 4. Select the appropriate keyboard layout and press **Enter**.

Step 5. Enter and confirm the root password and press **Enter**.

Step 6. The installer issues a warning that the selected disk will be repartitioned. Press **F11** to continue with the installation.

Step 7. After the installation is complete, press **Enter** to reboot the server.

Set up Management Networking for ESXi Hosts

Procedure 1. Add the Management Network for each VMware Host

Note: This is required for managing the host. To configure ESXi host with access to the management network, follow these steps on **each** ESXi host.

Step 1. After the server has finished rebooting, in the UCS KVM console, press **F2** to customize VMware ESXi.

Step 2. Log in as root, enter the password set during installation, and press **Enter** to log in.

Step 3. Use the down arrow key to select **Troubleshooting Options** and press **Enter**.

Step 4. Select **Enable ESXi Shell** and press Enter.

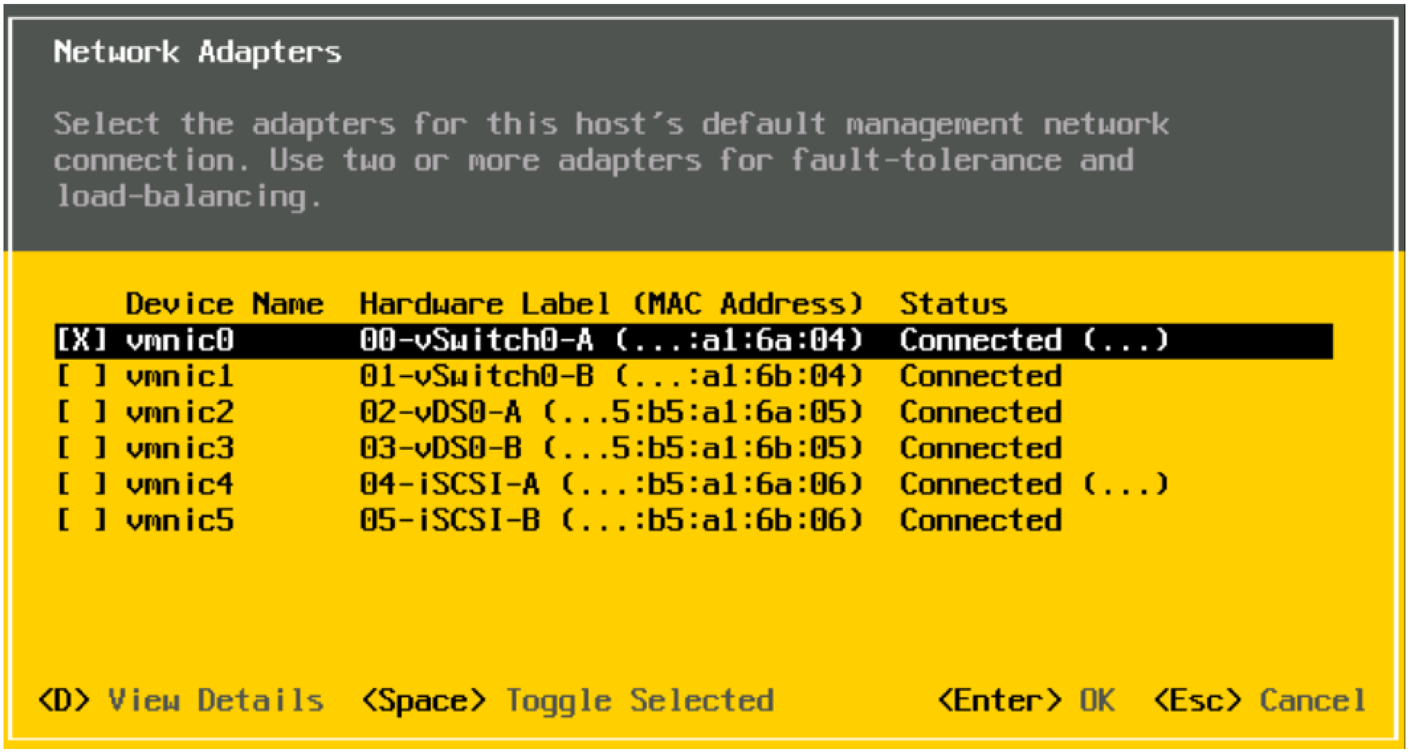
Step 5. Select **Enable SSH** and press **Enter**.

Step 6. Press **Esc** to exit the Troubleshooting Options menu.

Step 7. Select the Configure Management Network option and press Enter.

Step 8. Select Network Adapters and press **Enter**. Ensure the vmnic numbers align with the numbers under the Hardware Label (for example, vmnic0 and 00-vSwitch0-A). If these numbers do not align, note which vmnics are assigned to which vNICs (indicated under Hardware Label).

Note: In previous FlexPod CVDs, vmnic1 was selected at this stage as the second adapter in vSwitch0. It is important not to select vmnic1 at this stage. If using the Ansible configuration and vmnic1 is selected here, the Ansible playbook will fail.



```
Network Adapters

Select the adapters for this host's default management network
connection. Use two or more adapters for fault-tolerance and
load-balancing.

    Device Name  Hardware Label (MAC Address)  Status
[X] vmnic0       00-vSwitch0-A (...:a1:6a:04)  Connected (...)
[ ] vmnic1       01-vSwitch0-B (...:a1:6b:04)  Connected
[ ] vmnic2       02-vDS0-A (...5:b5:a1:6a:05)  Connected
[ ] vmnic3       03-vDS0-B (...5:b5:a1:6b:05)  Connected
[ ] vmnic4       04-iSCSI-A (...:b5:a1:6a:06)  Connected (...)
[ ] vmnic5       05-iSCSI-B (...:b5:a1:6b:06)  Connected

<D> View Details  <Space> Toggle Selected        <Enter> OK  <Esc> Cancel
```

Step 9. Press **Enter**.

Note: In the UCS Configuration portion of this document, the IB-MGMT VLAN was set as the native VLAN on the 00-vSwitch0-A and 01-vSwitch0-B vNICs. Because of this, the IB-MGMT VLAN should not be set here and should remain **Not set**.

Step 10. Select IPv4 Configuration and press Enter.

Note: When using DHCP to set the ESXi host networking configuration, setting up a manual IP address is not required.

Step 11. Select the **Set static IPv4 address and network configuration** option by using the arrow keys and space bar.

Step 12. Under **IPv4 Address**, enter the IP address for managing the ESXi host.

Step 13. Under **Subnet Mask**, enter the subnet mask.

Step 14. Under **Default Gateway**, enter the default gateway.

Step 15. Press **Enter** to accept the changes to the IP configuration.

Note: In previous versions of this CVD, IPv6 was disabled at this point. That is no longer necessary as the Ansible scripts will disable IPv6.

Step 16. Select the **DNS Configuration** option and press **Enter**.

Note: If the IP address is configured manually, the DNS information must be provided.

Step 17. Using the spacebar, select Use the following DNS server addresses and hostname.

Step 18. Under **Primary DNS Server**, enter the IP address of the primary DNS server.

Step 19. Optional: Under **Alternate DNS Server,** enter the IP address of the secondary DNS server.

Step 20. Under **Hostname**, enter the fully qualified domain name (FQDN) for the ESXi host.

Step 21. Press **Enter** to accept the changes to the DNS configuration.

Step 22. Press **Esc** to exit the Configure Management Network submenu.

Step 23. Press **Y** to confirm the changes and restart the management network.

Step 24. Back in the System Customization menu, use the arrow keys to select **Test Management Network** and press **Enter**.

Step 25. Press **Enter** to run the test.

Step 26. It is normal the first time the test is run for the first ping to fail. The test can be run again to see all fields pass, or if the remaining fields pass, press **Enter**.

Step 27. Press **Esc** to exit the System Customization menu.

Step 28. Repeat this procedure for all installed ESXi hosts.

(Optional) Reset VMware ESXi Host VMkernel Port MAC Address

Procedure 1. (Optional) Reset VMware ESXi Host VMkernel Port MAC Address

Note: By default, the MAC address of the management VMkernel port vmk0 is the same as the MAC address of the Ethernet port it is placed on. If the ESXi host's boot LUN is remapped to a different server Service Profile with different MAC addresses, a MAC address conflict will exist because vmk0 will retain the assigned MAC address unless the ESXi System Configuration is reset.

Step 1. From the ESXi console menu main screen, select **Macros** > **Static Macros** > **Ctrl + Alt + F** > **Ctrl + Alt + F1** to access the VMware console command line interface.

Step 2. Log in as **root**.

Step 3. Type "`esxcfg-vmknic –l`" to get a detailed listing of interface vmk0. vmk0 should be a part of the "Management Network" port group. Note the IP address and netmask of vmk0.

Step 4. To remove vmk0, type `esxcfg-vmknic –d "Management Network"`.

Step 5. To re-add vmk0 with a random MAC address, type `esxcfg-vmknic –a –i <vmk0-ip> -n <vmk0-netmask> "Management Network"`.

Step 6. Verify vmk0 has been re-added with a random MAC address by typing `esxcfg-vmknic –l`.

Step 7. Tag vmk0 as the management interface by typing `esxcli network ip interface tag add -i vmk0 -t Management`.

Step 8. When vmk0 was re-added, if a message pops up saying vmk1 was marked as the management interface, type `esxcli network ip interface tag remove -i vmk1 -t Management`.

Step 9. Press **Ctrl-D** to log out of the ESXi console.

Step 10. Select **Macros** > **Static Macros** > **Ctrl + Alt + F's** > **Ctrl + Alt + F2** to return to the VMware ESXi menu.

Cisco Intersight Hardware Compatibility List (HCL) Status

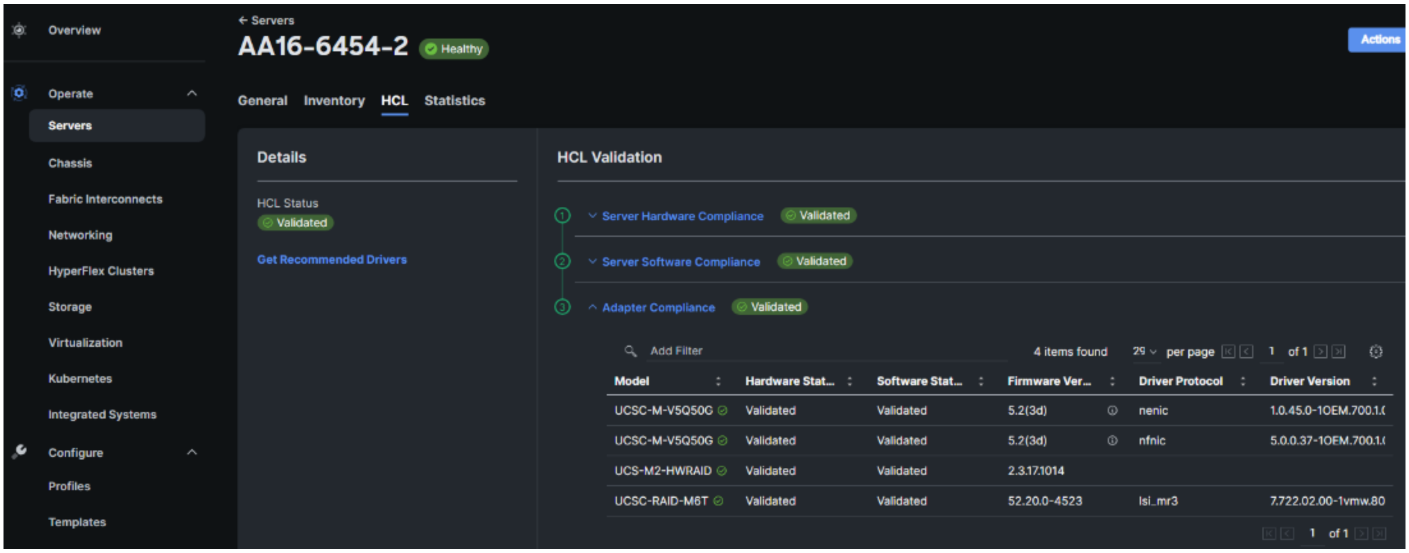
Cisco Intersight evaluates the compatibility of your UCS system to check if the hardware and software have been tested and validated by Cisco or Cisco partners. Intersight reports validation issues after checking the compatibility of the server model, processor, firmware, adapters, operating system, and drivers, and displays the compliance status with the Hardware Compatibility List (HCL).

To determine HCL compatibility for VMware ESXi, Cisco Intersight uses Cisco UCS Tools. The Cisco UCS Tools is part of VMware ESXi Cisco custom ISO, and no additional configuration is required.

For more details on Cisco UCS Tools manual deployment and troubleshooting, go to: https://intersight.com/help/saas/resources/cisco_ucs_tools#about_cisco_ucs_tools

Procedure 1. View Compute Node Hardware Compatibility

Step 1. To find detailed information about the hardware compatibility of a compute node, in Cisco Intersight, click **Infrastructure Service** > **Operate** > **Servers**, click a server and select **HCL**.



HCL Status: Validated

Get Recommended Drivers

1 Server Hardware Compliance: Validated

2 Server Software Compliance: Validated

3 Adapter Compliance: Validated

Model	Hardware Stat...	Software Stat...	Firmware Ver...	Driver Protocol	Driver Version
UCSC-M-V5Q50G	Validated	Validated	5.2(3d)	nenic	1.0.45.0-1OEM.700.1.
UCSC-M-V5Q50G	Validated	Validated	5.2(3d)	nfnic	5.0.0.37-1OEM.700.1.
UCS-M2-HWRAID	Validated	Validated	2.3.17.1014		
UCSC-RAID-M6T	Validated	Validated	52.20.0-4523	lsi_mr3	7.722.02.00-1vmw.80

Step 2. If any of the drivers do not show Validated under Software Status, use this information to properly fill in the FlexPod-IMM-VMware/FlexPod-IMM-VMware/roles/VMware/ESXIhosts/defaults/main.yml file below.

FlexPod VMware ESXi Ansible Configuration

Procedure 1. Use Ansible to Configure All VMware ESXi Hosts from the Management Workstation

Step 1. Edit the following variable files to ensure proper VMware variables are entered:

- FlexPod-IMM-VMware/FlexPod-IMM-VMware/group_vars/secrets.yml
- FlexPod-IMM-VMware/FlexPod-IMM-VMware/inventory
- FlexPod-IMM-VMware/FlexPod-IMM-VMware/group_vars/all.yml
- FlexPod-IMM-VMware/FlexPod-IMM-VMware/roles/VMware/ESXIhosts/defaults/main.yml
- FlexPod-IMM-VMware/FlexPod-IMM-VMware/roles/VMware/ESXIiscsi/defaults/main.yml (If using iSCSI boot)

Step 2. From FlexPod-IMM-VMware/FlexPod-IMM-VMware, run the Setup_ESXi.yml Ansible playbook:

```
ansible-playbook ./Setup_ESXi.yml -i inventory
```

VMware vCenter 8.0

The procedures in the following sections provide detailed instructions for installing the VMware vCenter 7.0U3h Server Appliance in a FlexPod environment.

Procedure 1. Download vCenter 8.0 from VMware

Step 1. Click this link: https://customerconnect.vmware.com/downloads/details?downloadGroup=VC800C&productId=1345&rPId=108068 and download the VMware-VCSA-all-8.0.0-21457384.iso.

Note: You will need a VMware user id and password on vmware.com to download this software.

Procedure 4. Install the VMware vCenter Server Appliance

Note: The VCSA deployment consists of 2 stages: installation and configuration.

Step 1. Locate and copy the **VMware-VCSA-all-8.0.0-21457384.iso** file to the desktop of the management workstation. This ISO is for the VMware vSphere 8.0 vCenter Server Appliance.

Step 2. Mount the ISO image as a disk on the management workstation. For example, with the Mount command in Windows Server 2012 and above.

Step 3. In the mounted disk directory, navigate to the **vcsa-ui-installer > win32** directory and double-click `installer.exe`. The vCenter Server Appliance Installer wizard appears.

Step 4. Click **Install** to start the vCenter Server Appliance deployment wizard.

Step 5. Click **NEXT** in the Introduction section.

Step 6. Read and accept the license agreement and click **NEXT**.

Step 7. In the “vCenter Server deployment target” window, enter the FQDN or IP address of the destination host, User name (root) and Password. Click **NEXT**.

Note: Installation of vCenter on a separate existing management infrastructure vCenter is recommended. If a separate management infrastructure is not available, customers can choose the recently configured first ESXi host as an installation target. The recently configured ESXi host is used in this deployment.

Step 8. Click **YES** to accept the certificate.

Step 9. Enter the Appliance VM name and password details shown in the Set up vCenter Server VM section. Click **NEXT**.

Step 10. In the Select deployment size section, select the Deployment size and Storage size. For example, select “Small” and “Default.” Click **NEXT**.

Step 11. Select the datastore (for example, infra_datastore) for storage. Click **NEXT**.

Step 12. In the Network Settings section, configure the following settings:

a. Select a Network: (for example, **IB-MGMT Network**)

Note: When the vCenter is running on the FlexPod, it is important that the vCenter VM stays on the IB-MGMT Network on vSwitch0 and not moved to a vDS. If vCenter is moved to a vDS and the virtual environment is completely shut down and then brought back up, trying to bring up vCenter on a different host than the one it was running on before the shutdown will cause problems with the network connectivity. With the vDS, for a virtual machine to move from one host to another, vCenter must be up and running to coordinate the move of the virtual ports on the vDS. If vCenter is down, the port move on the vDS cannot occur correctly. Moving vCenter to a different host on vSwitch0 does not require vCenter to already be up and running. If this vCenter is running in a different management environment, it is fine to have its’ networking on a vDS.

b. IP version: **IPV4**

c. IP assignment: **static**

d. FQDN: <vcenter-fqdn>

e. IP address: <**vcenter-ip**>

f. Subnet mask or prefix length: <**vcenter-subnet-mask**>

g. Default gateway: <**vcenter-gateway**>

h. DNS Servers: <dns-server1>,<dns-server2>

Step 13. Click **NEXT**.

Step 14. Review all values and click **FINISH** to complete the installation.

Note: The vCenter Server appliance installation will take a few minutes to complete.

Step 15. When Stage 1, Deploy vCenter Server, is complete, click **CONTINUE** to proceed with stage 2.

Step 16. Click **NEXT**.

Step 17. In the vCenter Server configuration window, configure these settings:

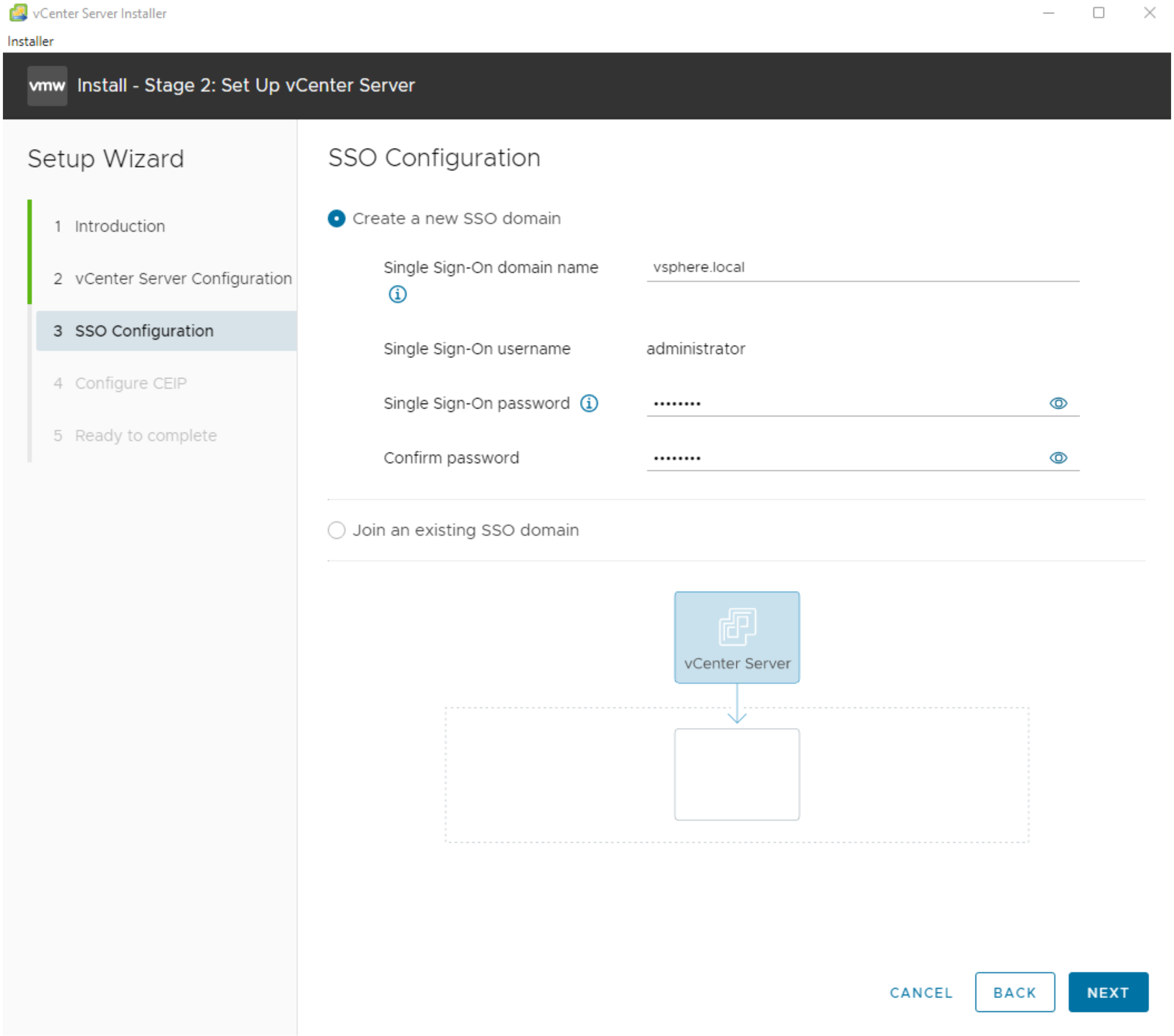
a. Time Synchronization Mode: Synchronize time with NTP servers.

b. NTP Servers: NTP server IP addresses from IB-MGMT VLAN

c. SSH access: Activated.

Step 18. Click **NEXT**.

Step 19. Complete the SSO configuration as shown below (or according to your organization's security policies):



SSO Configuration

● Create a new SSO domain

Single Sign-On domain name: vsphere.local

Single Sign-On username: administrator

Single Sign-On password: ••••••••

Confirm password: ••••••••

○ Join an existing SSO domain

Step 20. Click **NEXT**.

Step 21. Decide whether to join VMware's Customer Experience Improvement Program (CEIP).

Step 22. Click **NEXT**.

Step 23. Review the configuration and click **FINISH**.

Step 24. Click **OK**.

Note: vCenter Server setup will take a few minutes to complete and Install – Stage 2 with show Complete.

Step 25. Click **CLOSE**. Eject or unmount the VCSA installer ISO.

Procedure 5. Verify vCenter CPU Settings

Note: If a vCenter deployment size of Small or larger was selected in the vCenter setup, it is possible that the VCSA's CPU setup does not match the Cisco UCS server CPU hardware configuration. Cisco UCS C-Series M6 and B200 M6 servers are 2-socket servers. During this validation, the Small deployment size was selected and vCenter was setup for a 4-socket server. This setup can cause issues in the VMware ESXi cluster Admission Control.

Step 1. Open a web browser on the management workstation and navigate to the vCenter or ESXi server where the vCenter appliance was deployed and login.

Step 2. Click the **vCenter VM**, right-click and select **Edit settings**.

Step 3. In the **Edit settings** window, expand CPU and check the value of Sockets.

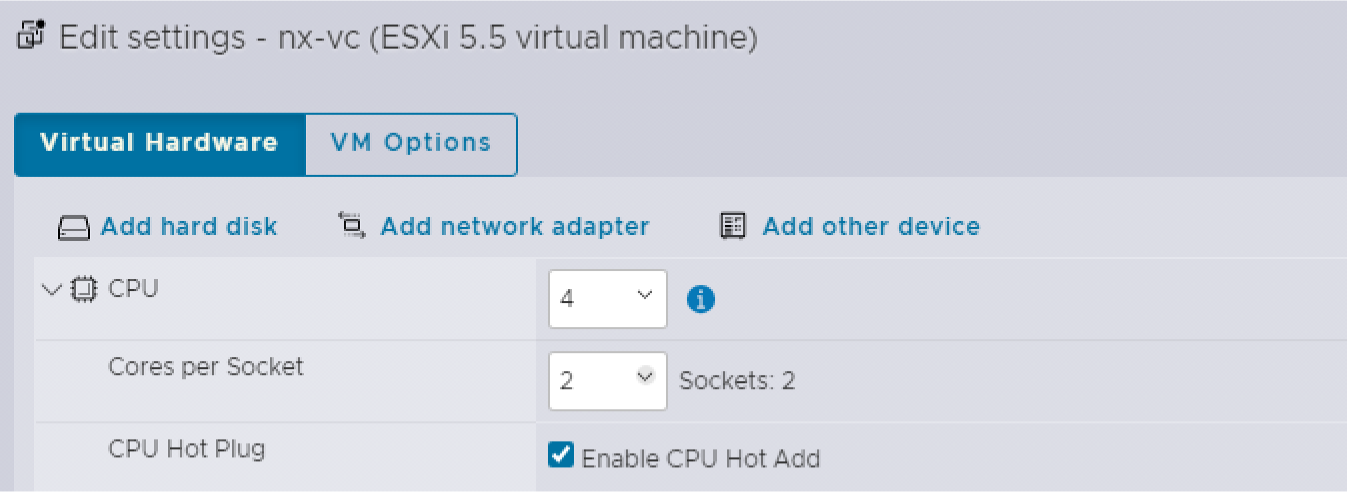
Step 4. If the number of Sockets matches the server configuration, click **Cancel**.

Step 5. If the number of Sockets does not match the server configuration, it will need to be adjusted:

a. Right-click the vCenter VM and click **Guest OS** > **Shut down**. Click **Yes** on the confirmation.

b. When vCenter is shut down, right-click the vCenter VM and click **Edit settings**.

c. In the Edit settings window, expand CPU and change the Cores per Socket value to make the Sockets value equal to the server configuration.



Edit settings - nx-vc (ESXi 5.5 virtual machine)

CPU: 4

Cores per Socket: 2 Sockets: 2

CPU Hot Plug: ☑ Enable CPU Hot Add

Step 6. Click **SAVE.**

Step 7. Right-click the vCenter VM and click **Power** > **Power on**. Wait approximately 10 minutes for vCenter to come up.

Procedure 6. Setup VMware vCenter Server

Step 1. Using a web browser, navigate to **https://<vcenter-ip-address>:5480**. Navigate the security screens.

Step 2. Log into the **VMware vCenter Server Management** interface as **root** with the root password set in the vCenter installation.

Step 3. In the menu on the left, click **Time**.

Step 4. Click **EDIT** to the right of Time zone.

Step 5. Select the appropriate Time zone and click **SAVE**.

Step 6. In the menu on the left select **Administration**.

Step 7. According to your Security Policy, adjust the settings for the root user and password.

Step 8. In the menu on the left click **Update**.

Step 9. Follow the prompts to stage and install any available vCenter 8.0 (not 8.0U1) updates.

Step 10. In the upper right-hand corner of the screen, click **root > Logout** to logout of the Appliance Management interface.

Step 11. Using a web browser, navigate to https://<vcenter-fqdn> and navigate through security screens.

Note: With VMware vCenter 7.0 and above, you must use the vCenter FQDN.

Step 12. Select LAUNCH VSPHERE CLIENT.

Step 13. Log in using the Single Sign-On username (administrator@vsphere.local) and password created during the vCenter installation. Dismiss the Licensing warning.

Procedure 7. Add AD User Authentication to vCenter (Optional)

Step 1. In the **AD Infrastructure**, using the Active Directory Users and Computers tool, setup a Domain Administrator user with a user name such as flexadmin (FlexPod Admin).

Step 2. Connect to https://<vcenter-fqdn> and select **LAUNCH VSPHERE CLIENT**.

Step 3. Log in as **administrator@vsphere.local** (or the SSO user set up in vCenter installation) with the corresponding password.

Step 4. Under the top-level menu, click **Administration.** In the list on the left, under **Single Sign On**, select **Configuration.**

Step 5. In the center pane, under **Configuration**, select the **Identity Provider** tab.

Step 6. In the list under **Type**, select **Active Directory Domain**.

Step 7. Click **JOIN AD**.

Step 8. Fill in the AD domain name, the Administrator user, and the domain Administrator password. Do not fill in an Organizational unit. Click **JOIN**.

Step 9. Click Acknowledge.

Step 10. In the list on the left under **Deployment**, click **System Configuration**. Select the radio button to select the vCenter, then click **REBOOT NODE**.

Step 11. Input a reboot reason and click **REBOOT**. The reboot will take approximately 10 minutes for full vCenter initialization.

Step 12. Log back into the vCenter vSphere Client as Administrator@vsphere.local.

Step 13. Under the top-level menu, click **Administration.** In the list on the left, under **Single Sign On**, click **Configuration.**

Step 14. In the center pane, under **Configuration**, click **the Identity Provider** tab. Under **Type**, select **Identity Sources**. Click **ADD**.

Step 15. Make sure Active Directory (Integrated Windows Authentication) is selected, your Windows Domain name is listed, and Use machine account is selected. Click **ADD**.

Step 16. In the list select the **Active Directory (Integrated Windows Authentication)** Identity source type. If desired, select **SET AS DEFAULT** and click **OK**.

Step 17. Under Access Control, select **Global Permissions**.

Step 18. In the center pane, click **ADD** to add a Global Permission.

Step 19. In the **Add Permission** window, select your AD domain for the Domain.

Step 20. In the User/Group line, enter either the FlexPod Admin username or the Domain Admins group. Leave the Role set to Administrator. Check the box for **Propagate to children**.

Note: The FlexPod Admin user was created in the Domain Admins group. The selection here depends on whether the FlexPod Admin user will be the only user used in this FlexPod or if additional users will be added later. By selecting the Domain Admins group, any user placed in that AD Domain group will be able to login to vCenter as an Administrator.

Step 21. Click **OK** to add the selected User or Group. The user or group should now appear in the Global Permissions list with the Administrator role.

Step 22. Log out and log back into the vCenter HTML5 Client as the FlexPod Admin user. You will need to add the domain name to the user, for example, flexadmin@domain if you did not make your AD Domain the default domain.

vCenter and ESXi Ansible Setup

Procedure 1. Configure the VMware vCenter and the three management ESXi hosts

Step 1. Edit the following variable files to ensure proper VMware variables are entered:

- FlexPod-IMM-VMware/FlexPod-IMM-VMware/group_vars/secrets.yml
- FlexPod-IMM-VMware/FlexPod-IMM-VMware/inventory
- FlexPod-IMM-VMware/FlexPod-IMM-VMware/group_vars/all.yml
- FlexPod-IMM-VMware/FlexPod-IMM-VMware/roles/VMware/ESXIpostvC/defaults/main.yml
- FlexPod-IMM-VMware/FlexPod-IMM-VMware/roles/VMware/ESXIpostvCiscsi/defaults/main.yml

Step 2. From FlexPod-IMM-VMware/FlexPod-IMM-VMware, run the Setup_vCenter.yml Ansible playbook:

```
ansible-playbook ./Setup_vCenter.yml -i inventory
```

Note: After the playbook run is complete, complete the following manual steps to complete vCenter setup.

Step 3. Right-click the Cluster that was created and select **Settings**.

Step 4. In the list in the center pane under **Configuration**, select **General**.

Step 5. On the right, to the right of **General**, select **EDIT**.

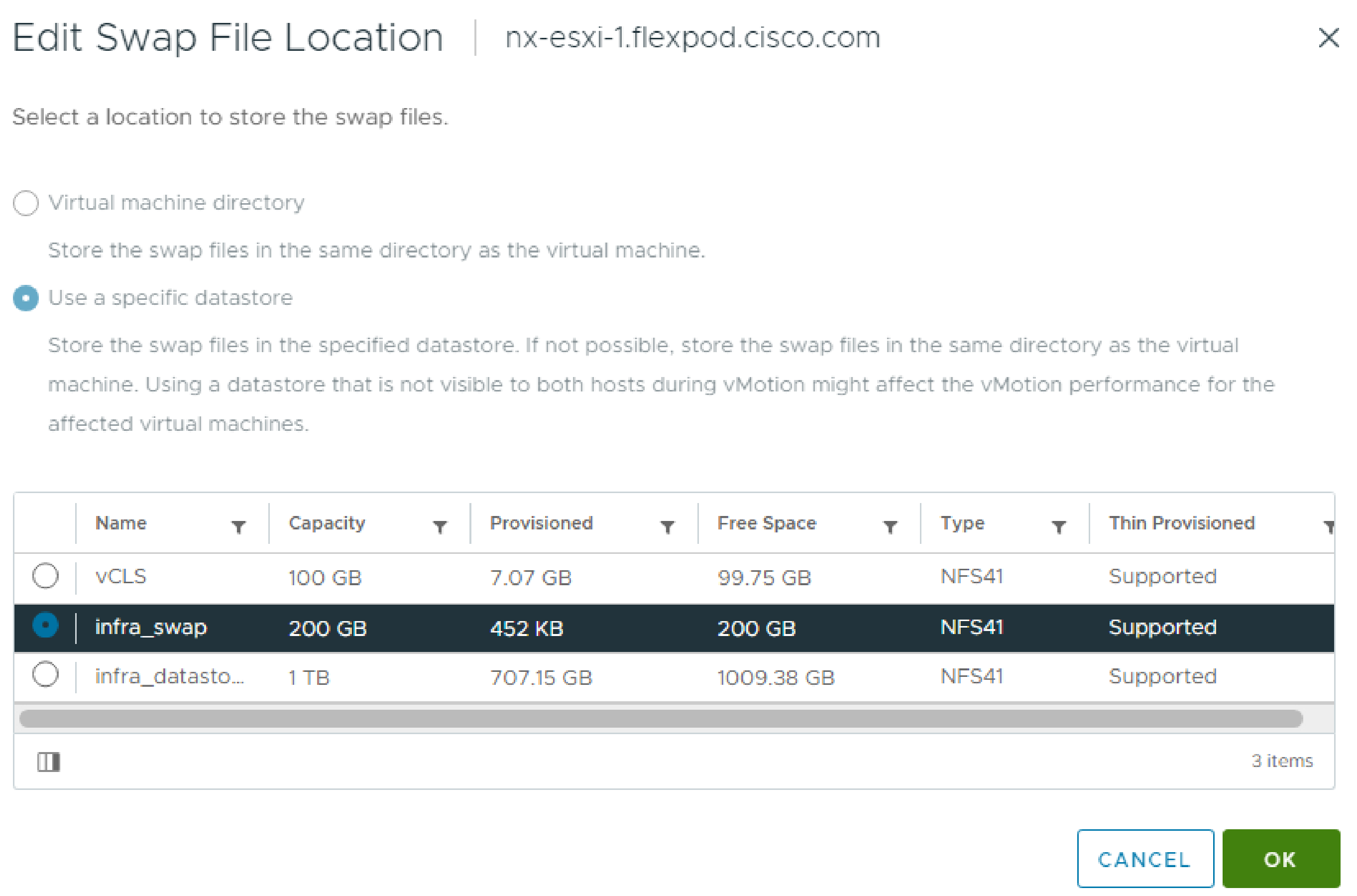
Step 6. Select Datastore specified by host and click **OK**.

Step 7. In the list on the left, select the first ESXi host. In the center pane, select the **Configure** tab.

Step 8. In the center pane list under **Virtual Machines**, click **Swap File location**.

Step 9. On the right, click **EDIT**.

Step 10. Select **infra_swap** and click **OK**.



Edit Swap File Location | nx-esxi-1.flexpod.cisco.com

Select a location to store the swap files.

○ Virtual machine directory

Store the swap files in the same directory as the virtual machine.

● Use a specific datastore

Store the swap files in the specified datastore. If not possible, store the swap files in the same directory as the virtual machine. Using a datastore that is not visible to both hosts during vMotion might affect the vMotion performance for the affected virtual machines.

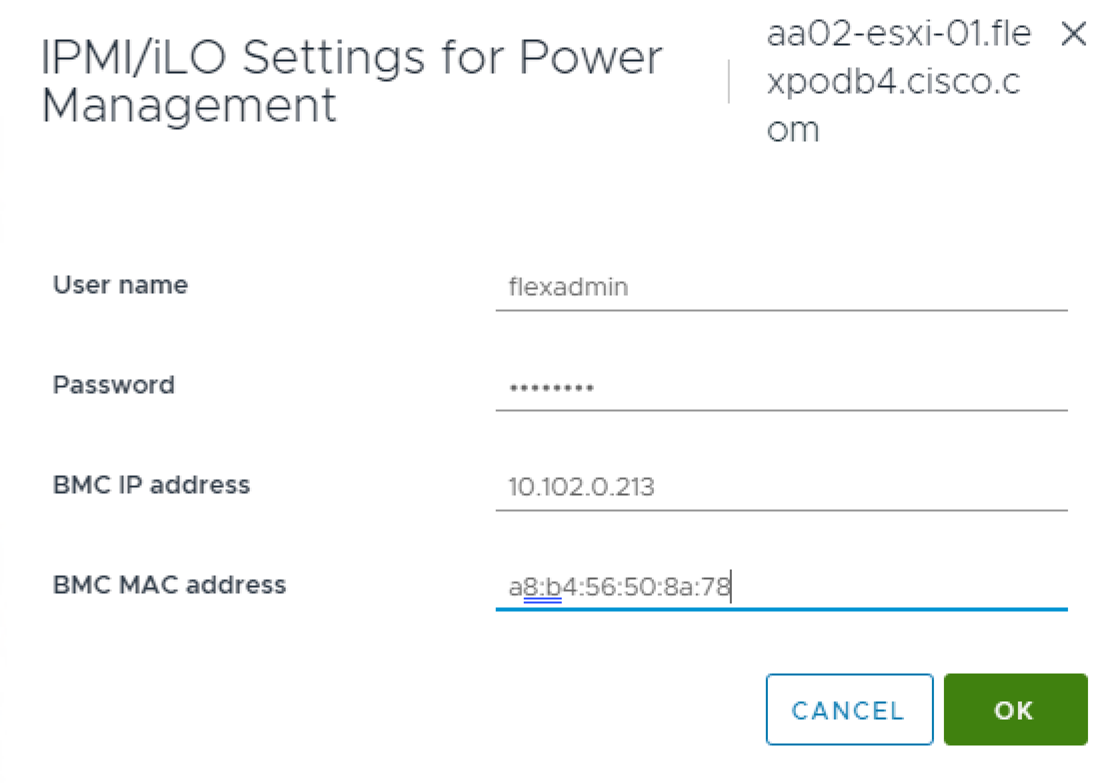
	Name	Capacity	Provisioned	Free Space	Type	Thin Provisioned
○	vCLS	100 GB	7.07 GB	99.75 GB	NFS41	Supported
●	infra_swap	200 GB	452 KB	200 GB	NFS41	Supported
○	infra_datasto...	1 TB	707.15 GB	1009.38 GB	NFS41	Supported

3 items

Step 11. Repeat steps 7-10 to set the swap file location for each ESXi host.

Step 12. Select each ESXi host and from the **Summary** tab, clear any alerts or alarms associated with the host.

Step 13. Select the first ESXi host and under **Configure** > **System**, click **Power Management**. In the upper right corner, click **EDIT**. Fill in the User name (admin or flexadmin) and associated password as configured in the Local User policy. The MAC can also be obtained by using ipmitool on a Linux machine with the following query: "ipmitool -I lanplus -H <serverOOBMGMTIP> -U flexadmin -P <password> lan print". The server's <serverOOBMGMTIP> can be obtained in Cisco Intersight under **Infrastructure Service > Servers**. When all fields are populated, click **OK**. VMware ESXi will launch an IPMI over LAN query to the server's CIMC and verify the BMC MAC address. This setup will allow the ESXi host to be powered on from vCenter. Repeat this step for all ESXi hosts.



IPMI/iLO Settings for Power Management | aa02-esxi-01.flexpodb4.cisco.com

User name: flexadmin

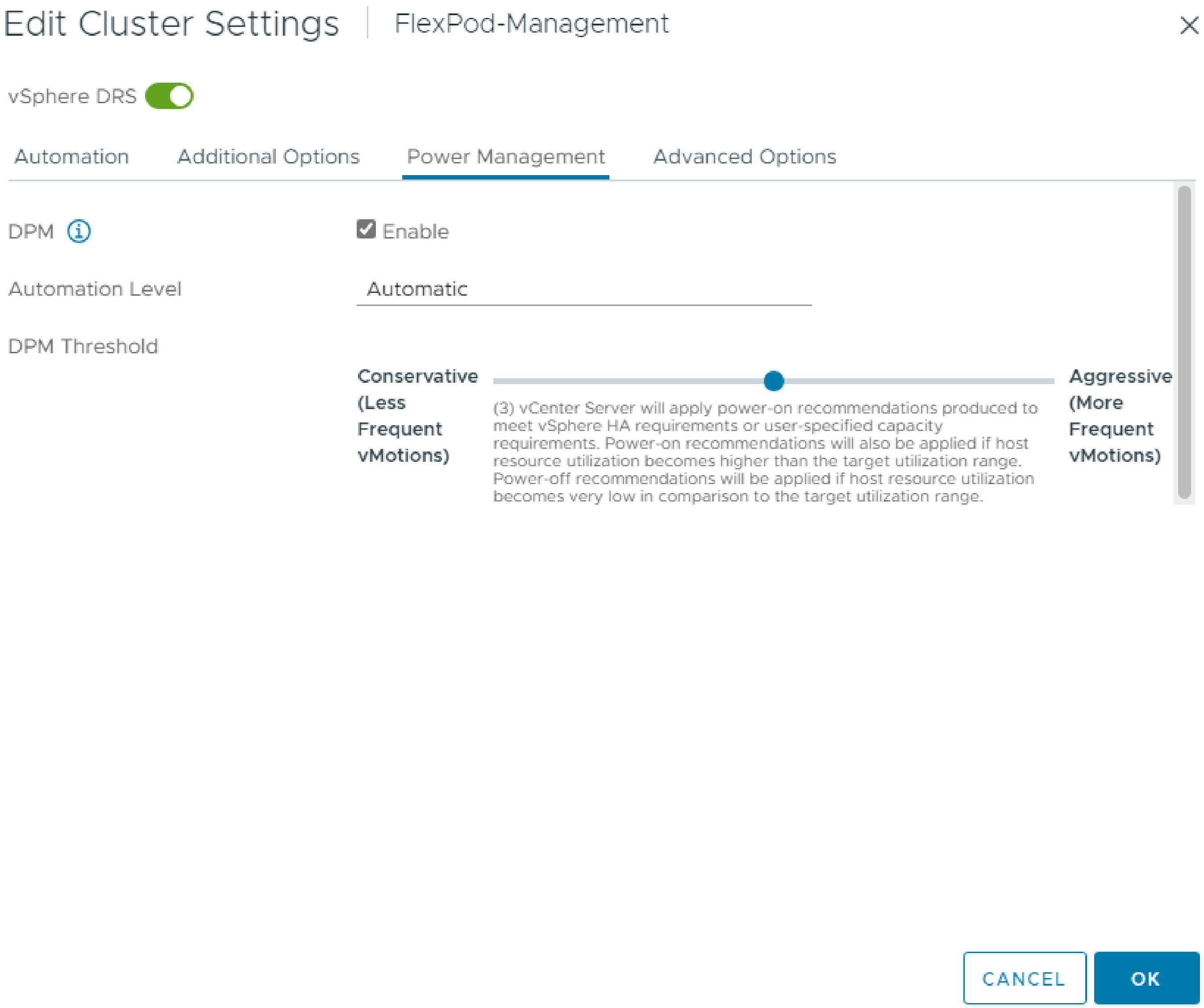
Password: ********

BMC IP address: 10.102.0.213

BMC MAC address: a8:b4:56:50:8a:78

Note: IPMI over LAN cannot be configured for Cisco UCS C220 and C240 M7 servers.

Step 14. Optional. This step is optional and should only be done if you are not using Cisco Intersight Workload Optimizer (IWO) to suspend servers in an effort to lower power usage. In VMware vCenter, under Inventory, select the ESXi cluster. In the center pane, select **Configure** and then under Services select **vSphere DRS**. On the right, click **EDIT** then select **Power Management**. Check the **Enable** box to turn on DPM and select your desired Automation Level. Click **OK** to finalize this setting.


Edit Cluster Settings | FlexPod-Management

vSphere DRS ●

DPM ☑ Enable

Automation Level: Automatic

DPM Threshold

Conservative (Less Frequent vMotions) — Aggressive (More Frequent vMotions)

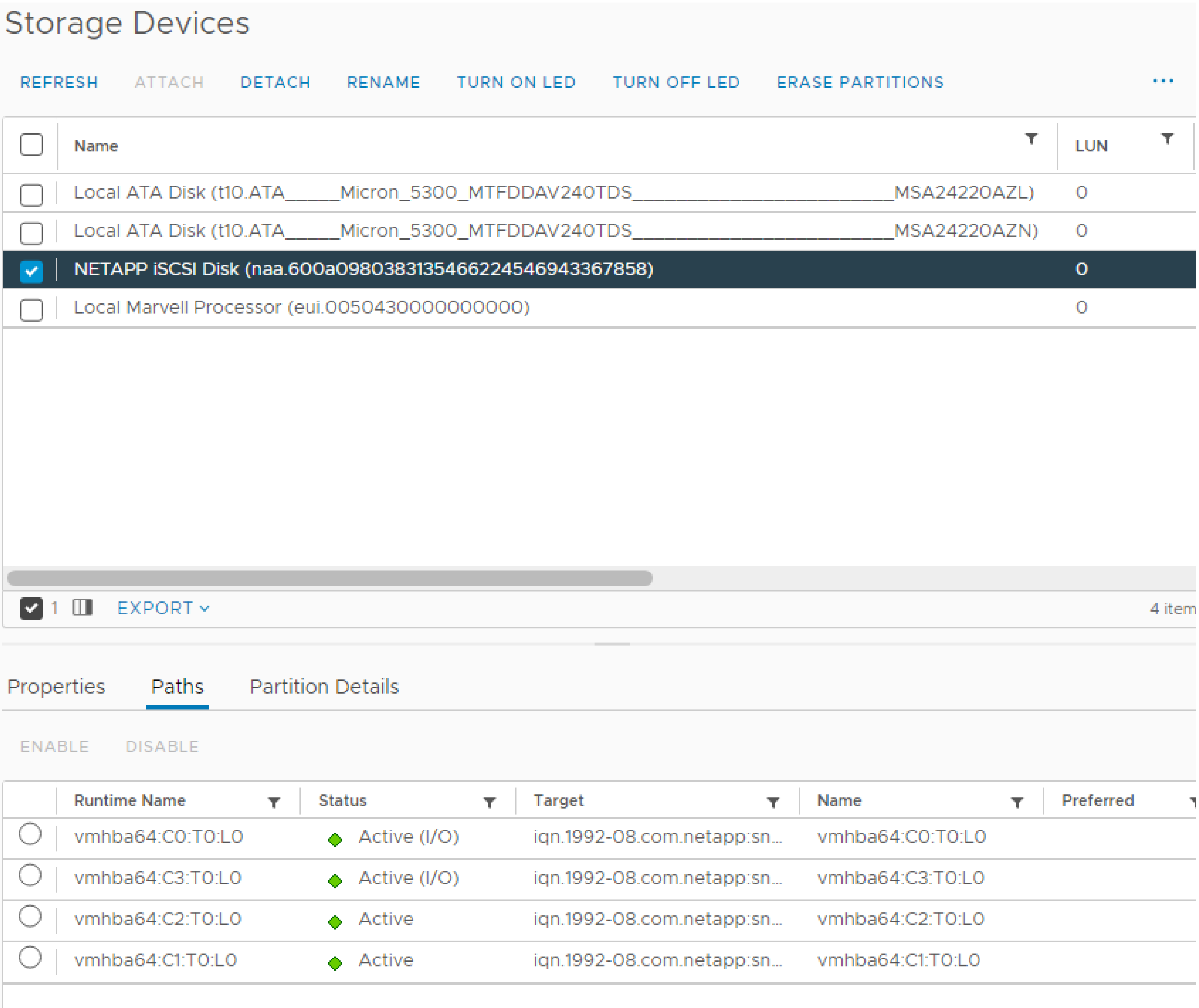
(3) vCenter Server will apply power-on recommendations produced to meet vSphere HA requirements or user-specified capacity requirements. Power-on recommendations will also be applied if host resource utilization becomes higher than the target utilization range. Power-off recommendations will be applied if host resource utilization becomes very low in comparison to the target utilization range.

Note: It is recommended to cycle through the ESXi hosts testing whether the server can be powered on with IPMI over LAN before turning on DPM.

Step 15. Select the first ESXi host. In the center pane under **Configure** > **Storage**, click **Storage Devices**. Make sure the NETAPP Fibre Channel Disk LUN 0 or NETAPP iSCSI Disk LUN 0 is selected.

Step 16. Click the **Paths** tab.

Step 17. Ensure that 4 paths appear, two of which should have the status Active (I/O). The output below shows the paths for an iSCSI LUN.



Storage Devices

□	Name	LUN
□	Local ATA Disk (t10.ATA_____Micron_5300_MTFDDAV240TDS________________________MSA24220AZL)	0
□	Local ATA Disk (t10.ATA_____Micron_5300_MTFDDAV240TDS________________________MSA24220AZN)	0
☑	NETAPP iSCSI Disk (naa.600a0980383135466224546943367858)	0
□	Local Marvell Processor (eui.0050430000000000)	0

	Runtime Name	Status	Target	Name	Preferred
○	vmhba64:C0:T0:L0	◆ Active (I/O)	iqn.1992-08.com.netapp:sn...	vmhba64:C0:T0:L0	
○	vmhba64:C3:T0:L0	◆ Active (I/O)	iqn.1992-08.com.netapp:sn...	vmhba64:C3:T0:L0	
○	vmhba64:C2:T0:L0	◆ Active	iqn.1992-08.com.netapp:sn...	vmhba64:C2:T0:L0	
○	vmhba64:C1:T0:L0	◆ Active	iqn.1992-08.com.netapp:sn...	vmhba64:C1:T0:L0	

Step 18. Repeat steps 15-17 for all ESXi hosts.

Procedure 8. VMware ESXi 8.0 TPM Attestation

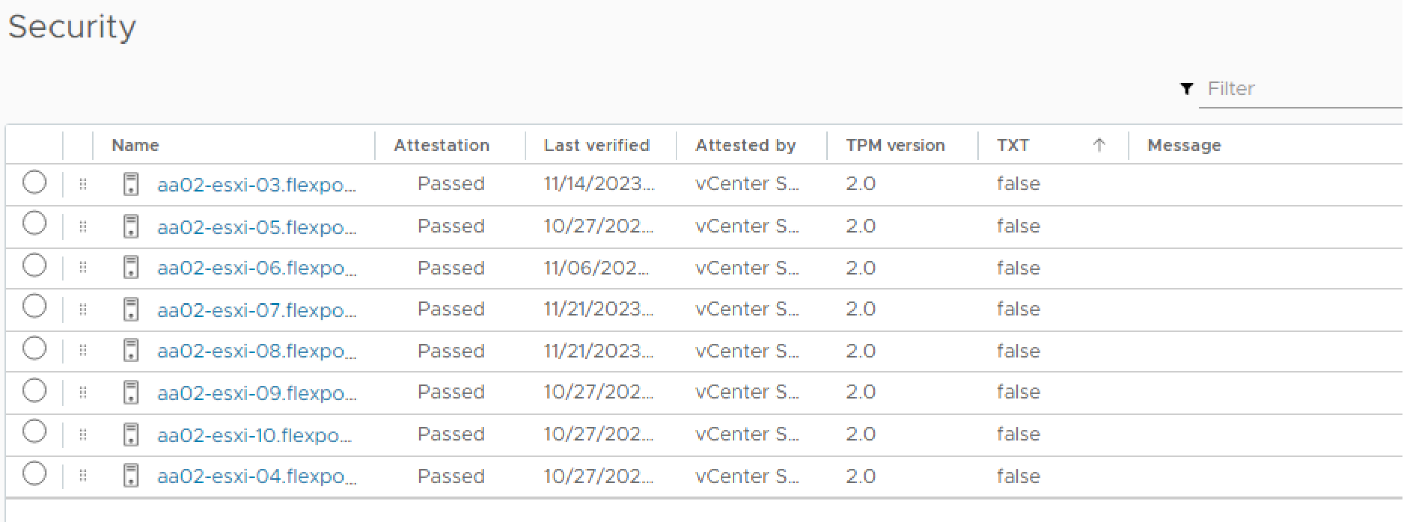
Note: If your Cisco UCS servers have Trusted Platform Module (TPM) 2.0 modules installed, the TPM can provide assurance that ESXi has booted with UEFI Secure Boot enabled and using only digitally signed code. In the Cisco UCS Configuration section of this document, UEFI secure boot was enabled in the boot order policy. A server can boot with UEFI Secure Boot with or without a TPM 2.0 module. If it has a TPM, VMware vCenter can attest that the server booted with UEFI Secure Boot.

Step 1. For Cisco UCS servers that have TPM 2.0 modules installed, TPM Attestation can be verified in the vSphere HTML5 Client.

Step 2. In the vCenter Interface, under **Inventory** select the cluster.

Step 3. In the center pane, click the **Monitor** tab.

Step 4. Click **Monitor** > **Security.** The Attestation status will show the status of the TPM:



Security

Name	Attestation	Last verified	Attested by	TPM version	TXT	Message
○ aa02-esxi-03.flexpo...	Passed	11/14/2023...	vCenter S...	2.0	false	
○ aa02-esxi-05.flexpo...	Passed	10/27/202...	vCenter S...	2.0	false	
○ aa02-esxi-06.flexpo...	Passed	11/06/202...	vCenter S...	2.0	false	
○ aa02-esxi-07.flexpo...	Passed	11/21/2023...	vCenter S...	2.0	false	
○ aa02-esxi-08.flexpo...	Passed	11/21/2023...	vCenter S...	2.0	false	
○ aa02-esxi-09.flexpo...	Passed	10/27/202...	vCenter S...	2.0	false	
○ aa02-esxi-10.flexpo...	Passed	10/27/202...	vCenter S...	2.0	false	
○ aa02-esxi-04.flexpo...	Passed	10/27/202...	vCenter S...	2.0	false	

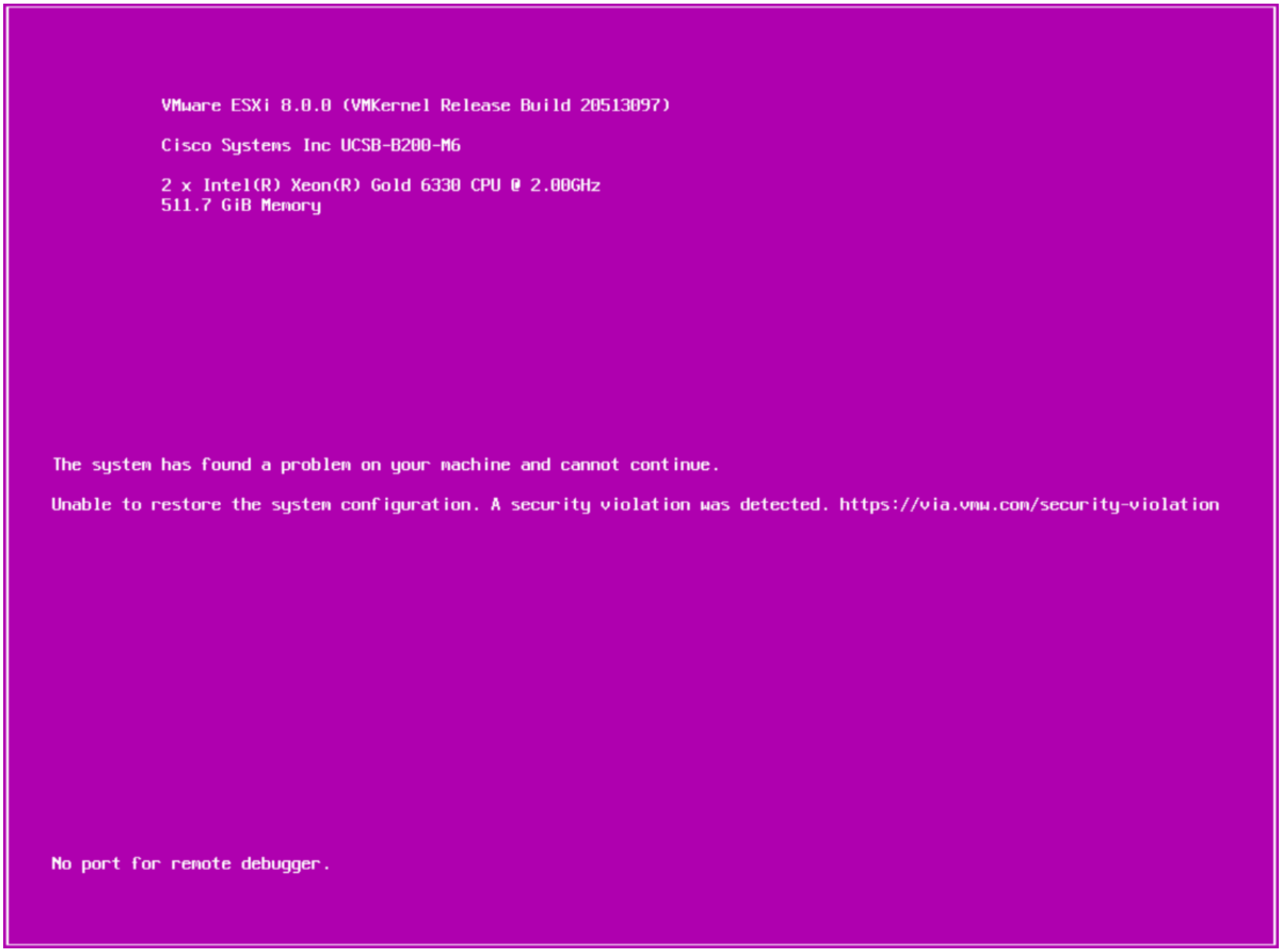
Note: It may be necessary to disconnect and reconnect or reboot a host from vCenter to get it to pass attestation the first time.

Procedure 9. Avoiding Boot Failure When UEFI Secure Booted Server Profiles are Moved

Typically, hosts in FlexPod Datacenter are configured for boot from SAN. Cisco UCS supports stateless compute where a server profile can be moved from one blade or compute node to another seamlessly.

When a server profile is moved from one blade to another blade server with the following conditions, the ESXi host runs into PSOD and ESXi will fail to boot:

- TPM present in the node (Cisco UCS M5 and M6 family servers)
- Host installed with ESXi 7.0 U2 or above
- Boot mode is UEFI Secure
- Error message: Unable to restore system configuration. A security violation was detected. https://via.vmw.com/security-violation.



```
VMware ESXi 8.0.0 (VMKernel Release Build 20513097)

Cisco Systems Inc UCSB-B200-M6

2 x Intel(R) Xeon(R) Gold 6330 CPU @ 2.00GHz
511.7 GiB Memory

The system has found a problem on your machine and cannot continue.

Unable to restore the system configuration. A security violation was detected. https://via.vmw.com/security-violation

No port for remote debugger.
```

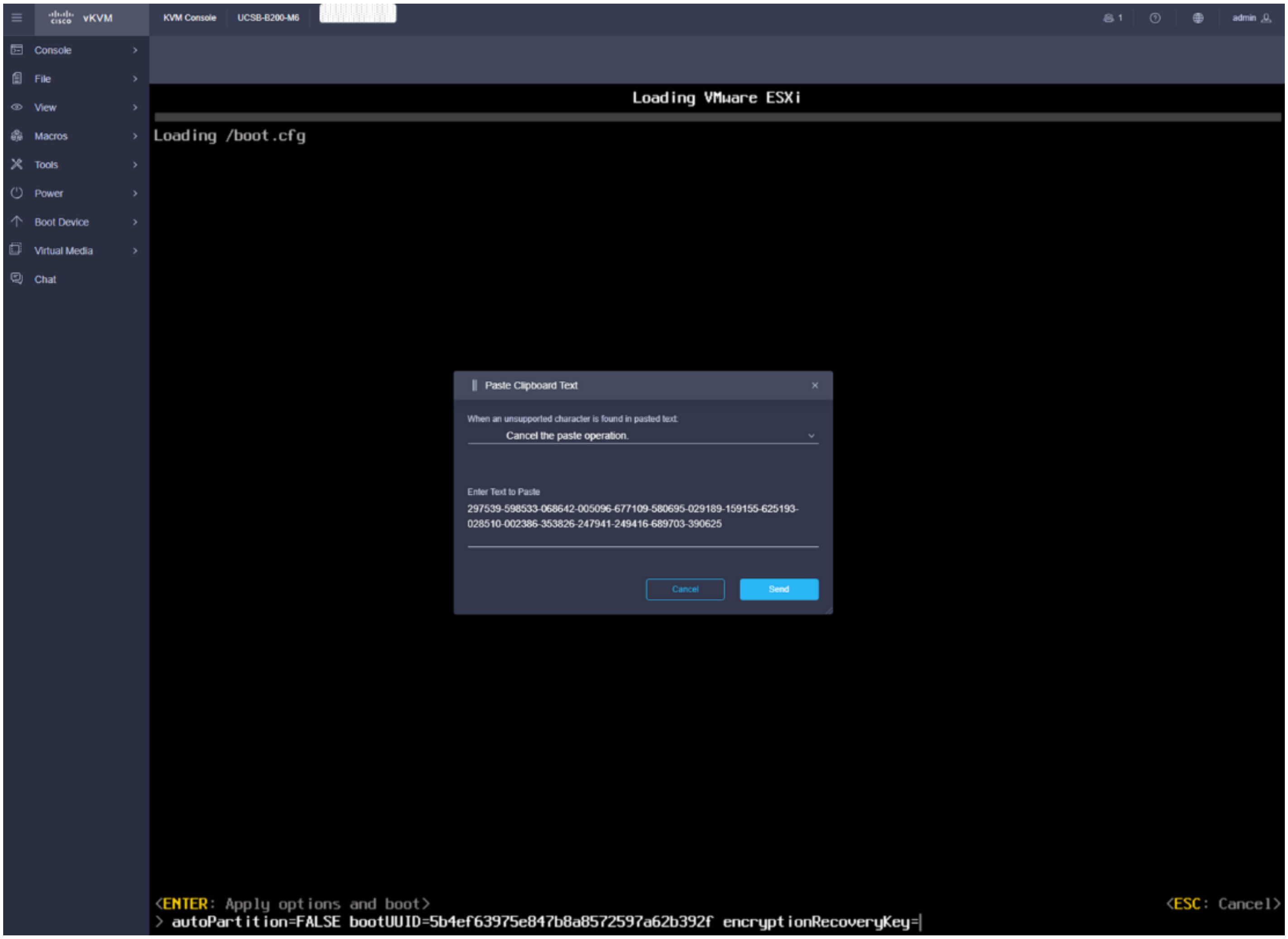
Step 1. Log into the host using **SSH**.

Step 2. Gather the recovery key using this command:

```
[root@nx-esxi-1:~] esxcli system settings encryption recovery list
Recovery ID                                Key
--------------------------------------  ---
{74AC4D68-FE47-491F-B529-6355D4AAF52C}  529012-402326-326163-088960-184364-097014-312164-590080-407316-
660658-634787-601062-601426-263837-330828-197047
```

Step 3. Store the keys from all hosts in a safe location.

Step 4. After associating the Server Profile to the new compute-node or blade, stop the ESXi boot sequence by pressing **Shift + O** when the ESXi boot screen appears.



```
Loading VMware ESXi
Loading /boot.cfg
```

When an unsupported character is found in pasted text: Cancel the paste operation.

Enter Text to Paste: 297539-598533-068642-005096-677109-580695-029189-159155-625193-028510-002386-353826-247941-249416-689703-390625

```
<ENTER: Apply options and boot>                                                  <ESC: Cancel>
> autoPartition=FALSE bootUUID=5b4ef63975e847b8a8572597a62b392f encryptionRecoveryKey=
```

Step 5. Add the recovery key using following boot option: encryptionRecoveryKey=*recovery_key.* Use **File** > **Paste Clipboard Text** and **Send** to paste in the recovery key. Press **Enter** to continue the boot process.

Step 6. To persist the change, enter the following command at the VMware ESXi ssh command prompt:

```
/sbin/auto-backup.sh
```

Note: For more information, go to: https://docs.vmware.com/en/VMware-vSphere/8.0/vsphere-security/GUID-30DA8CC1-5D9F-4025-B5DB-6D592B6BD9B4.html.

Storage Configuration – ONTAP NVMe Configuration and Finalizing ONTAP Storage

This chapter contains the following:

- Ansible ONTAP Storage Configuration Part 3

Ansible ONTAP Storage Configuration Part 3

Procedure 1. Configure the ONTAP NVMe setup and finalize ONTAP storage using Ansible

Step 1. Edit the following variable files to ensure proper variables are entered:

- FlexPod-IMM-VMware/FlexPod-IMM-VMware/group_vars/all.yml
- FlexPod-IMM-VMware/FlexPod-IMM-VMware/vars/ontap_main.yml

Note: Update the “nvme_namespaces” and “nvme_subsystem” variables in vars/ontap_main.yml file. Add the NQNs from each ESXi host to the corresponding variable “nvme_nqn” in group_vars/all.yml file. The NVMe namespace will be shared by all the hosts in the nvme subsystem in this solution

Note: The ONTAP NVMe setup is only required for FC-NVMe and NVMe/TCP configurations.

Step 2. From FlexPod-IMM-VMware/FlexPod-IMM-VMware, invoke the ansible scripts for this section using the following command:

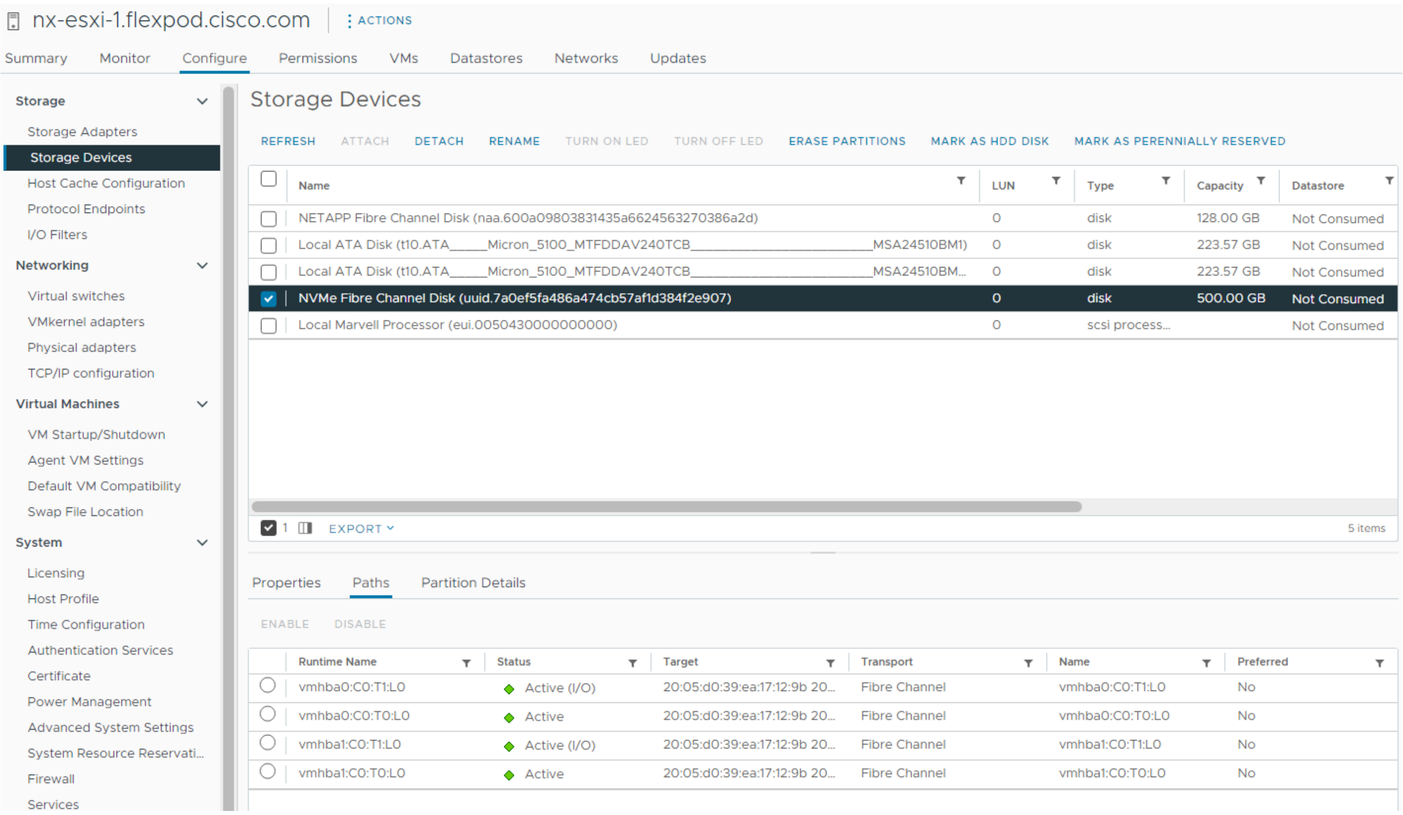
```
ansible-playbook -i inventory Setup_ONTAP.yml -t ontap_config_part_3
```

Procedure 10. Configure ESXi Host NVMe over FC and NVMe over TCP Datastore

Step 1. To verify that the NVMe Fibre Channel Disk is mounted on each ESXi host, log into the **VMware vCenter** using a web-browser.

Step 2. Under **Inventory** select an ESXi host running FC-NVMe. In the center pane, go to **Configure** > **Storage** > **Storage Devices**. The NVMe Fibre Channel Disk should be listed under Storage Devices.

Step 3. Select the NVMe Fibre Channel Disk, then select **Paths** underneath. Verify 2 paths have a status of Active (I/O) and 2 paths have a status of Active.



Storage Devices

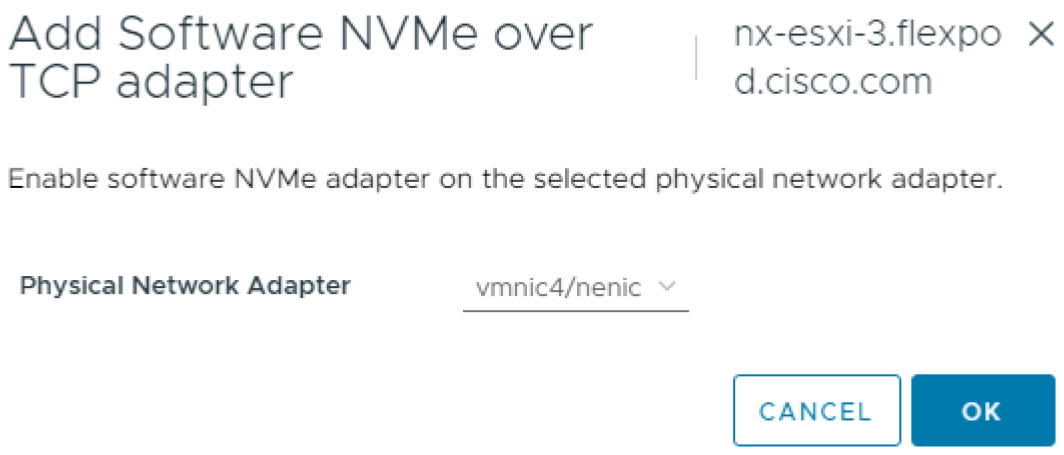
☐	Name	LUN	Type	Capacity	Datastore
☐	NETAPP Fibre Channel Disk (naa.600a09803831435a6624563270386a2d)	0	disk	128.00 GB	Not Consumed
☐	Local ATA Disk (t10.ATA_____Micron_5100_MTFDDAV240TCB_________________________MSA24510BM1)	0	disk	223.57 GB	Not Consumed
☐	Local ATA Disk (t10.ATA_____Micron_5100_MTFDDAV240TCB_________________________MSA24510BM...	0	disk	223.57 GB	Not Consumed
☑	NVMe Fibre Channel Disk (uuid.7a0ef5fa486a474cb57af1d384f2e907)	0	disk	500.00 GB	Not Consumed
☐	Local Marvell Processor (eui.0050430000000000)	0	scsi process...		Not Consumed

	Runtime Name	Status	Target	Transport	Name	Preferred
○	vmhba0:C0:T1:L0	Active (I/O)	20:05:d0:39:ea:17:12:9b 20...	Fibre Channel	vmhba0:C0:T1:L0	No
○	vmhba0:C0:T0:L0	Active	20:05:d0:39:ea:17:12:9b 20...	Fibre Channel	vmhba0:C0:T0:L0	No
○	vmhba1:C0:T1:L0	Active (I/O)	20:05:d0:39:ea:17:12:9b 20...	Fibre Channel	vmhba1:C0:T1:L0	No
○	vmhba1:C0:T0:L0	Active	20:05:d0:39:ea:17:12:9b 20...	Fibre Channel	vmhba1:C0:T0:L0	No

Step 4. Repeat Step 3 for all the FC-NVMe hosts.

Step 5. Under **Inventory** select an ESXi host running NVMe-TCP. In the center pane, go to **Configure** > **Storage** > **Storage Adapters.**

Step 6. Click **ADD SOFTWARE-ADAPTER** > **Add NVMe over TCP adapter.** From the drop-down list select **vmnic4/nenic** and click **OK.** A new vmhba should appear under Storage Adapters.



Add Software NVMe over TCP adapter | nx-esxi-3.flexpod.cisco.com

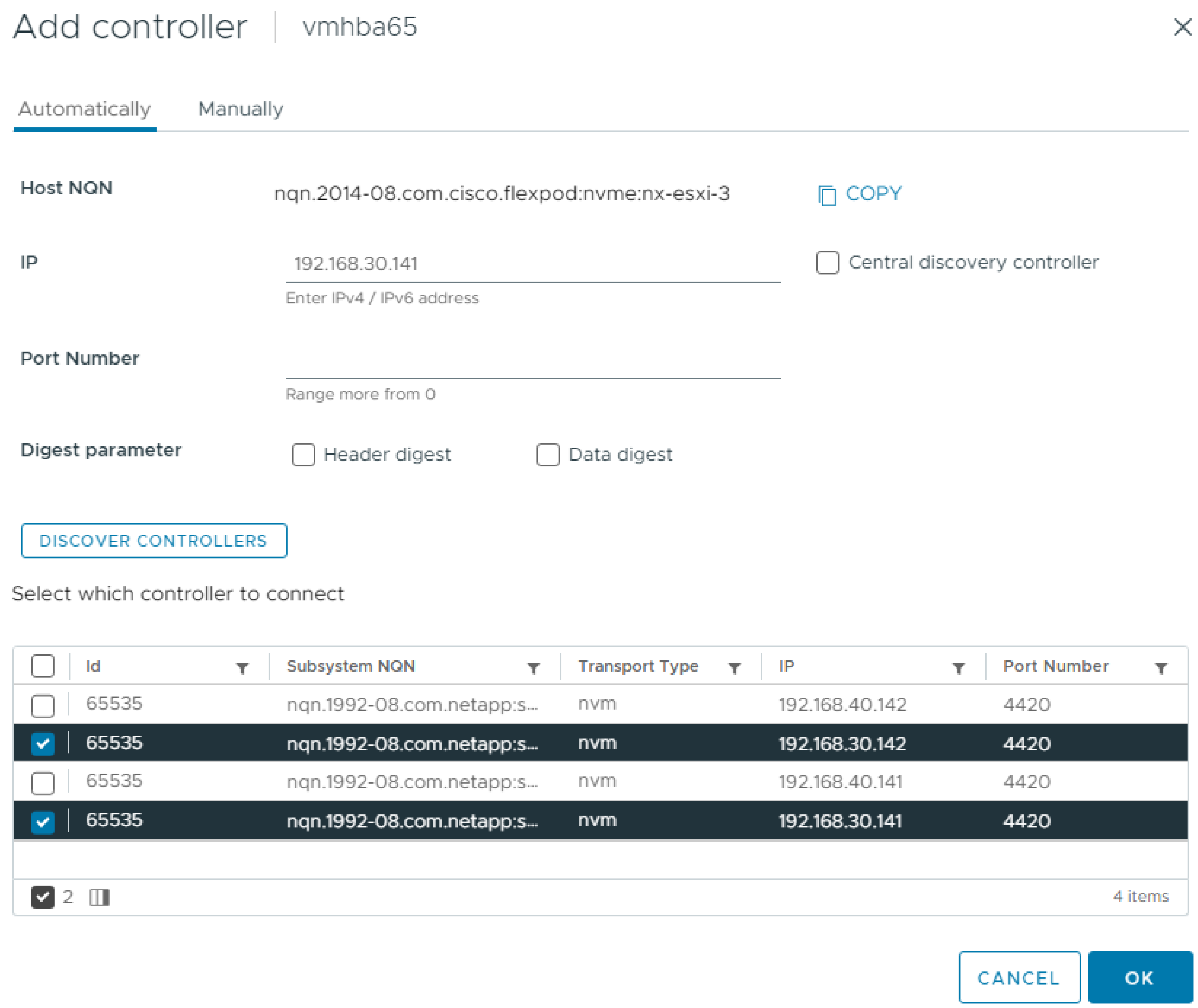
Enable software NVMe adapter on the selected physical network adapter.

Physical Network Adapter: vmnic4/nenic

Step 7. Click **ADD SOFTWARE-ADAPTER** > **Add NVMe over TCP adapter** to add a second vmhba. Use the pulldown to select **vmnic5/nenic** and click **OK.** A new vmhba should appear under Storage Adapters.

Step 8. Select the first VMware NVMe over TCP Storage Adapter added (for example, vmhba65). In the middle of the window, select the **Controllers** tab. Click **ADD CONTROLLER.**

Step 9. Enter the IP address of nvme-tcp-lif-01a and click **DISCOVER CONTROLLERS**. Select the two controllers in the Infra-NVMe-TCP-A subnet and click **OK.** The two controllers should now appear under the Controllers tab after clicking **Refresh.**



Add controller | vmhba65

Host NQN: nqn.2014-08.com.cisco.flexpod:nvme:nx-esxi-3 COPY

IP: 192.168.30.141 (Enter IPv4 / IPv6 address) □ Central discovery controller

Port Number: (Range more from 0)

Digest parameter: □ Header digest □ Data digest

DISCOVER CONTROLLERS

Select which controller to connect

□	Id	Subsystem NQN	Transport Type	IP	Port Number
□	65535	nqn.1992-08.com.netapp:s...	nvm	192.168.40.142	4420
☑	65535	nqn.1992-08.com.netapp:s...	nvm	192.168.30.142	4420
□	65535	nqn.1992-08.com.netapp:s...	nvm	192.168.40.141	4420
☑	65535	nqn.1992-08.com.netapp:s...	nvm	192.168.30.141	4420

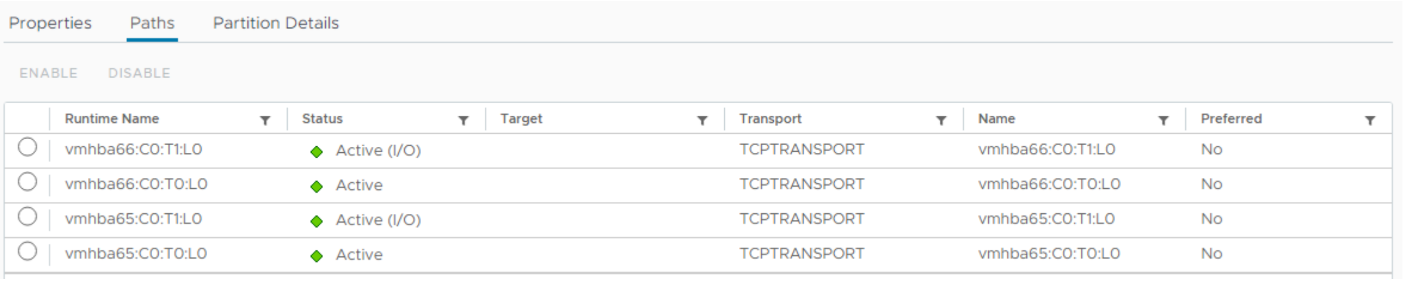
☑ 2 — 4 items

Step 10. Select the second VMware NVMe over TCP Storage Adapter added (for example, vmhba66). In the middle of the window, select the **Controllers** tab. Click **ADD CONTROLLER.**

Step 11. Enter the IP address of nvme-tcp-lif-02b and click **DISCOVER CONTROLLERS**. Select the two controllers in the Infra-NVMe-TCP-B subnet and click **OK.** The two controllers should now appear under the **Controllers** tab after clicking to **Refresh.**

Step 12. Repeat steps 5-11 for all ESXi hosts running NVMe-TCP.

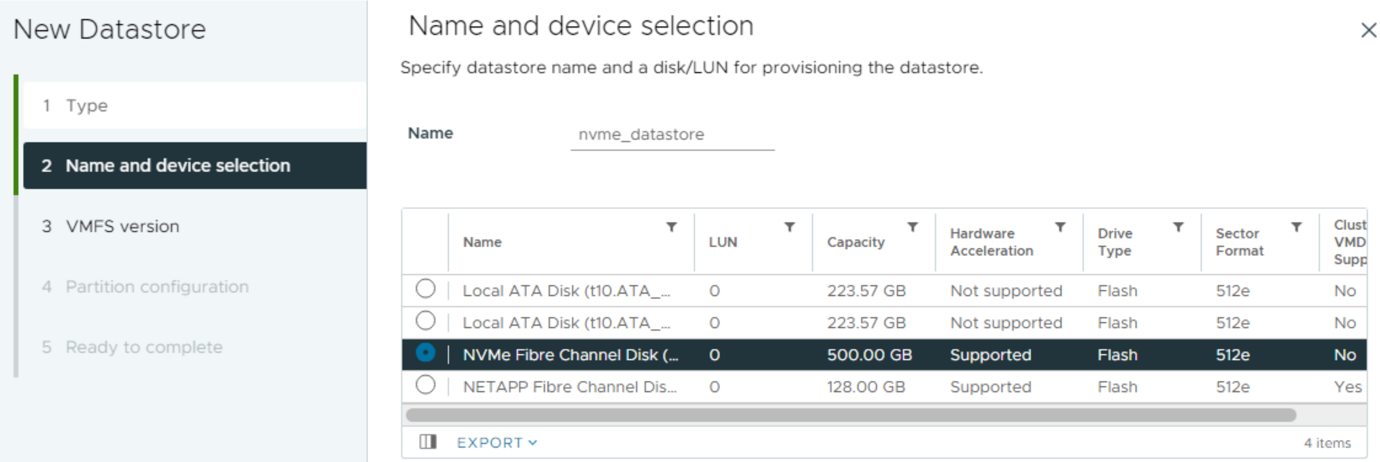
Step 13. For each of the hosts running NVMe-TCP, select **Configure** > **Storage** > **Storage Devices**, then select the NVMe Disk. Under the Paths tab, make sure that 4 paths are shown and that 2 of the paths have the Status **Active (I/O).** Also, all paths should have the Transport **TCPTRANSPORT.**



Runtime Name	Status	Target	Transport	Name	Preferred
○ vmhba66:C0:T1:L0	◆ Active (I/O)		TCPTRANSPORT	vmhba66:C0:T1:L0	No
○ vmhba66:C0:T0:L0	◆ Active		TCPTRANSPORT	vmhba66:C0:T0:L0	No
○ vmhba65:C0:T1:L0	◆ Active (I/O)		TCPTRANSPORT	vmhba65:C0:T1:L0	No
○ vmhba65:C0:T0:L0	◆ Active		TCPTRANSPORT	vmhba65:C0:T0:L0	No

Step 14. For any one of these hosts, right-click the host under **Inventory** and click **Storage** > **New Datastore**. Leave VMFS selected and click **NEXT**.

Step 15. Name the datastore (for example, nvme_datastore) and select the **NVMe Disk**. Click **NEXT**.



New Datastore
1 Type
2 Name and device selection
3 VMFS version
4 Partition configuration
5 Ready to complete
Name and device selection
×

Specify datastore name and a disk/LUN for provisioning the datastore.

Name nvme_datastore

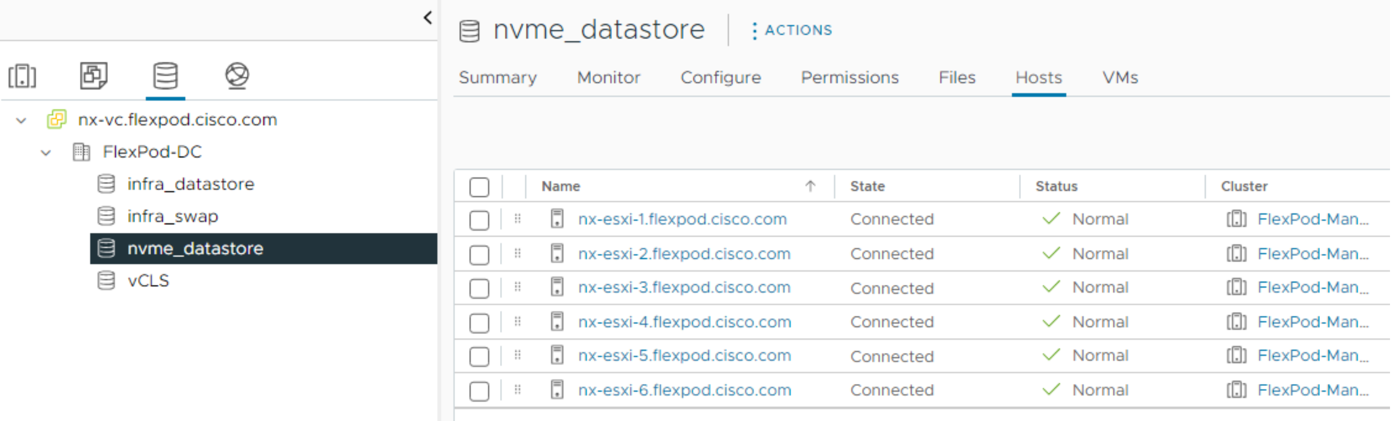
	Name	LUN	Capacity	Hardware Acceleration	Drive Type	Sector Format	Clust VMD Supp
○	Local ATA Disk (t10.ATA_...	0	223.57 GB	Not supported	Flash	512e	No
○	Local ATA Disk (t10.ATA_...	0	223.57 GB	Not supported	Flash	512e	No
●	NVMe Fibre Channel Disk (...	0	500.00 GB	Supported	Flash	512e	No
○	NETAPP Fibre Channel Dis...	0	128.00 GB	Supported	Flash	512e	Yes

Step 16. Leave VMFS 6 selected and click **NEXT**.

Step 17. Leave all Partition configuration values at the default values and click **NEXT**.

Step 18. Review the information and click **FINISH**.

Step 19. Select **Storage**, expand the vCenter and Datacenter, and select the new NVMe datastore. In the center pane, select **Hosts**. Ensure all the NVMe hosts have mounted the datastore.



Name	State	Status	Cluster
nx-esxi-1.flexpod.cisco.com	Connected	✓ Normal	FlexPod-Man...
nx-esxi-2.flexpod.cisco.com	Connected	✓ Normal	FlexPod-Man...
nx-esxi-3.flexpod.cisco.com	Connected	✓ Normal	FlexPod-Man...
nx-esxi-4.flexpod.cisco.com	Connected	✓ Normal	FlexPod-Man...
nx-esxi-5.flexpod.cisco.com	Connected	✓ Normal	FlexPod-Man...
nx-esxi-6.flexpod.cisco.com	Connected	✓ Normal	FlexPod-Man...

Note: If any hosts are missing from the list, it may be necessary to put the host in Maintenance Mode and reboot the host. If you happen to have hosts with both FC-boot and iSCSI-boot and are running both FC-NVMe and NVMe-TCP, notice that the same datastore is mounted on both types of hosts and that the only difference in the storage configuration is what LIF the traffic is coming in on.

FlexPod Management Tools Setup

This chapter contains the following:

Cisco Intersight Hardware Compatibility List (HCL) Status

Cisco Intersight evaluates the compatibility of your UCS system to check if the hardware and software have been tested and validated by Cisco or Cisco partners. Intersight reports validation issues after checking the compatibility of the server model, processor, firmware, adapters, operating system, and drivers, and displays the compliance status with the Hardware Compatibility List (HCL).

To determine HCL compatibility for VMware ESXi, Cisco Intersight uses Cisco UCS Tools. The Cisco UCS Tools is part of VMware ESXi Cisco custom ISO, and no additional configuration is required.

For more information on Cisco UCS Tools manual deployment and troubleshooting, go to: https://intersight.com/help/saas/resources/cisco_ucs_tools#about_cisco_ucs_tools

NetApp ONTAP Tools 9.12 Deployment

The ONTAP tools for VMware vSphere provide end-to-end life cycle management for virtual machines in VMware environments that use NetApp storage systems. It simplifies storage and data management for VMware environments by enabling administrators to directly manage storage within the vCenter Server. This topic describes the deployment procedures for the NetApp ONTAP Tools for VMware vSphere.

NetApp ONTAP Tools for VMware vSphere 9.12 Pre-installation Considerations

The following licenses are required for ONTAP Tools on storage systems that run ONTAP 9.8 or above:

- Protocol licenses (NFS, FCP, and/or iSCSI)

- NetApp FlexClone ((optional) Required for performing test failover operations for SRA and for vVols operations of VASA Provider
- NetApp SnapRestore (for backup and recovery)
- The NetApp SnapManager Suite
- NetApp SnapMirror or NetApp SnapVault (Optional - required for performing failover operations for SRA and VASA Provider when using vVols replication)

The Backup and Recovery capability has been integrated with SnapCenter and requires additional licenses for SnapCenter to perform backup and recovery of virtual machines and applications.

Note: Beginning with ONTAP 9.10.1, all licenses are delivered as NLFs (NetApp License File). NLF licenses can enable one or more ONTAP features, depending on your purchase. ONTAP 9.10.1 also supports 28-character license keys using System Manager or the CLI. However, if an NLF license is installed for a feature, you cannot install a 28-character license key over the NLF license for the same feature.

Table 6. Port Requirements for NetApp ONTAP Tools

TCP Port	Requirement
443 (HTTPS)	Secure communications between VMware vCenter Server and the storage systems
8143 (HTTPS)	ONTAP Tools listens for secure communications
9083 (HTTPS)	VASA Provider uses this port to communicate with the vCenter Server and obtain TCP/IP settings
7	ONTAP tools sends an echo request to ONTAP to verify reachability and is required only when adding storage system and can be disabled later.

Note: The requirements for deploying NetApp ONTAP Tools are listed here.

Procedure 1. Install NetApp ONTAP Tools for VMware vSphere via Ansible

Step 1. Clone the repository from https://github.com/NetApp/ONTAP-Tools-for-VMware-vSphere.

Step 2. Follow the instructions in the README file in the repository to ensure the Ansible environment is configured properly.

Step 3. Update the following variable files:

```
hosts
group_vars/vcenter
vars/ontap_tools_main.yml
```

Step 4. To invoke the ansible scripts, use the following command:

```
ansible-playbook -i hosts Setup_ONTAP_tools.yml
```

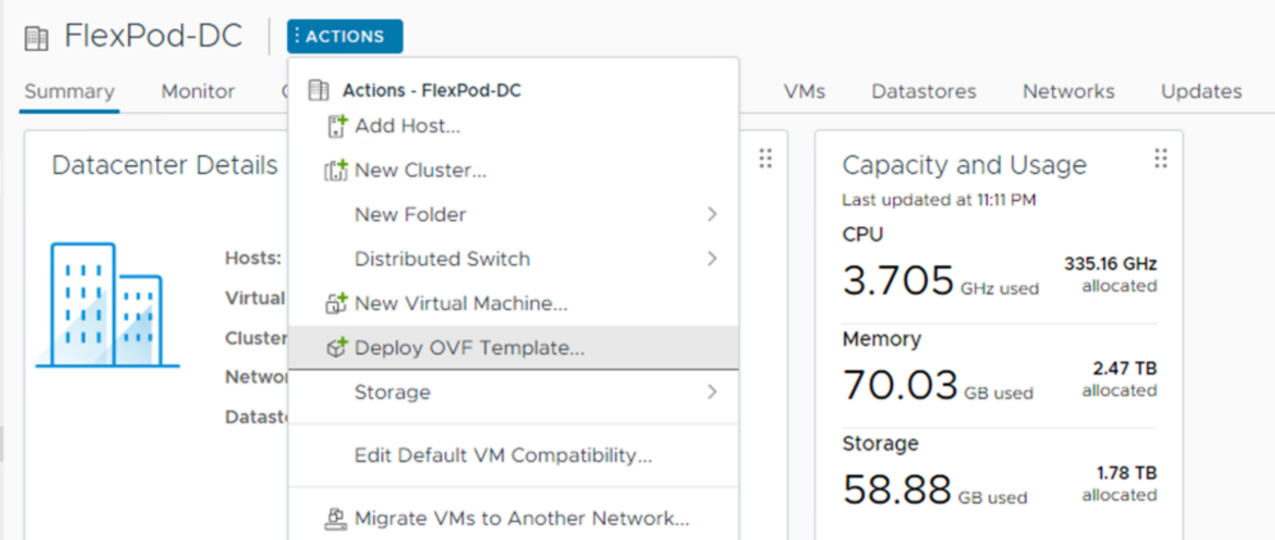
Note: The above playbook installs NetApp ONTAP Tools for VMware vSphere and registers it with VMWare vCenter. It also adds the ONTAP Storage System to ONTAP tools.

Procedure 2. Install NetApp ONTAP Tools for VMware vSphere Manually

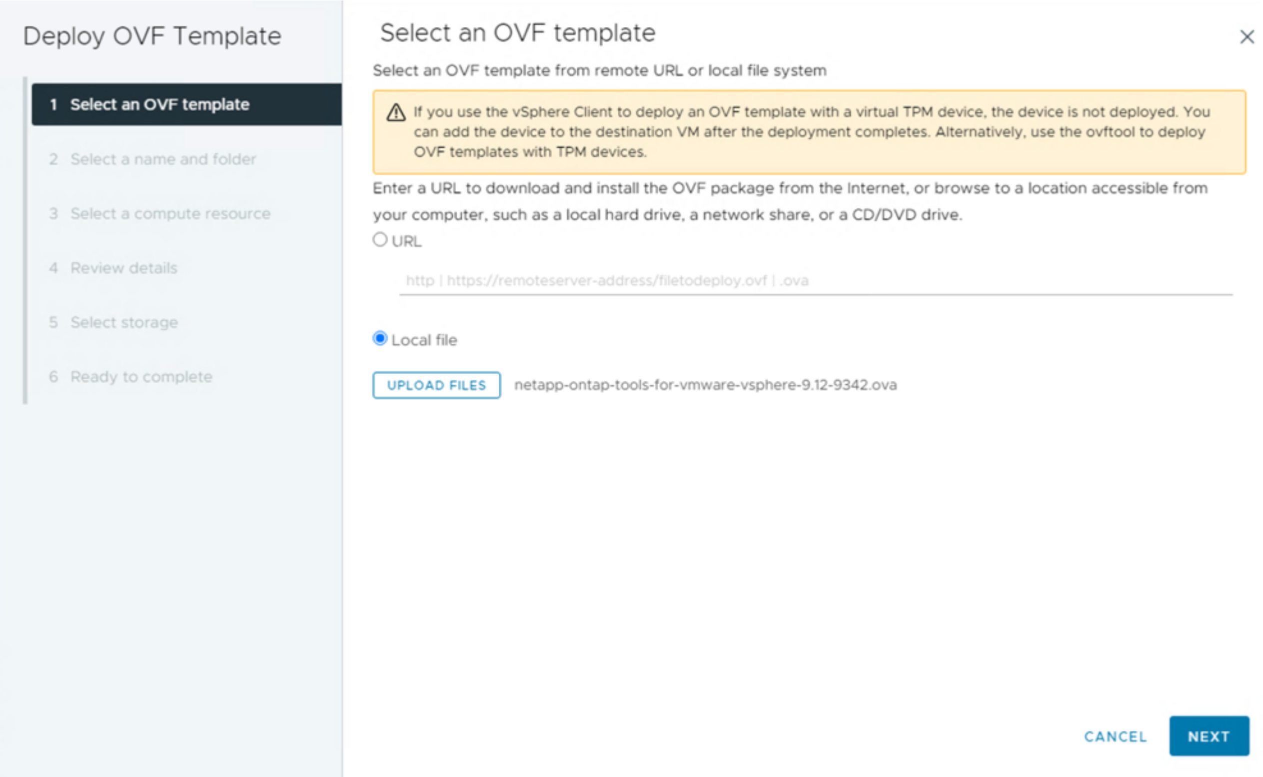
Use the following steps to manually install NetApp ONTAP Tools for VMware vSphere if desirable, or if there is a problem with running Ansible automation for it.

Step 1. Launch the **vSphere Web Client** and navigate to **Hosts** and **Clusters**.

Step 2. Select **ACTIONS** for the FlexPod-DC datacenter and select **Deploy OVF Template**.



Step 3. Select an OVF template from remote URL or local file system and click **NEXT**.



Select an OVF template from remote URL or local file system

⚠ If you use the vSphere Client to deploy an OVF template with a virtual TPM device, the device is not deployed. You can add the device to the destination VM after the deployment completes. Alternatively, use the ovftool to deploy OVF templates with TPM devices.

Enter a URL to download and install the OVF package from the Internet, or browse to a location accessible from your computer, such as a local hard drive, a network share, or a CD/DVD drive.

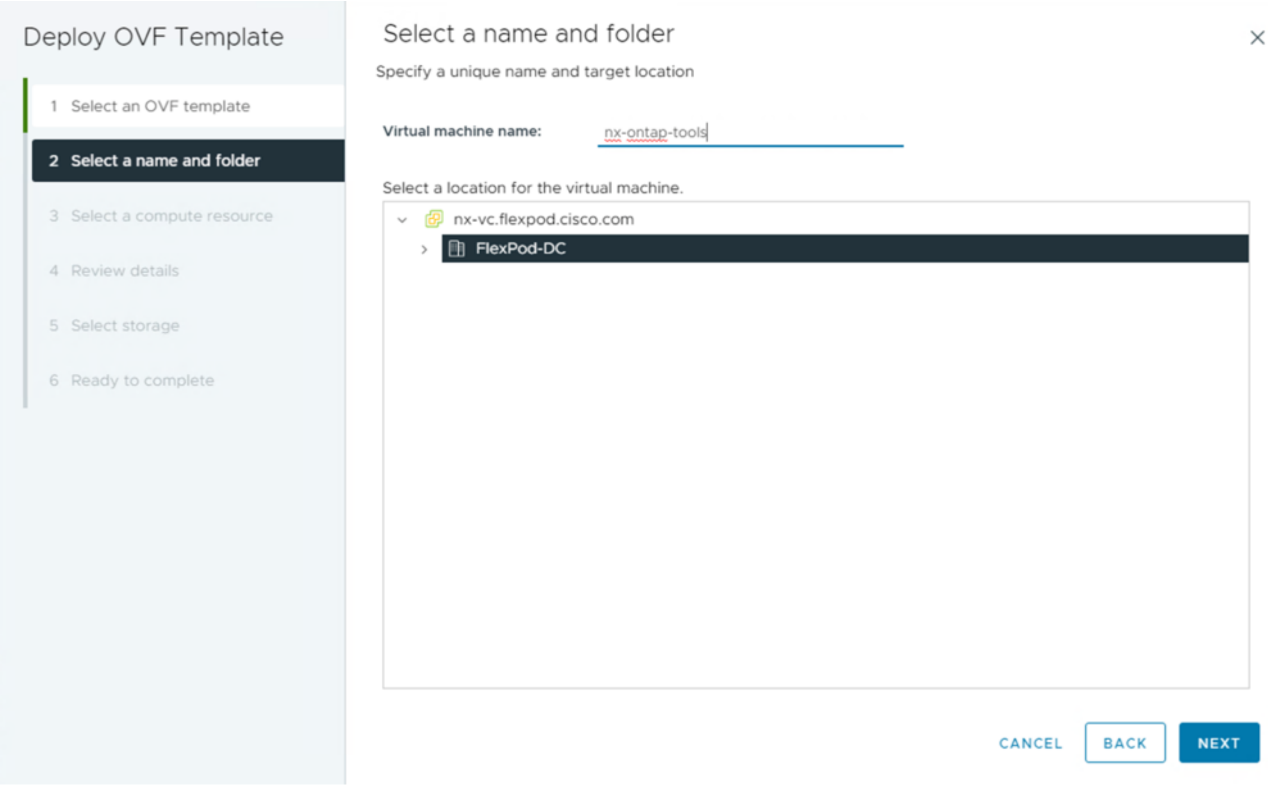
○ URL

http | https://remoteserver-address/filetodeploy.ovf | .ova

● Local file

UPLOAD FILES netapp-ontap-tools-for-vmware-vsphere-9.12-9342.ova

Step 4. Enter the **VM name**, select a **location** for the VM and click **NEXT**.



Select a name and folder

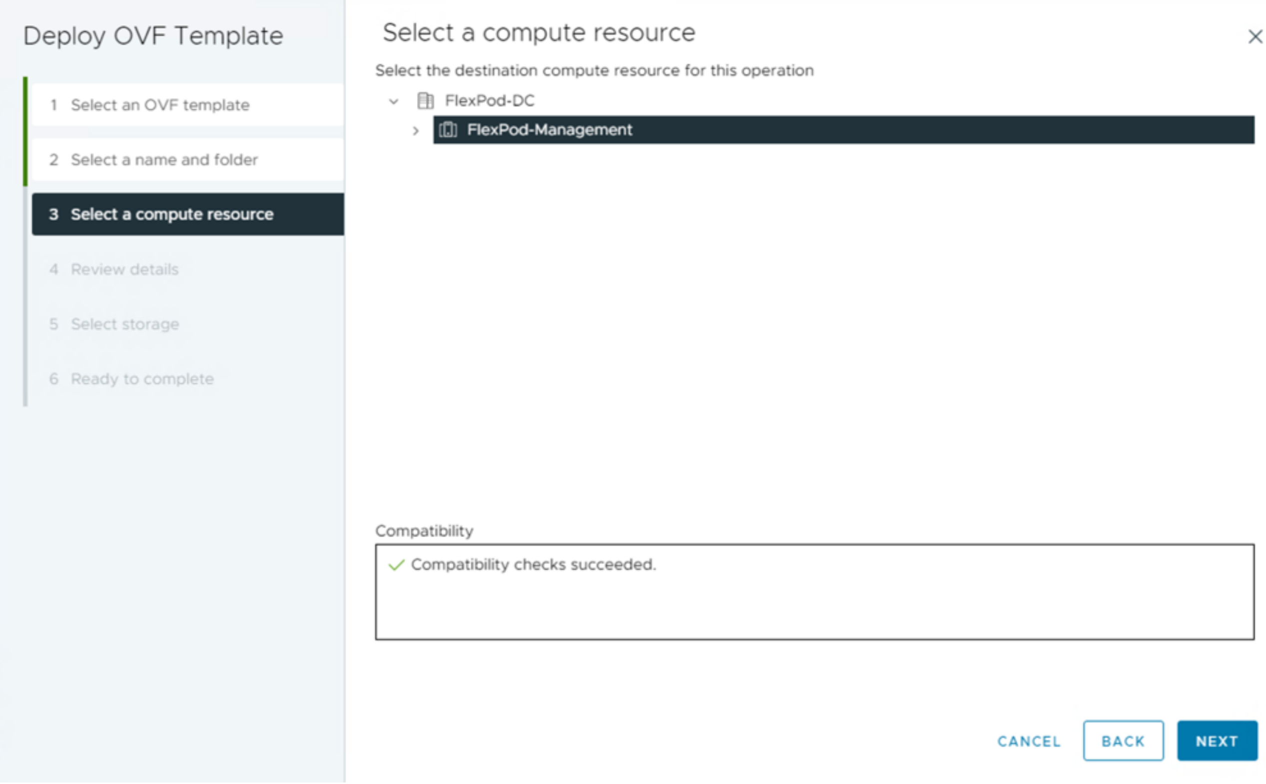
Specify a unique name and target location

Virtual machine name: nx-ontap-tools

Select a location for the virtual machine.

nx-vc.flexpod.cisco.com
FlexPod-DC

Step 5. Select a host cluster resource in which to deploy OVA and click **NEXT**.



Select a compute resource

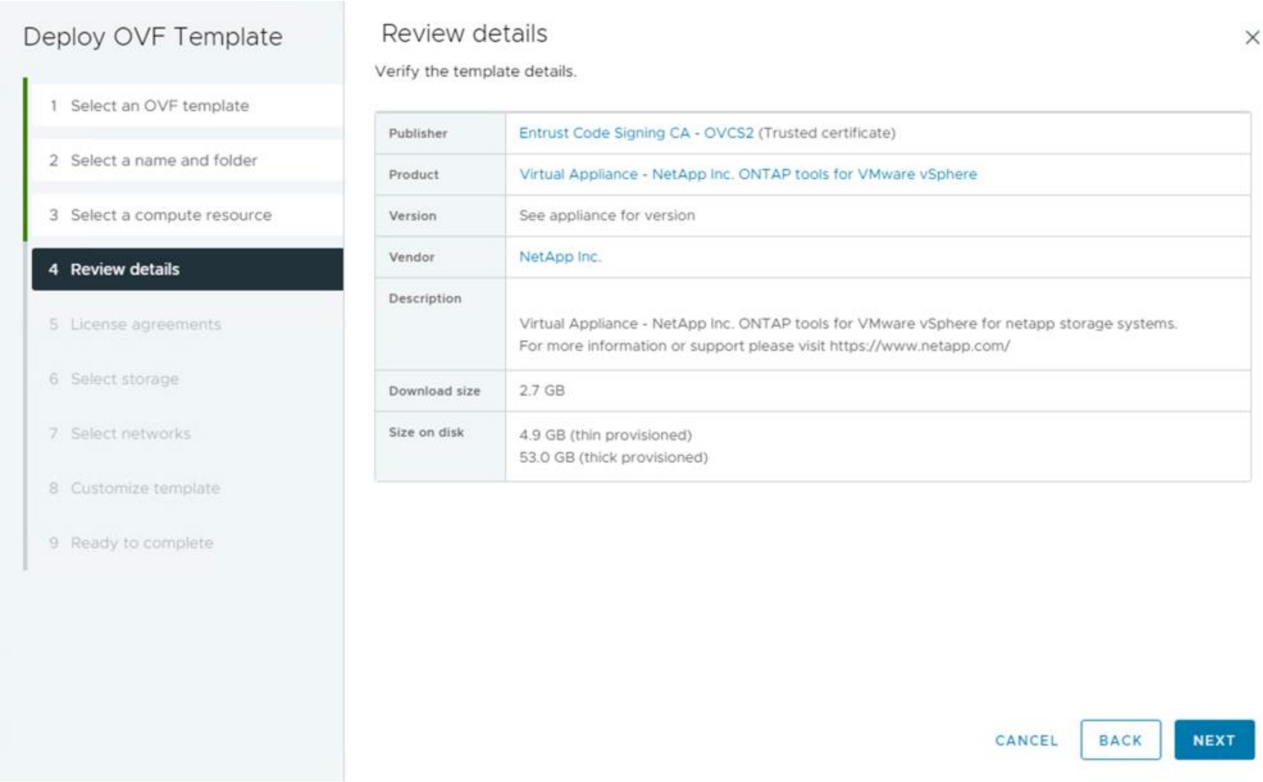
Select the destination compute resource for this operation

FlexPod-DC
FlexPod-Management

Compatibility

✓ Compatibility checks succeeded.

Step 6. Verify the template details and click **Next.**

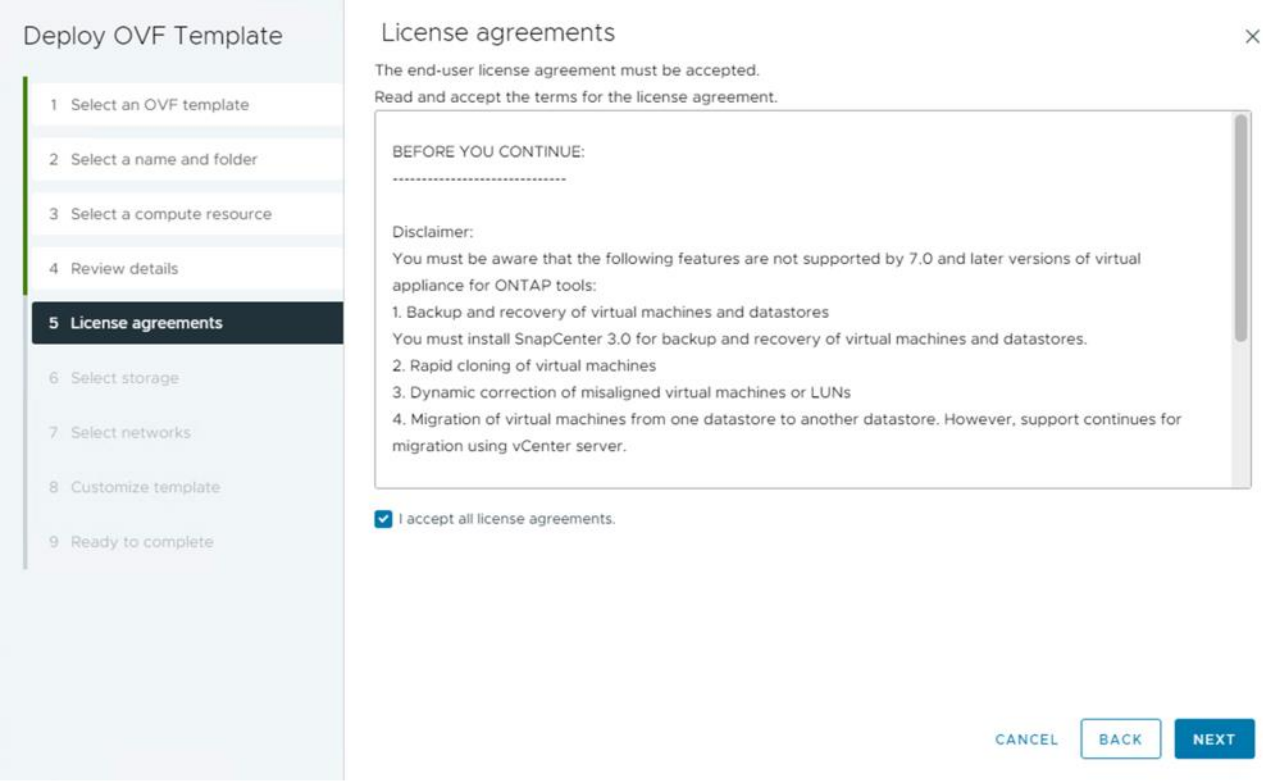


Review details

Verify the template details.

Publisher	Entrust Code Signing CA - OVCS2 (Trusted certificate)
Product	Virtual Appliance - NetApp Inc. ONTAP tools for VMware vSphere
Version	See appliance for version
Vendor	NetApp Inc.
Description	Virtual Appliance - NetApp Inc. ONTAP tools for VMware vSphere for netapp storage systems. For more information or support please visit https://www.netapp.com/
Download size	2.7 GB
Size on disk	4.9 GB (thin provisioned) 53.0 GB (thick provisioned)

Step 7. Read and accept the license agreement and click **Next.**



License agreements

The end-user license agreement must be accepted.

Read and accept the terms for the license agreement.

BEFORE YOU CONTINUE:

Disclaimer:

You must be aware that the following features are not supported by 7.0 and later versions of virtual appliance for ONTAP tools:

1. Backup and recovery of virtual machines and datastores

You must install SnapCenter 3.0 for backup and recovery of virtual machines and datastores.

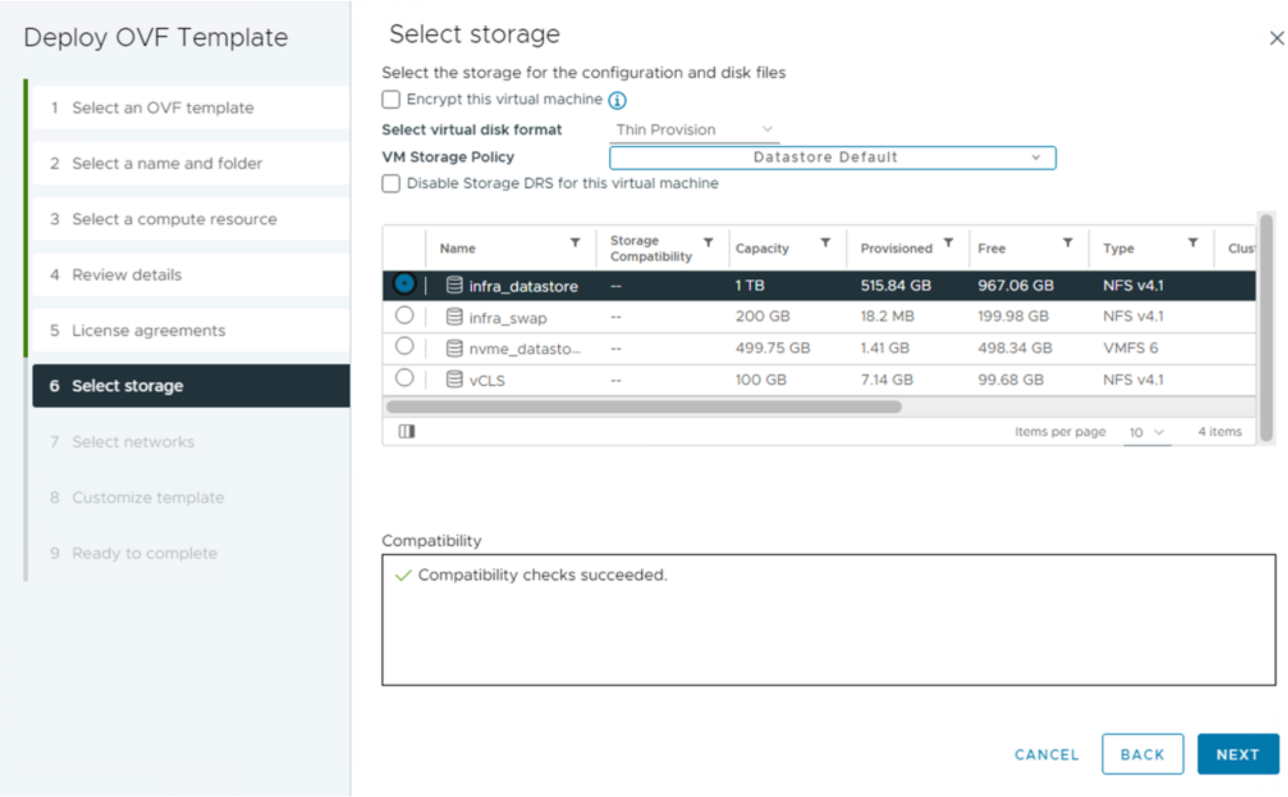
2. Rapid cloning of virtual machines

3. Dynamic correction of misaligned virtual machines or LUNs

4. Migration of virtual machines from one datastore to another datastore. However, support continues for migration using vCenter server.

☑ I accept all license agreements.

Step 8. Select the **Thin Provision** option for the virtual disk format, select **infra_datastore** for storage and click **Next.**



Select storage

Select the storage for the configuration and disk files

☐ Encrypt this virtual machine

Select virtual disk format: Thin Provision

VM Storage Policy: Datastore Default

☐ Disable Storage DRS for this virtual machine

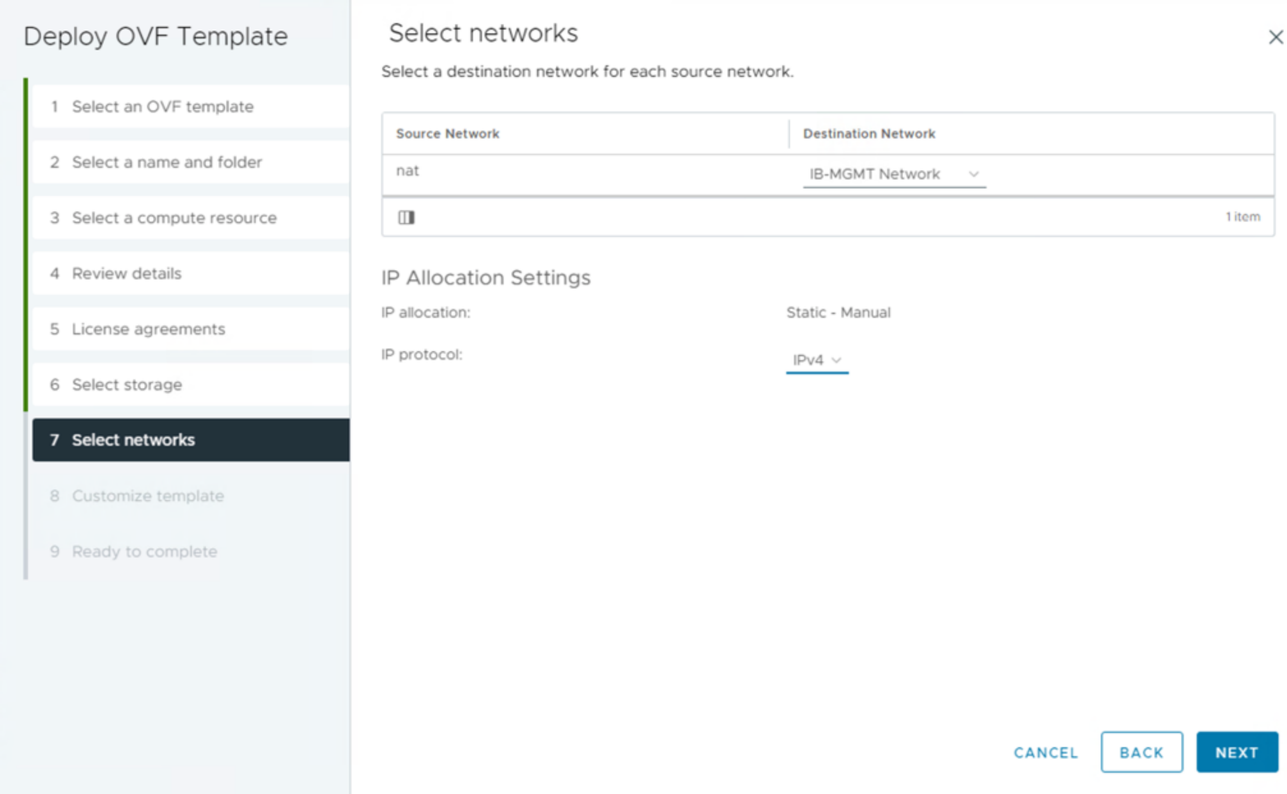
	Name	Storage Compatibility	Capacity	Provisioned	Free	Type	Clus
●	infra_datastore	--	1 TB	515.84 GB	967.06 GB	NFS v4.1	
○	infra_swap	--	200 GB	18.2 MB	199.98 GB	NFS v4.1	
○	nvme_datasto...	--	499.75 GB	1.41 GB	498.34 GB	VMFS 6	
○	vCLS	--	100 GB	7.14 GB	99.68 GB	NFS v4.1	

Items per page 10 4 items

Compatibility

✓ Compatibility checks succeeded.

Step 9. Select a destination network, IP protocol, and click **Next**.



Select networks

Select a destination network for each source network.

Source Network	Destination Network
nat	IB-MGMT Network

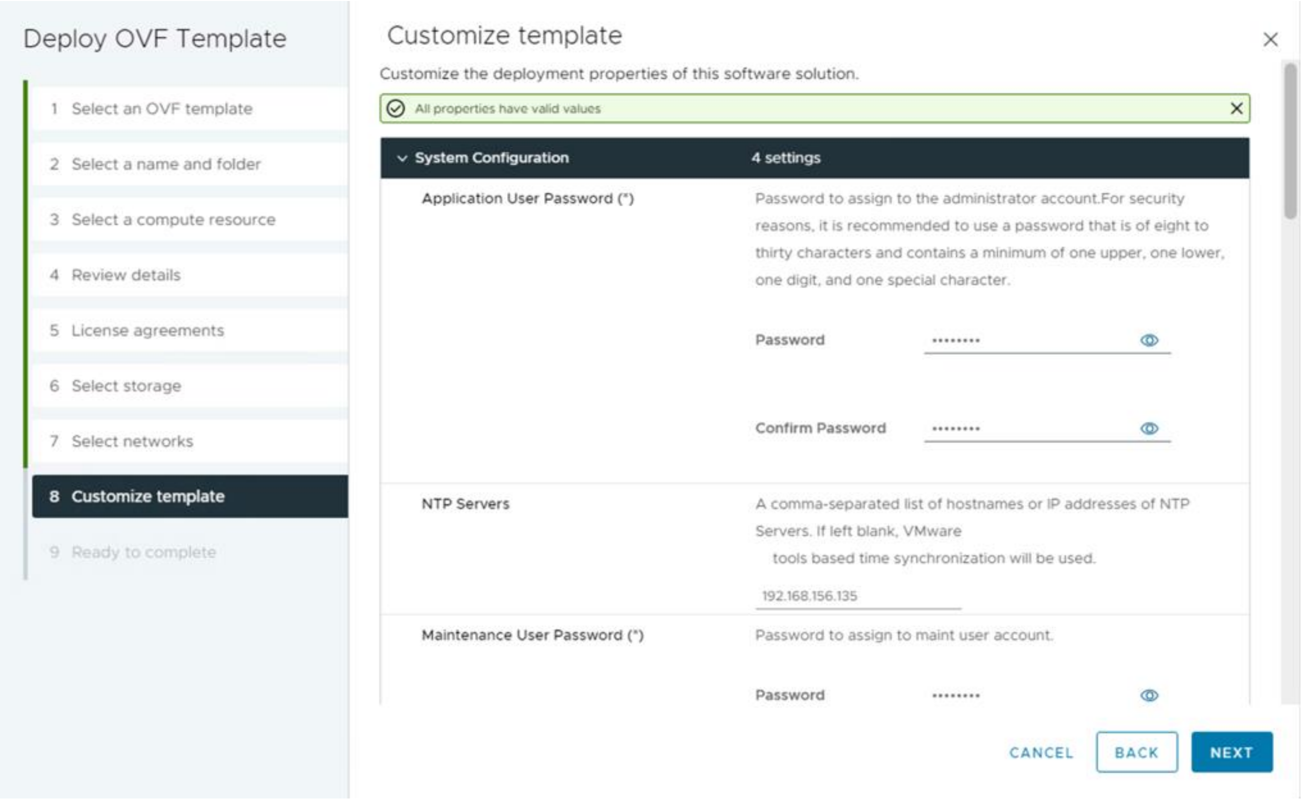
1 item

IP Allocation Settings

IP allocation: Static - Manual

IP protocol: IPv4

Step 10. From Customize Template, enter the ONTAP tools system configurations, vCenter name or IP address and other network property details and click **NEXT**.



Customize template

Customize the deployment properties of this software solution.

All properties have valid values

System Configuration 4 settings

Application User Password (*)

Password to assign to the administrator account.For security reasons, it is recommended to use a password that is of eight to thirty characters and contains a minimum of one upper, one lower, one digit, and one special character.

Password ••••••••

Confirm Password ••••••••

NTP Servers

A comma-separated list of hostnames or IP addresses of NTP Servers. If left blank, VMware tools based time synchronization will be used.

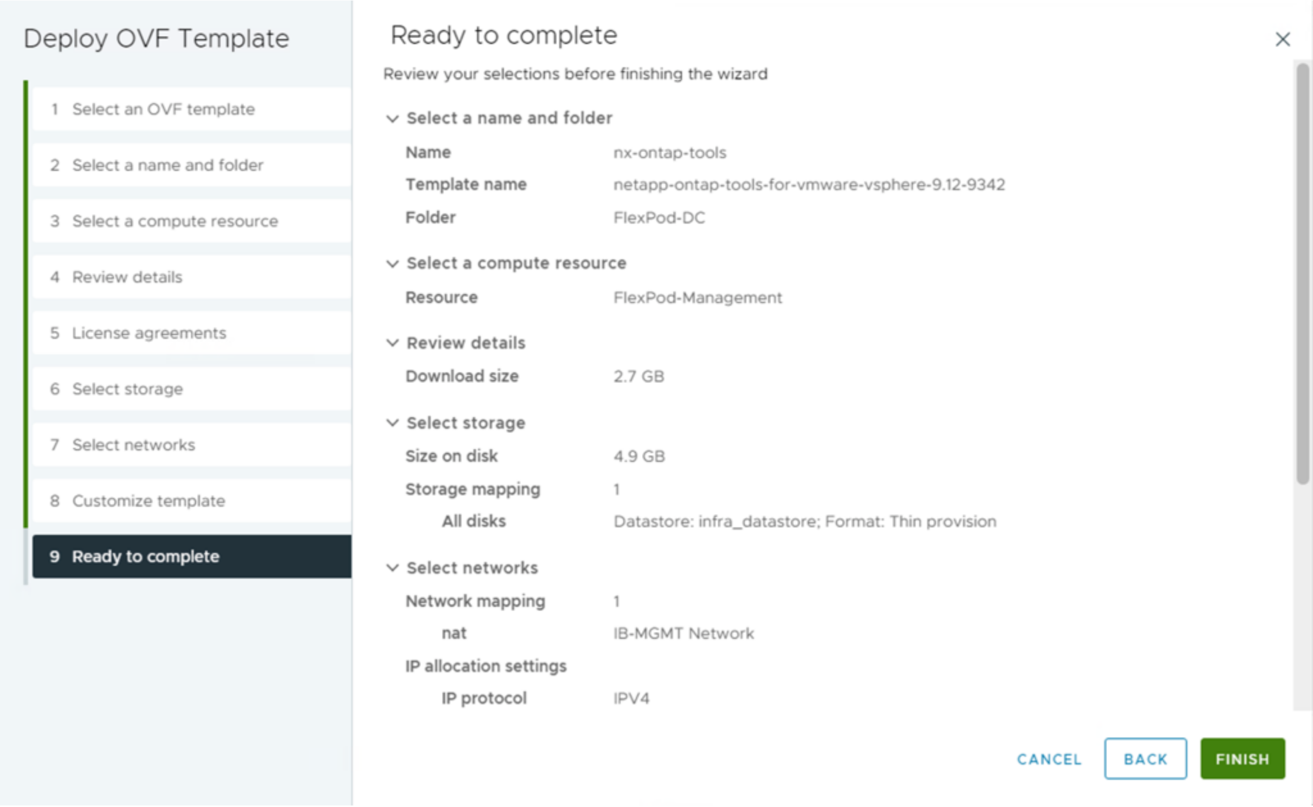
192.168.156.135

Maintenance User Password (*)

Password to assign to maint user account.

Password ••••••••

Step 11. Review the configuration details entered and click **FINISH** to complete the deployment of ONTAP tools VM.



Ready to complete

Review your selections before finishing the wizard

Select a name and folder

Name	nx-ontap-tools
Template name	netapp-ontap-tools-for-vmware-vsphere-9.12-9342
Folder	FlexPod-DC

Select a compute resource

Resource	FlexPod-Management

Review details

Download size	2.7 GB

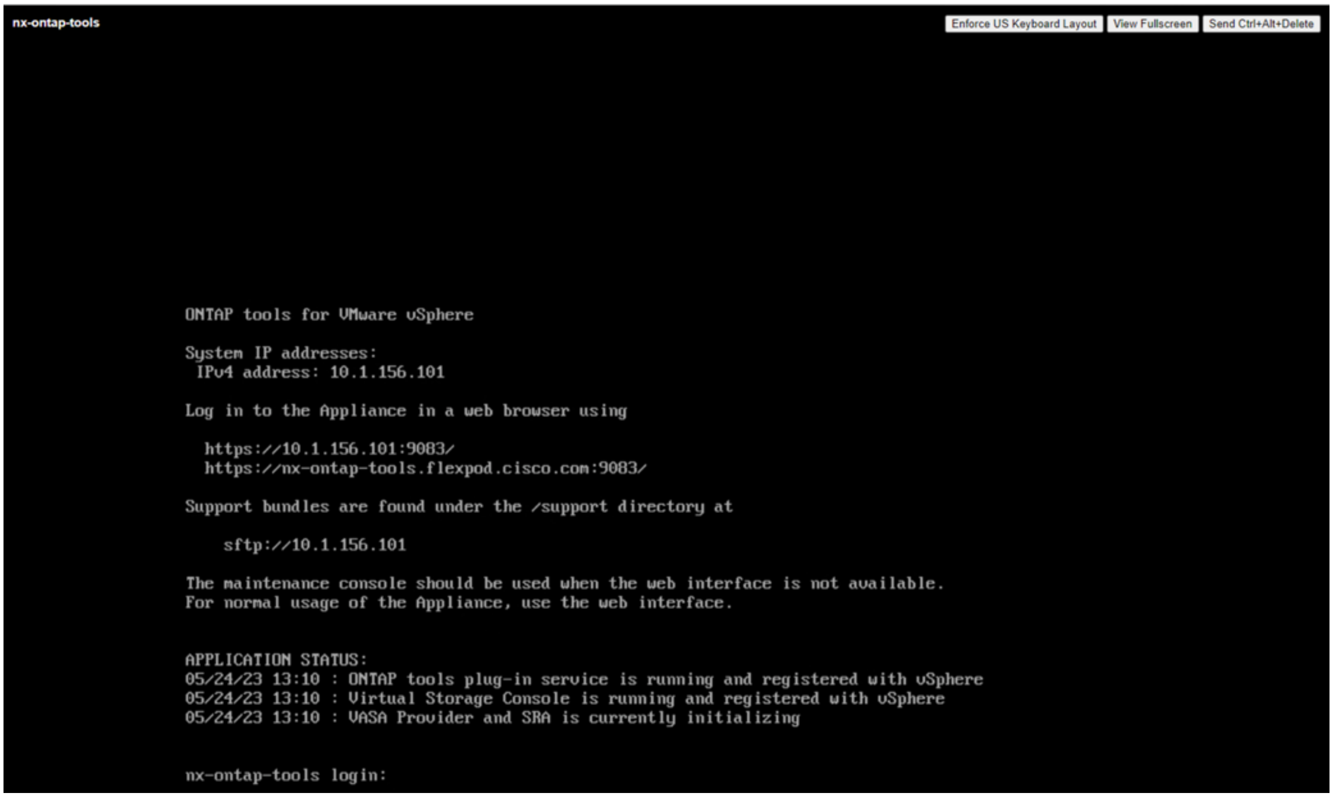
Select storage

Size on disk	4.9 GB
Storage mapping	1
All disks	Datastore: infra_datastore; Format: Thin provision

Select networks

Network mapping	1
nat	IB-MGMT Network
IP allocation settings	
IP protocol	IPV4

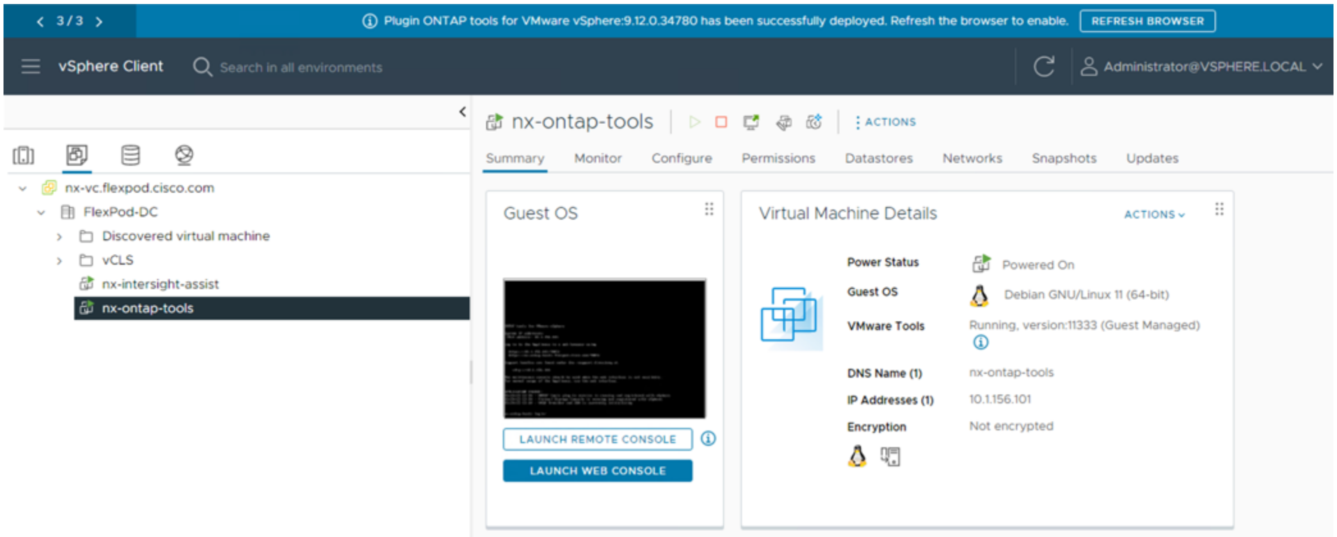
Step 12. Power on the **ONTAP tools VM** and open the **VM console** to monitor the boot up process and the information provided to confim that the tool is registered with vCenter and the Virtual Storage Console (VSC) is running.



```
ONTAP tools for VMware vSphere

System IP addresses:
 IPv4 address: 10.1.156.101

Log in to the Appliance in a web browser using

  https://10.1.156.101:9083/
  https://nx-ontap-tools.flexpod.cisco.com:9083/

Support bundles are found under the /support directory at

    sftp://10.1.156.101

The maintenance console should be used when the web interface is not available.
For normal usage of the Appliance, use the web interface.


APPLICATION STATUS:
05/24/23 13:10 : ONTAP tools plug-in service is running and registered with vSphere
05/24/23 13:10 : Virtual Storage Console is running and registered with vSphere
05/24/23 13:10 : VASA Provider and SRA is currently initializing


nx-ontap-tools login:
```

Note: If ONTAP tools is not registered with any vCenter Server, go to https://appliance_ip:8143/Register.html to register the VSC instance. The Register.html redirects you to the swagger page. From ONTAP tools 9.12 onwards the registration of ONTAP tools with vCenter happens from the swagger page.

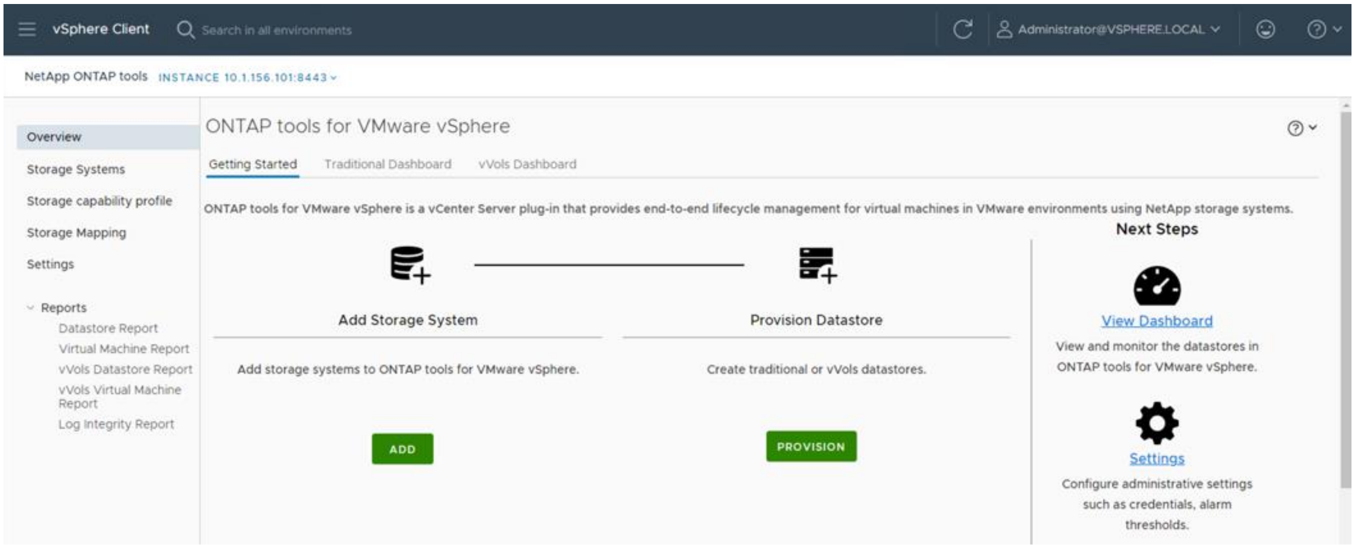
Step 13. Click the notification on top of the vSphere Client GUI to see the notification that the ONTAP tools plugin has been deployed and click **REFRESH BROWSER** to enable it.



Plugin ONTAP tools for VMware vSphere:9.12.0.34780 has been successfully deployed. Refresh the browser to enable.

Power Status	Powered On
Guest OS	Debian GNU/Linux 11 (64-bit)
VMware Tools	Running, version:11333 (Guest Managed)
DNS Name (1)	nx-ontap-tools
IP Addresses (1)	10.1.156.101
Encryption	Not encrypted

Step 14. From the **vSphere Client GUI menu**, open the **NetApp ONTAP tools plugin** to view the plugin information, add storage system, and provision datastores.



ONTAP tools for VMware vSphere is a vCenter Server plug-in that provides end-to-end lifecycle management for virtual machines in VMware environments using NetApp storage systems.

Add storage systems to ONTAP tools for VMware vSphere.

Create traditional or vVols datastores.

View and monitor the datastores in ONTAP tools for VMware vSphere.

Configure administrative settings such as credentials, alarm thresholds.

Procedure 3. Add ONTAP Cluster to ONTAP tools manually

Step 1. From the vSphere Client GUI Menu, open the NetApp ONTAP tools plugin.

Step 2. From the **Getting Started** tab, add storage system to ONTAP tools by clicking **ADD**.

Step 3. Provide the storage system information and login credential and click **ADD**.

Step 4.

Step 5. Click **YES** when prompted to authorize the ONTAP Cluster certificate.

Step 6. Go to the **Storage System menu** to see the newly added ONTAP cluster information.

Procedure 4. Download and Install the NetApp NFS Plug-in for VMware VAAI

Step 1. Download the Netapp NFS Plug-in 2.0.1 for VMware VAAI file from: https://mysupport.netapp.com/site/products/all/details/nfsplugin-vmware-vaai/downloads-tab

Step 2. Go to vib20 > NetAppNasPlugin and unzip the file and extract NetApp_bootbank_NetAppNasPlugin_2.0.1-16.vib.

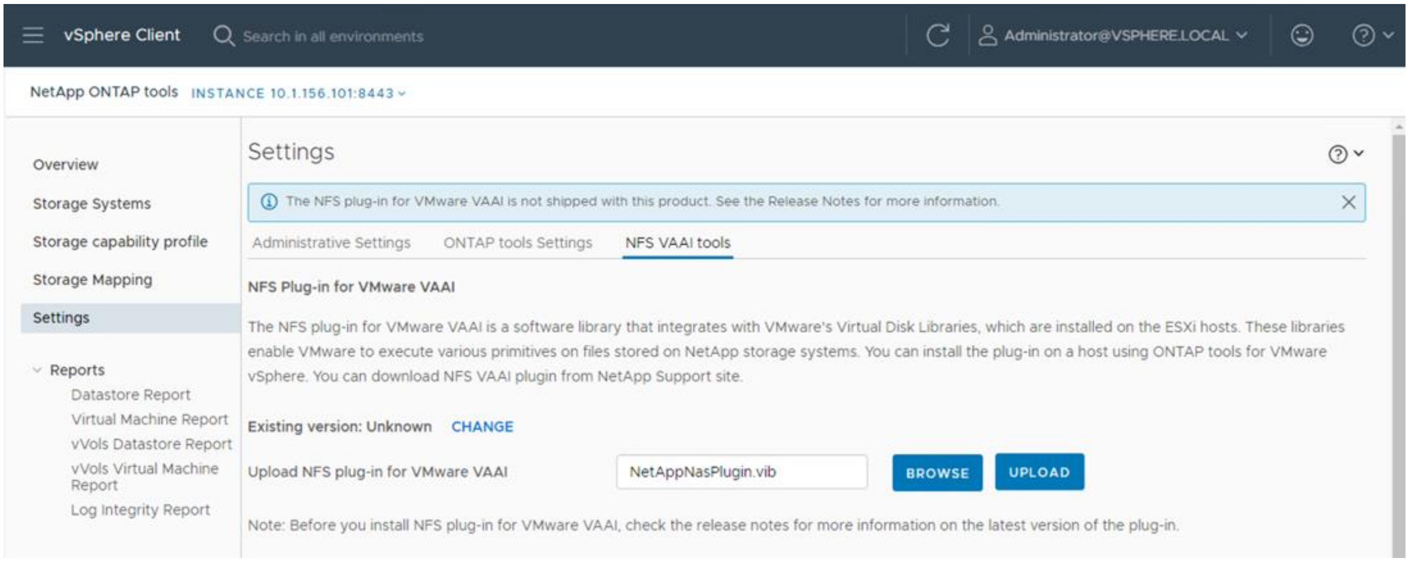
Step 3. Rename the .vib file to **NetAppNasPlugin.vib** to match the predefined name that ONTAP tools uses.

Step 4. Click **Settings** from the ONTAP tool Getting Started page.

Step 5. Click NFS VAAI Tools tab.

Step 6. Click **Change** in the Existing version section.

Step 7. Browse and select the renamed .vib file, and then click **Upload** to upload the file to the virtual appliance.



Settings

The NFS plug-in for VMware VAAI is not shipped with this product. See the Release Notes for more information.

NFS Plug-in for VMware VAAI

The NFS plug-in for VMware VAAI is a software library that integrates with VMware's Virtual Disk Libraries, which are installed on the ESXi hosts. These libraries enable VMware to execute various primitives on files stored on NetApp storage systems. You can install the plug-in on a host using ONTAP tools for VMware vSphere. You can download NFS VAAI plugin from NetApp Support site.

Existing version: Unknown

Upload NFS plug-in for VMware VAAI: NetAppNasPlugin.vib

Note: Before you install NFS plug-in for VMware VAAI, check the release notes for more information on the latest version of the plug-in.

Note: The next step is only required on the hosts where NetApp VAAI plug-in was not installed alongside Cisco VIC driver installation.

Step 8. In the **Install on ESXi Hosts** section, select the ESXi host where the NFS Plug-in for VAAI is to be installed, and then click **Install.**

Step 9. **Reboot** the ESXi host after the installation finishes.

Procedure 11. Verify the VASA Provider

Note: The VASA provider for ONTAP is enabled by default during the installation of the NetApp ONTAP tools.

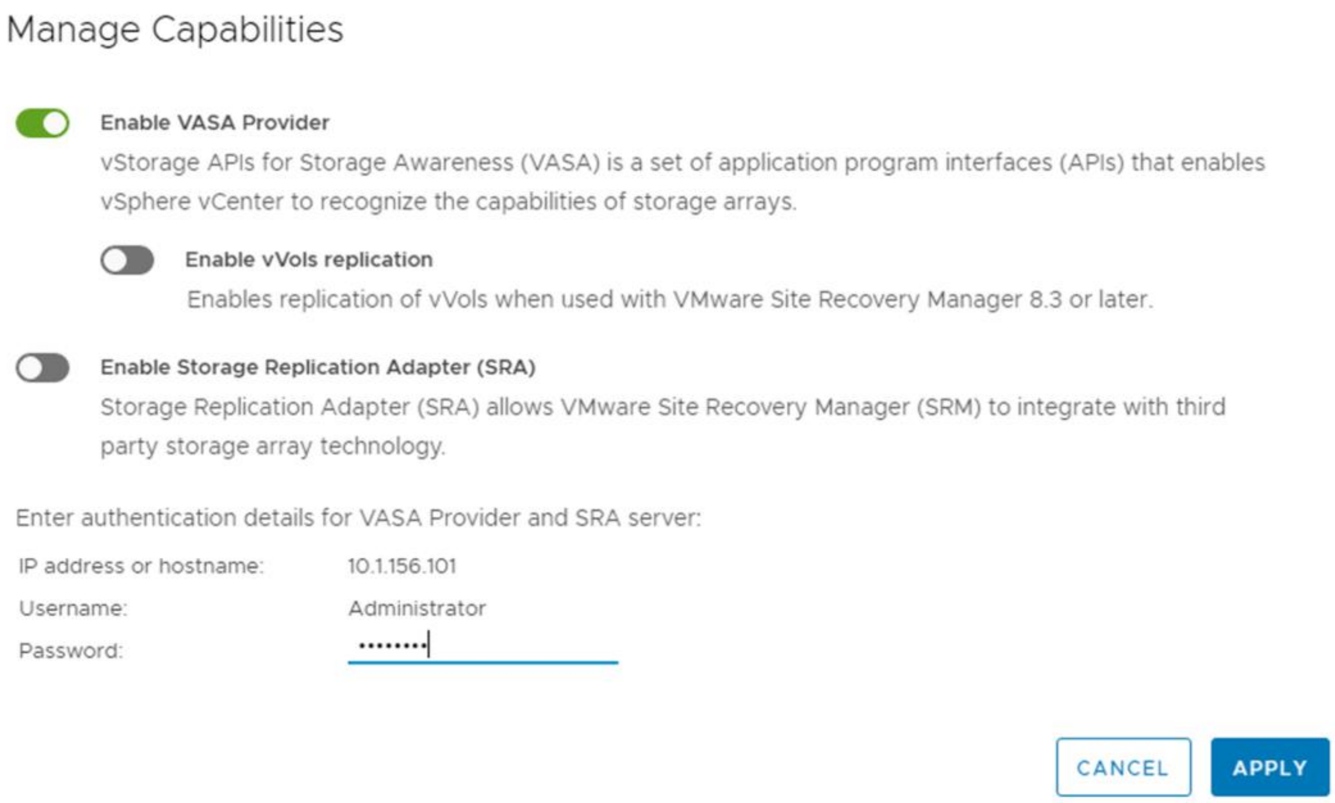
Step 1. From the vSphere Client, click **Menu** > **NetApp ONTAP tools**.

Step 2. Click **Settings**.

Step 3. From the Administrative Settings tab, click **Manage Capabilities**.

Step 4. In the **Manage Capabilities** dialog box, click **Enable VASA Provider** if it was not pre-enabled.

Step 5. Enter the IP address of the virtual appliance for ONTAP tools, VASA Provider, and VMware Storage Replication Adapter (SRA) and the administrator password, and then click **Apply if changes to capabilities were made.**



Manage Capabilities

Enable VASA Provider

vStorage APIs for Storage Awareness (VASA) is a set of application program interfaces (APIs) that enables vSphere vCenter to recognize the capabilities of storage arrays.

Enable vVols replication

Enables replication of vVols when used with VMware Site Recovery Manager 8.3 or later.

Enable Storage Replication Adapter (SRA)

Storage Replication Adapter (SRA) allows VMware Site Recovery Manager (SRM) to integrate with third party storage array technology.

Enter authentication details for VASA Provider and SRA server:

IP address or hostname: 10.1.156.101

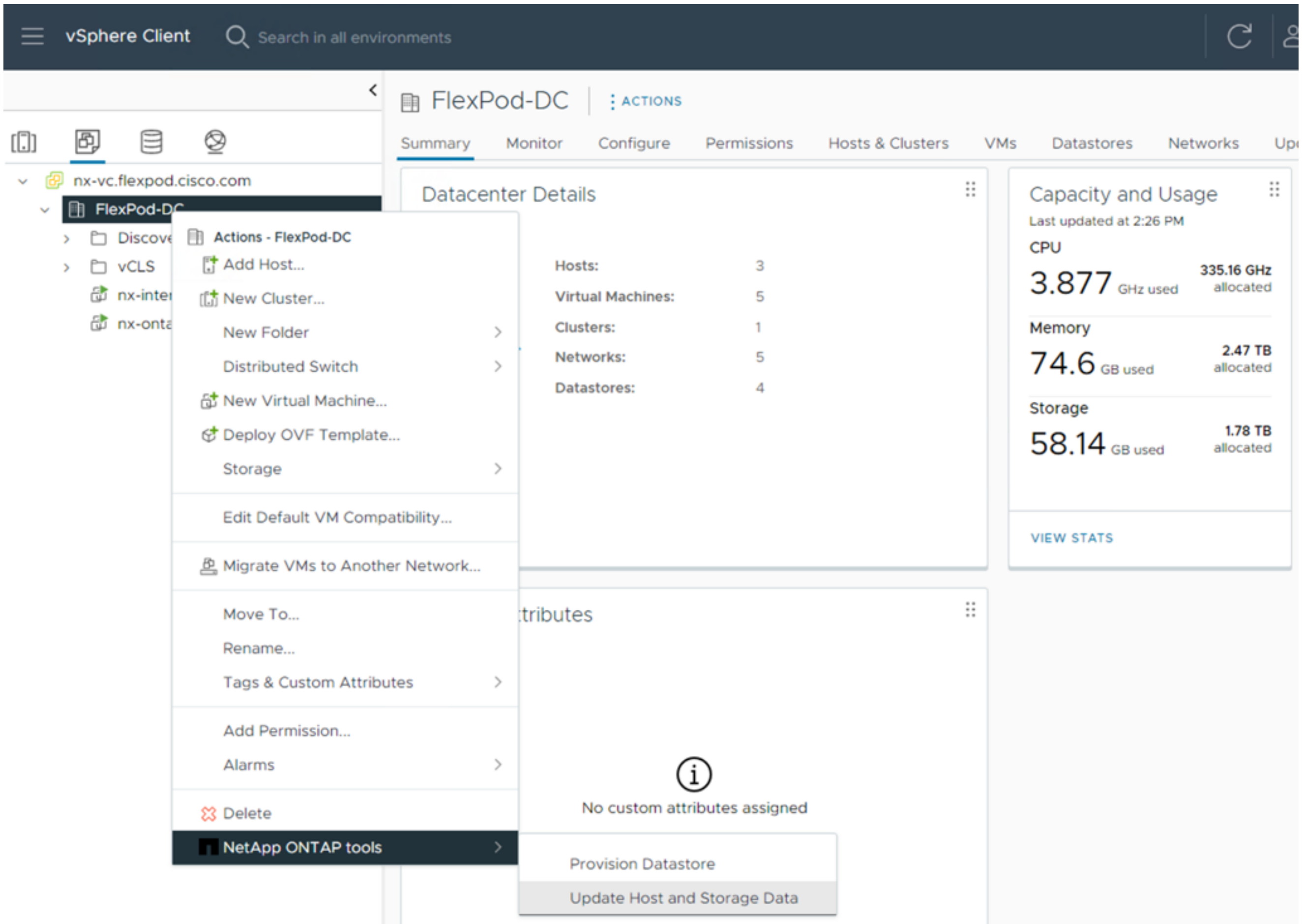
Username: Administrator

Password: ••••••••

Procedure 5. Update Host and Storage Data

Step 1. From the vSphere Client Home Page, click **Hosts** and **Clusters**.

Step 2. Right-click the FlexPod-DC datacenter, click **NetApp ONTAP tools** > **Update Host and Storage Data**.



Step 3. On the Confirmation dialog box, click **YES**. It might take a few minutes to update the data.

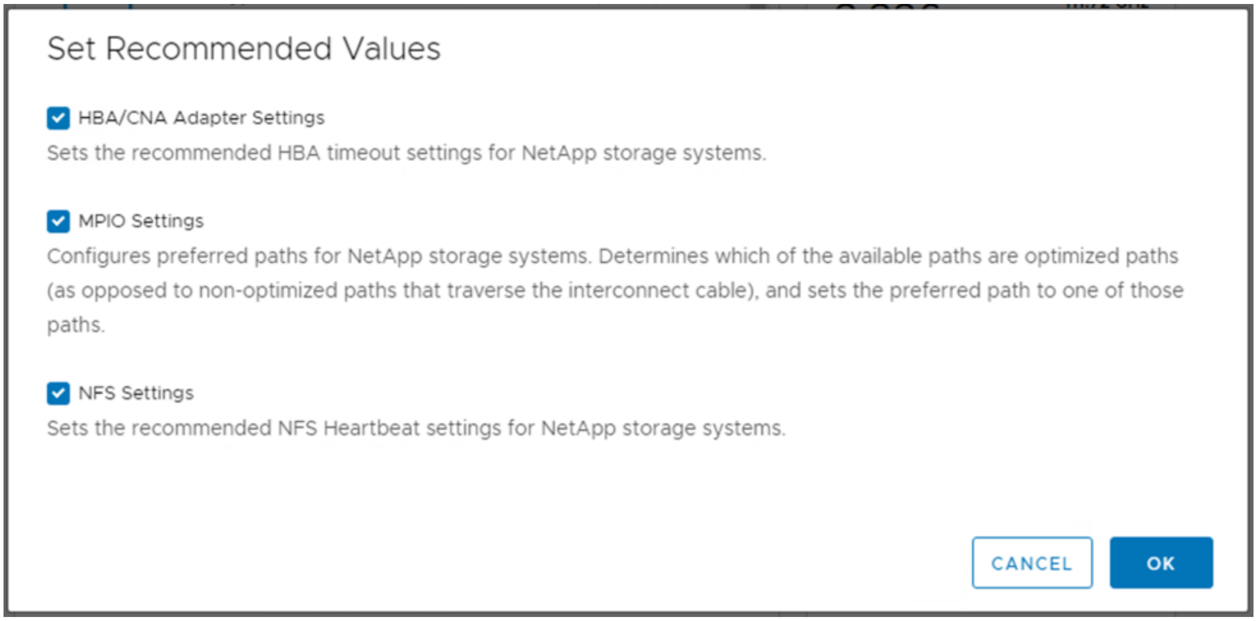
Procedure 6. Optimal Storage Settings for ESXi Hosts

Note: ONTAP tools enables the automated configuration of storage-related settings for all ESXi hosts that are connected to NetApp storage controllers.

Step 1. From the VMware vSphere Web Client Home page, click vCenter > Hosts and Clusters.

Step 2. Select a host and then click Actions > NetApp ONTAP tools > Set Recommended Values.

Step 3. In the **NetApp Recommended Settings** dialog box, select all the applicable **values** for the ESXi host.



Set Recommended Values

☑ HBA/CNA Adapter Settings

Sets the recommended HBA timeout settings for NetApp storage systems.

☑ MPIO Settings

Configures preferred paths for NetApp storage systems. Determines which of the available paths are optimized paths (as opposed to non-optimized paths that traverse the interconnect cable), and sets the preferred path to one of those paths.

☑ NFS Settings

Sets the recommended NFS Heartbeat settings for NetApp storage systems.

Note: This functionality sets values for HBAs and converged network adapters (CNAs), sets appropriate paths and path-selection plug-ins, and verifies appropriate settings for NFS I/O. A vSphere host reboot may be required after applying the settings.

Table 7. Click **OK**.

Provision Datastores using ONTAP Tools (Optional)

Using ONTAP tools, the administrator can provision an NFS, FC, FC-NVMe or iSCSI datastore and attach it to a single or multiple hosts in the cluster. The following steps describe provisioning a datastore and attaching it to the cluster.

Note: It is a NetApp best practice to use ONTAP tools to provision any additional datastores for the FlexPod infrastructure. When using VSC to create vSphere datastores, all NetApp storage best practices are implemented during volume creation and no additional configuration is needed to optimize performance of the datastore volumes.

Storage Capabilities

A storage capability is a set of storage system attributes that identifies a specific level of storage performance (storage service level), storage efficiency, and other capabilities such as encryption for the storage object that is associated with the storage capability.

Create the Storage Capability Profile

In order to leverage the automation features of VASA two primary components must first be configured. The Storage Capability Profile (SCP) and the VM Storage Policy. The Storage Capability Profile expresses a specific set of storage characteristics into one or more profiles used to provision a Virtual Machine. The SCP is specified as part of VM Storage Policy. NetApp ONTAP tools comes with several pre-configured SCPs such as Platinum, Bronze, and so on.

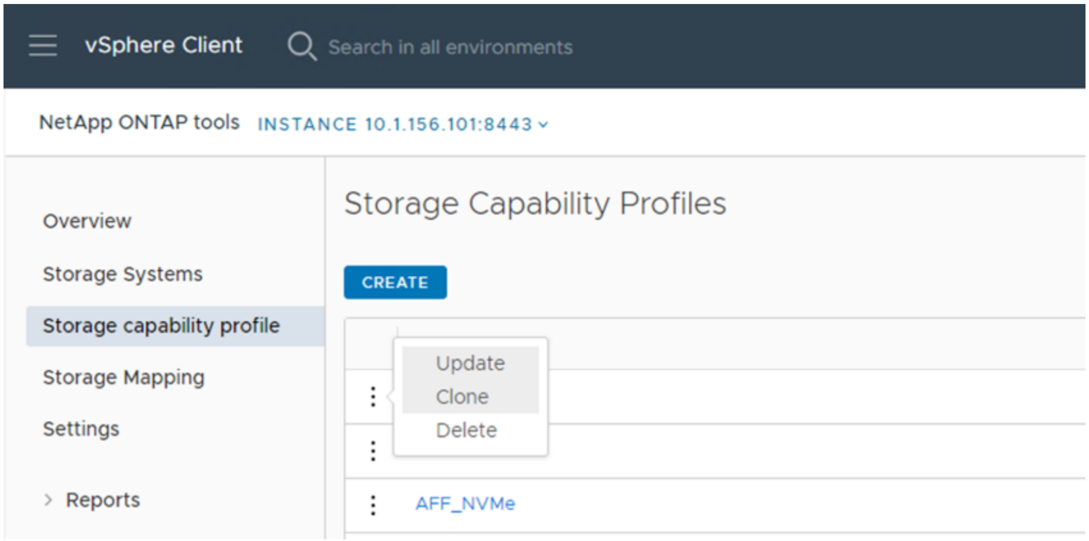
Note: The ONTAP tools for VMware vSphere plug-in also allows you to set Quality of Service (QoS) rule using a combination of maximum and/or minimum IOPs.

Procedure 1. Review or Edit the Built-In Profiles Pre-Configured with ONTAP Tools

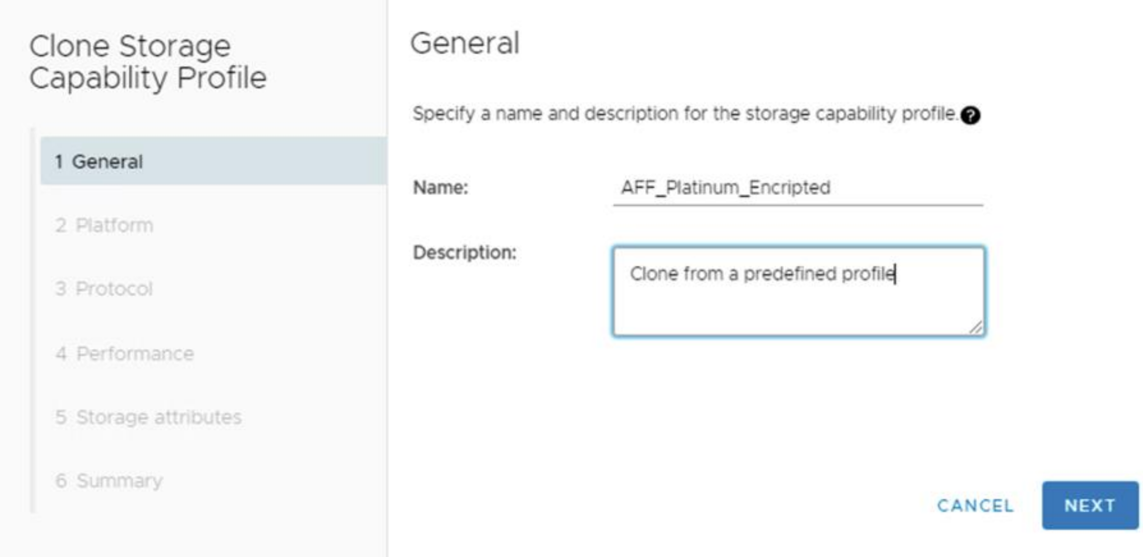
Step 1. From the vCenter console, click **Menu** > **NetApp ONTAP tools.**

Step 2. From the NetApp ONTAP tools click Storage Capability Profiles.

Step 3. Select the **Platinum** Storage Capability Profile and select **Clone** from the toolbar.



Step 4. Enter a name for the cloned SCP (for example, AFF_Platinum_Encrypted) and add a description if desired. Click **NEXT**.



Specify a name and description for the storage capability profile.

Name: AFF_Platinum_Encripted

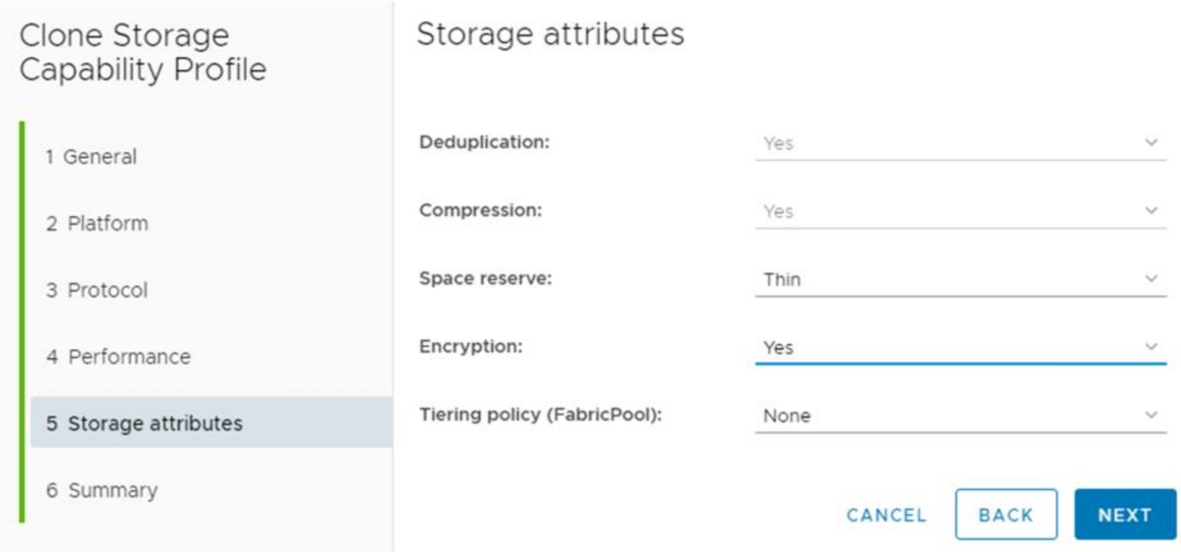
Description: Clone from a predefined profile

Step 5. Select **All Flash FAS(AFF)** for the storage platform and click **NEXT**.

Step 6. Select **Any** for the Protocol and click **NEXT**.

Step 7. Select **None** to allow unlimited performance or set a the desired minimum and maximum IOPS for the QoS policy group. Click **NEXT**.

Step 8. On the Storage attributes page**,** change the Encryption and Tiering policy to the desired settings and click **NEXT**. In the example below, Encryption was enabled.



Storage attributes

Deduplication: Yes

Compression: Yes

Space reserve: Thin

Encryption: Yes

Tiering policy (FabricPool): None

Step 9. Review the summary page and click **FINISH** to create the storage capability profile.

Note: It is recommended to Clone the Storage Capability Profile if you wish to make any changes to the predefined profiles rather than editing the built-in profile.

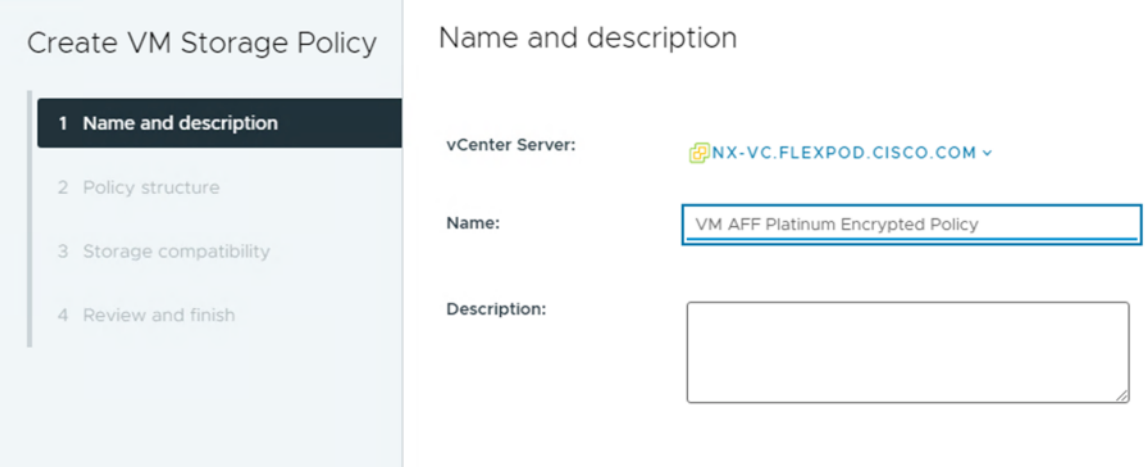
Procedure 7. Create a VM Storage Policy

Note: You must create a VM storage policy and associate SCP to the datastore that meets the requirements defined in the SCP.

Step 1. From the vCenter console, click **Menu** > **Policies and Profiles**.

Step 2. Select VM Storage Policies and click **CREATE**.

Step 3. Create a name for the VM storage policy and enter a description if desired and click **NEXT**.



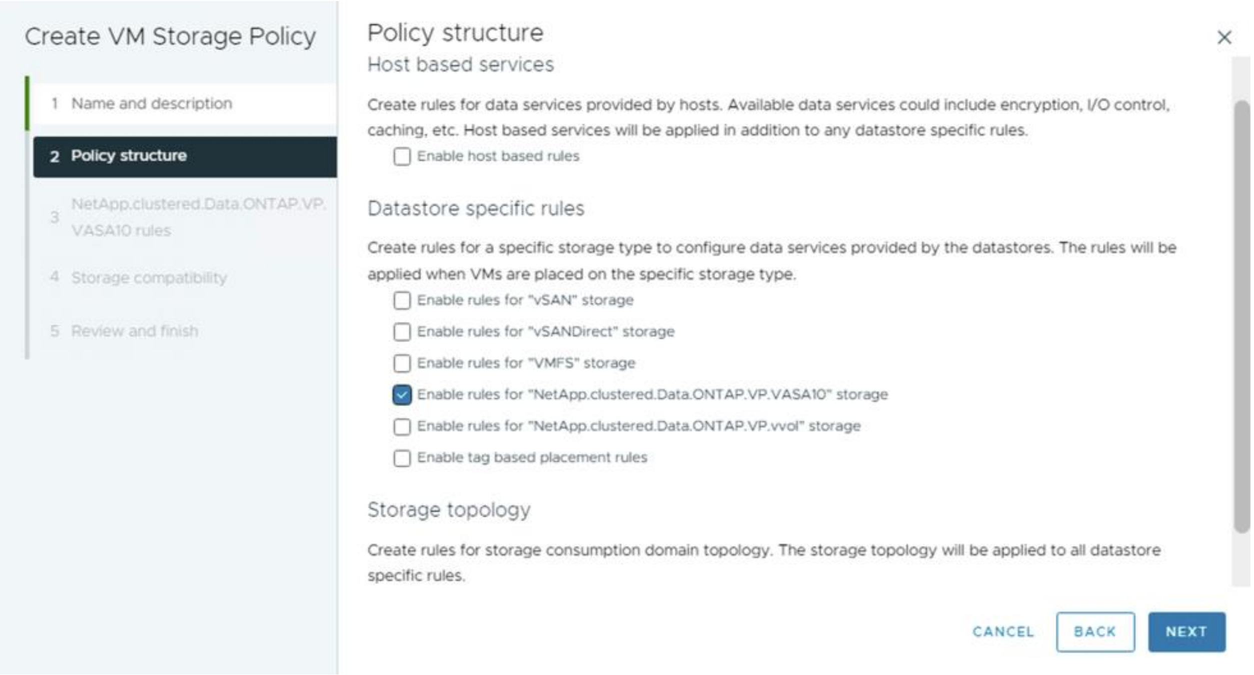
Name and description

vCenter Server: NX-VC.FLEXPOD.CISCO.COM

Name: VM AFF Platinum Encrypted Policy

Description:

Step 4. Select **Enable rules for NetApp.clustered.Data.ONTAP.VP.VASA10 storage** located under the Datastore specific rules section and click **NEXT**.


Create VM Storage Policy

1 Name and description

2 Policy structure

3 NetApp.clustered.Data.ONTAP.VP.VASA10 rules

4 Storage compatibility

5 Review and finish

Policy structure

Host based services

Create rules for data services provided by hosts. Available data services could include encryption, I/O control, caching, etc. Host based services will be applied in addition to any datastore specific rules.

□ Enable host based rules

Datastore specific rules

Create rules for a specific storage type to configure data services provided by the datastores. The rules will be applied when VMs are placed on the specific storage type.

□ Enable rules for "vSAN" storage

□ Enable rules for "vSANDirect" storage

□ Enable rules for "VMFS" storage

☑ Enable rules for "NetApp.clustered.Data.ONTAP.VP.VASA10" storage

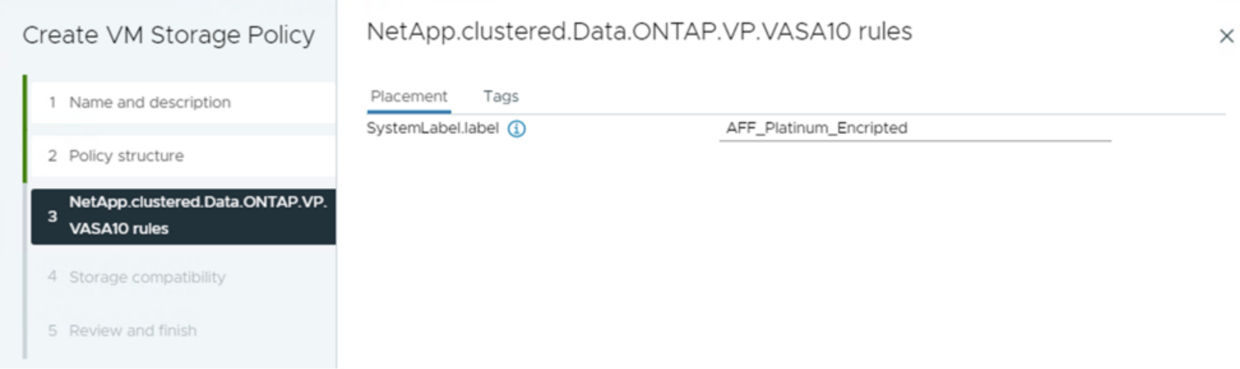
□ Enable rules for "NetApp.clustered.Data.ONTAP.VP.vvol" storage

□ Enable tag based placement rules

Storage topology

Create rules for storage consumption domain topology. The storage topology will be applied to all datastore specific rules.

Step 5. From the Placement tab select the SCP created in the previous step and click **NEXT**.


Create VM Storage Policy

1 Name and description

2 Policy structure

3 NetApp.clustered.Data.ONTAP.VP.VASA10 rules

4 Storage compatibility

5 Review and finish

NetApp.clustered.Data.ONTAP.VP.VASA10 rules

SystemLabel.label AFF_Platinum_Encripted

Step 6. All the datastores with matching capabilities are displayed, click **NEXT**.

Step 7. Review the policy summary and click **FINISH**.

Procedure 8. Provision NFS Datastore

Step 1. From the vCenter console, click **Menu > NetApp ONTAP tools**.

Step 2. From the **ONTAP tools Home** page, click **Overview**.

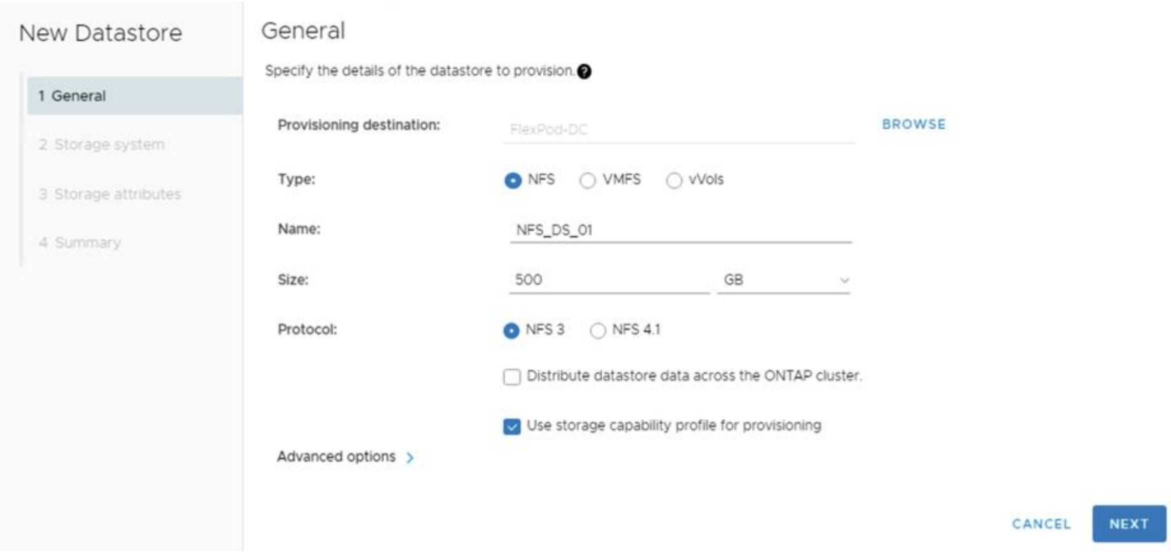
Step 3. From the Getting Started tab, click **Provision**.

Step 4. Click **Browse** to select the destination to provision the datastore.

Step 5. Select the type as **NFS** and Enter the datastore name (for example, NFS_DS_1).

Step 6. Provide the size of the datastore and the NFS Protocol.

Step 7. Check the storage capability profile and click **NEXT**.


New Datastore

General

Specify the details of the datastore to provision.

Provisioning destination: FlexPod-DC BROWSE

Type: ● NFS ○ VMFS ○ vVols

Name: NFS_DS_01

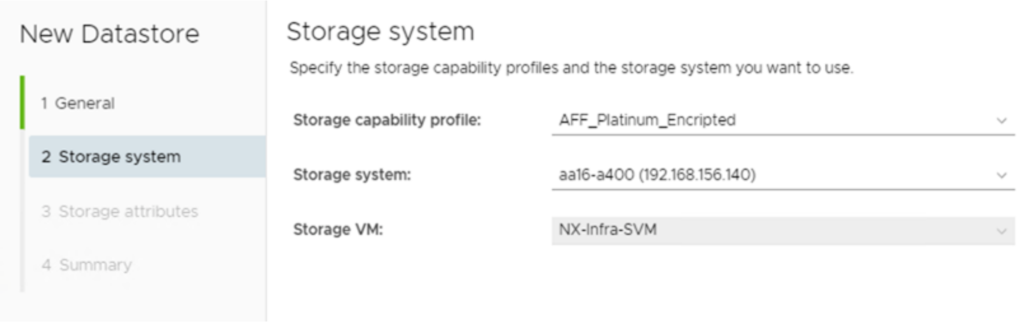
Size: 500 GB

Protocol: ● NFS 3 ○ NFS 4.1

□ Distribute datastore data across the ONTAP cluster.

☑ Use storage capability profile for provisioning

Step 8. Select the desired Storage Capability Profile, cluster name and the desired SVM to create the datastore. In this example, the Infra-SVM is selected.


New Datastore

Storage system

Specify the storage capability profiles and the storage system you want to use.

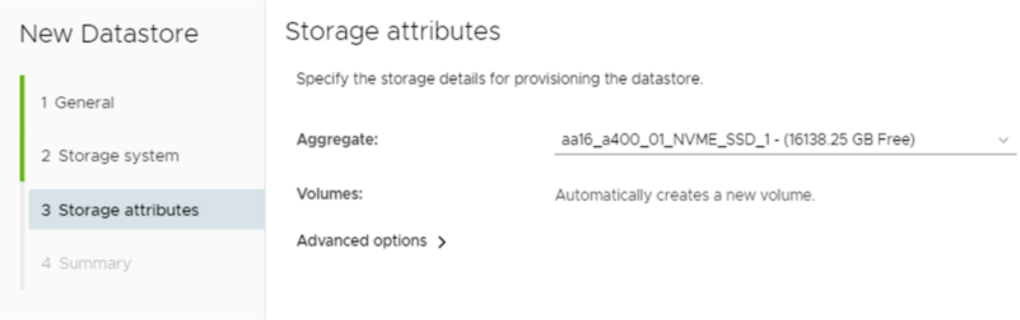
Storage capability profile: AFF_Platinum_Encripted

Storage system: aa16-a400 (192.168.156.140)

Storage VM: NX-Infra-SVM

Step 9. Click **NEXT**.

Step 10. Select the aggregate name and click **NEXT**.


New Datastore

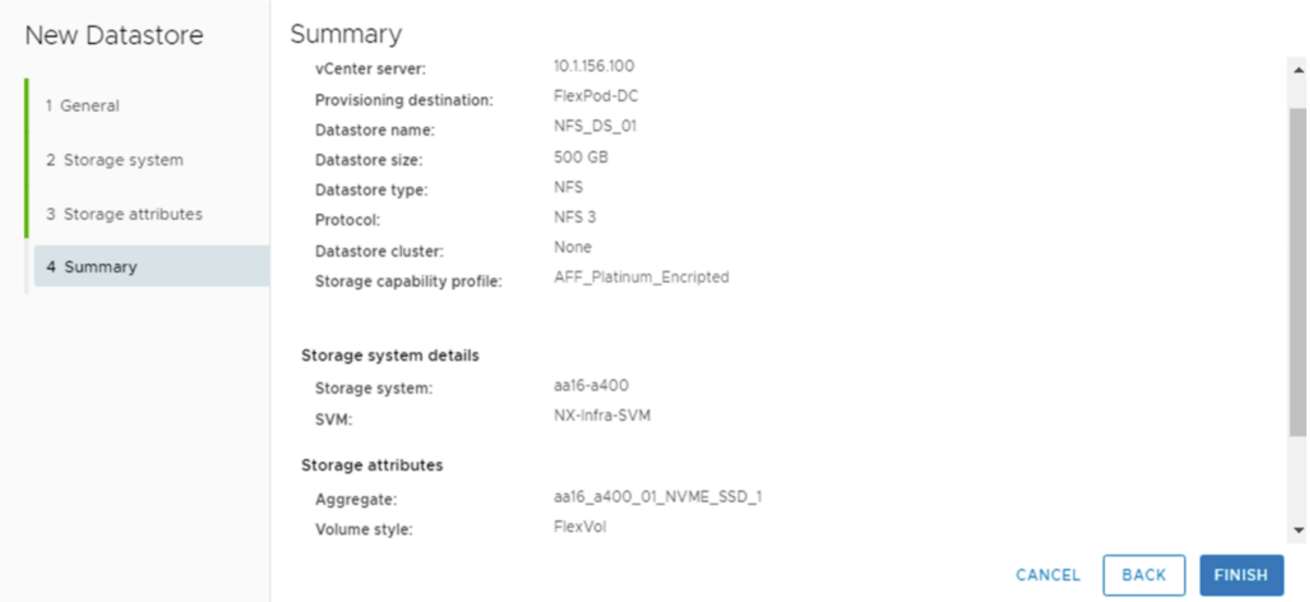
Storage attributes

Specify the storage details for provisioning the datastore.

Aggregate: aa16_a400_01_NVME_SSD_1 - (16138.25 GB Free)

Volumes: Automatically creates a new volume.

Step 11. Review the Summary and click **FINISH**.



New Datastore

1 General
2 Storage system
3 Storage attributes
4 Summary

Summary

vCenter server: 10.1.156.100
Provisioning destination: FlexPod-DC
Datastore name: NFS_DS_01
Datastore size: 500 GB
Datastore type: NFS
Protocol: NFS 3
Datastore cluster: None
Storage capability profile: AFF_Platinum_Encripted

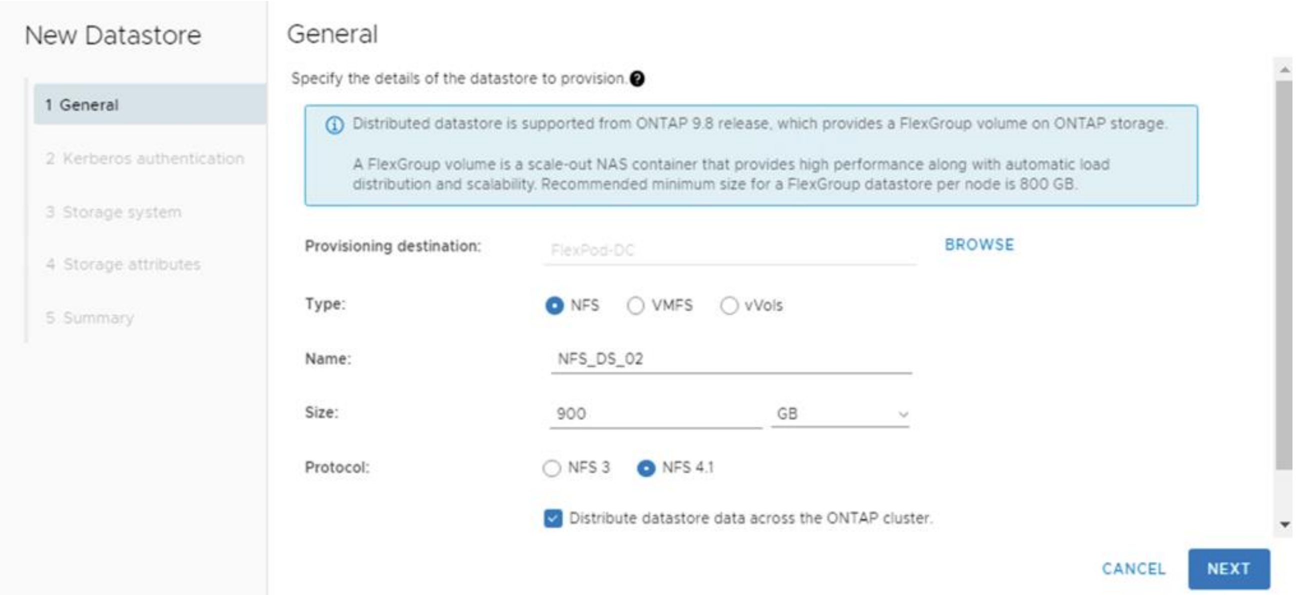
Storage system details
Storage system: aa16-a400
SVM: NX-Infra-SVM

Storage attributes
Aggregate: aa16_a400_01_NVME_SSD_1
Volume style: FlexVol

Step 12. The datastore is created and mounted on the hosts in the cluster. Click **Refresh** from the vSphere Web Client to see the newly created datastore.

Note: Before provision a datastore with encryption, be sure to enable storage cluster onboard key manager using the “security key-manager onboard enable” command or provide an external key manager with the “security key-manager external” command with additional information for the external key manager.

Note: Distributed datastore is supported from ONTAP 9.8, which provides FlexGroup volume on ONTAP storage. To create a Distributed Datastore across the ONTAP Cluster select NFS 4.1 and check the box for Distributed datastore data across the ONTAP Cluster as shown in the example below.



New Datastore

1 General
2 Kerberos authentication
3 Storage system
4 Storage attributes
5 Summary

General

Specify the details of the datastore to provision.

Distributed datastore is supported from ONTAP 9.8 release, which provides a FlexGroup volume on ONTAP storage.

A FlexGroup volume is a scale-out NAS container that provides high performance along with automatic load distribution and scalability. Recommended minimum size for a FlexGroup datastore per node is 800 GB.

Provisioning destination: FlexPod-DC
Type: ● NFS ○ VMFS ○ vVols
Name: NFS_DS_02
Size: 900 GB
Protocol: ○ NFS 3 ● NFS 4.1
☑ Distribute datastore data across the ONTAP cluster.

Procedure 9. Provision FC Datastore

Step 1. From the vCenter console, click **Menu** > **ONTAP tools**.

Step 2. From the **ONTAP tools Home** page, click **Overview**.

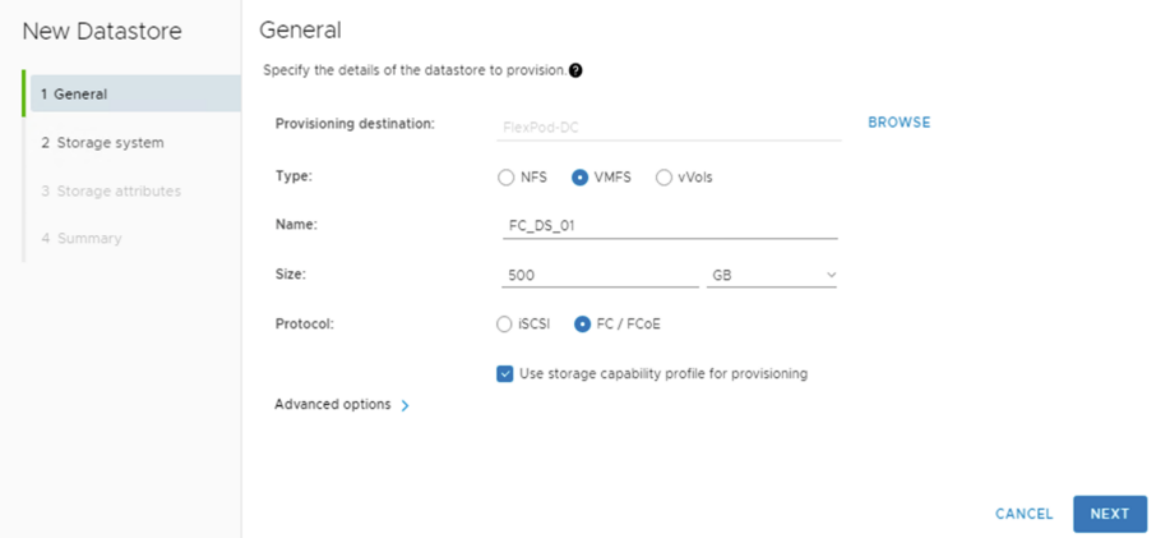
Step 3. From the Getting Started tab, click **Provision**.

Step 4. Click **Browse** to select the destination to provision the datastore.

Step 5. Select the type as **VMFS** and Enter the datastore name.

Step 6. Provide the size of the datastore and the FC Protocol.

Step 7. Check the Use storage capability profile and click **NEXT**.



General

Specify the details of the datastore to provision.

Provisioning destination: FlexPod-DC BROWSE

Type: ○ NFS ● VMFS ○ vVols

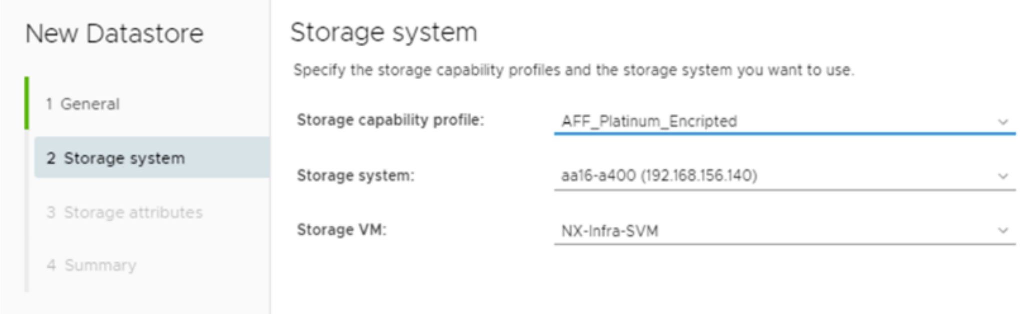
Name: FC_DS_01

Size: 500 GB

Protocol: ○ iSCSI ● FC / FCoE

☑ Use storage capability profile for provisioning

Step 8. Select the **Storage Capability Profile**, **Storage System,** and the desired **Storage VM** to create the datastore.



Storage system

Specify the storage capability profiles and the storage system you want to use.

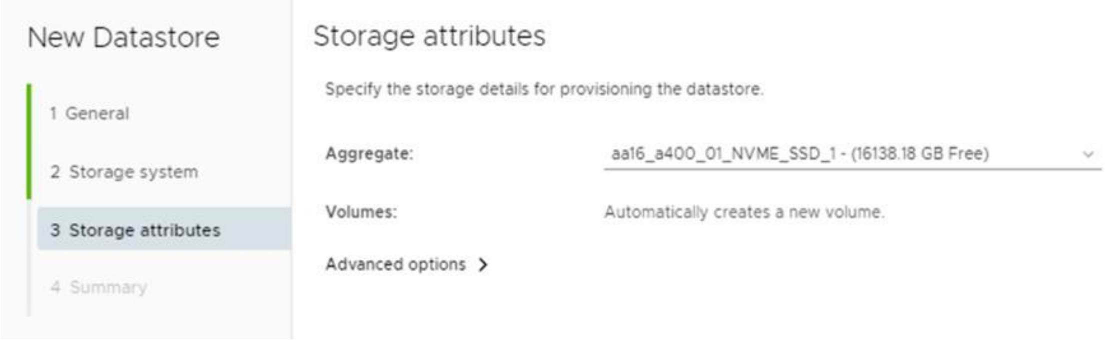
Storage capability profile: AFF_Platinum_Encripted

Storage system: aa16-a400 (192.168.156.140)

Storage VM: NX-Infra-SVM

Step 9. Click **NEXT**.

Step 10. Select the aggregate name and click **NEXT**.



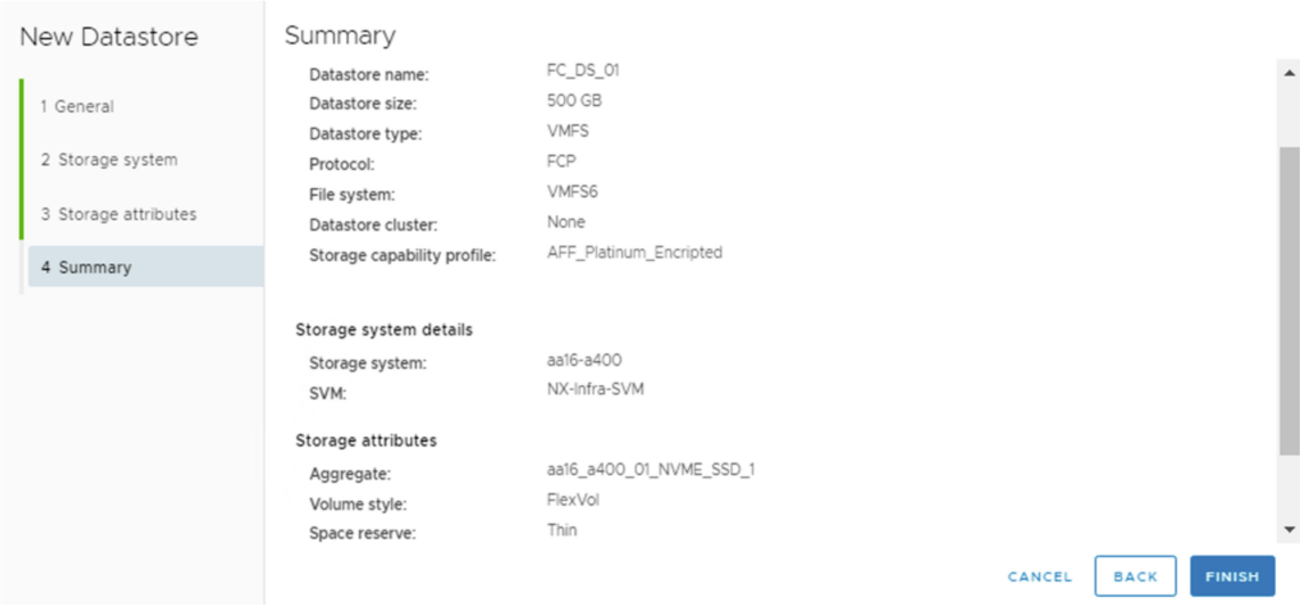
Storage attributes

Specify the storage details for provisioning the datastore.

Aggregate: aa16_a400_01_NVME_SSD_1 - (16138.18 GB Free)

Volumes: Automatically creates a new volume.

Step 11. Review the Summary and click **FINISH**.



New Datastore

1 General
2 Storage system
3 Storage attributes
4 Summary

Summary

Datastore name:	FC_DS_01
Datastore size:	500 GB
Datastore type:	VMFS
Protocol:	FCP
File system:	VMFS6
Datastore cluster:	None
Storage capability profile:	AFF_Platinum_Encripted

Storage system details

Storage system:	aa16-a400
SVM:	NX-Infra-SVM

Storage attributes

Aggregate:	aa16_a400_01_NVME_SSD_1
Volume style:	FlexVol
Space reserve:	Thin

Step 12. The datastore is created and mounted on all the hosts in the cluster. Click **Refresh** from the vSphere Web Client to see the newly created datastore.

Procedure 10. Create Virtual Machine with Assigned VM Storage Policy

Step 1. Log into vCenter and navigate to the **VMs and Templates** tab and click to select the datacenter (for example, FlexPod-DC).

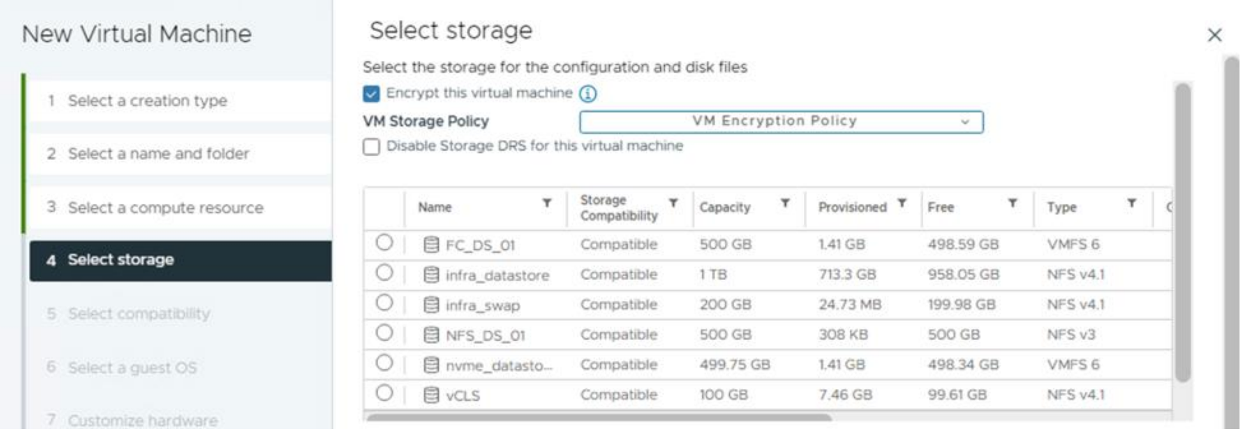
Step 2. Click Actions and click New Virtual Machine.

Step 3. Click Create a new virtual machine and click NEXT.

Step 4. Enter a name for the VM and select the datacenter (for example, FlexPod-DC).

Step 5. Select the cluster (for example, FlexPod-Management) and click **NEXT**.

Step 6. Select the VM storage policy from the selections and select a compatible datastore. Click **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

Select storage

Select the storage for the configuration and disk files

☑ Encrypt this virtual machine

VM Storage Policy: VM Encryption Policy

☐ Disable Storage DRS for this virtual machine

	Name	Storage Compatibility	Capacity	Provisioned	Free	Type
○	FC_DS_01	Compatible	500 GB	1.41 GB	498.59 GB	VMFS 6
○	infra_datastore	Compatible	1 TB	713.3 GB	958.05 GB	NFS v4.1
○	infra_swap	Compatible	200 GB	24.73 MB	199.98 GB	NFS v4.1
○	NFS_DS_01	Compatible	500 GB	308 KB	500 GB	NFS v3
○	nvme_datasto...	Compatible	499.75 GB	1.41 GB	498.34 GB	VMFS 6
○	vCLS	Compatible	100 GB	7.46 GB	99.61 GB	NFS v4.1

Step 7. Select Compatibility (for example, ESXi 8.0 or later) and click **NEXT**.

Step 8. Select the Guest OS and click **NEXT**.

Step 9. Customize the hardware for the VM and click **NEXT**.

Step 10. Review the details and click **FINISH**.

Note: By selecting the VM storage policy in Step 6, the VM will be deployed on the compatible datastores.

Virtual Volumes – vVol (Optional)

NetApp VASA Provider enables customers to create and manage VMware virtual volumes (vVols). A vVols datastore consists of one or more FlexVol volumes within a storage container (also called " backing storage"). A virtual machine can be spread across one vVols datastore or multiple vVols datastores. All of the FlexVol volumes within the storage container must use the same protocol (NFS, iSCSI, or FCP) and the same SVMs.

For more information on vVOL datastore configuration, see: https://www.cisco.com/c/en/us/td/docs/unified_computing/ucs/UCS_CVDs/flexpod_xseries_vmware_7u2.html#VirtualVolumesvVolOptional

NetApp SnapCenter Plug-in 4.8 Installation

SnapCenter Software is a centralized and scalable platform that provides application-consistent data protection for applications, databases, host file systems, and VMs running on ONTAP systems anywhere in the Hybrid Cloud.

NetApp SnapCenter Architecture

The SnapCenter platform is based on a multitier architecture that includes a centralized management server (SnapCenter Server) and a SnapCenter host agent. The host agent that performs virtual machine and datastore backups for VMware vSphere is the SnapCenter Plug-in for VMware vSphere. It is packaged as a Linux appliance (Debian-based Open Virtual Appliance format) and is no longer part of the SnapCenter Plug-ins Package for Windows. Additional information on deploying SnapCenter server for application backups can be found in the documentation listed below.

This guide focuses on deploying and configuring the SnapCenter plug-in for VMware vSphere to protect virtual machines and VM datastores.

Note: You must install SnapCenter Server and the necessary plug-ins to support application-consistent backups for Microsoft SQL, Microsoft Exchange, Oracle databases and SAP HANA. Application-level protection is beyond the scope of this deployment guide.

Note: Refer to the SnapCenter documentation for more information or the application specific CVD's and technical reports for detailed information on how to deploy SnapCenter for a specific application configuration:

- SnapCenter Documentation: https://docs.netapp.com/us-en/snapcenter/index.html
- Deploy FlexPod Datacenter for Microsoft SQL Server 2019 with VMware 7.0 on Cisco UCS B200 M6 and NetApp ONTAP 9.8: https://www.cisco.com/c/en/us/products/collateral/servers-unified-computing/ucs-b-series-blade-servers/flexpod-sql-2019-vmware-on-ucs-netapp-ontap-wp.html
- SnapCenter Plug-in for VMware vSphere Documentation: SnapCenter Plug-in for VMware vSphere documentation (netapp.com)

Host and Privilege Requirements for the SnapCenter Plug-In for VMware vSphere

Review the following requirements before installing the SnapCenter Plug-in for VMware vSphere virtual appliance:

- SnapCenter Plug-in for VMware vSphere is deployed as a Linux based virtual appliance.
- Virtual appliances must not be deployed in a folder name with special characters.
- A separate, unique instance of the virtual appliance must be deployed for each vCenter Server.

Table 8. Port Requirements

Port	Requirement
8080(HTTPS) bidirectional	This port is used to manage the virtual appliance
8144(HTTPs) bidirectional	Communication between SnapCenter Plug-in for VMware vSphere and vCenter
443 (HTTPS)	Communication between SnapCenter Plug-in for VMware vSphere and vCenter

License Requirements for SnapCenter Plug-In for VMware vSphere

The licenses listed in Table 9 are required on the ONTAP storage system to backup and restore VM's in the virtual infrastructure:

Table 9. SnapCenter Plug-in for VMware vSphere License Requirements

Product	License Requirements
ONTAP	**SnapManager Suite:** Used for backup operations One of these: SnapMirror or SnapVault (for secondary data protection regardless of the type of relationship)
ONTAP Primary Destinations	To perform protection of VMware VMs and datastores the following licenses should be installed: **SnapRestore**: used for restoring operations **FlexClone**: used for mount and attach operations
ONTAP Secondary Destinations	To perform protection of VMware VMs and datastores only: **FlexClone**: used for mount and attach operations
VMware	**vSphere Standard, Enterprise, or Enterprise Plus** A vSphere license is required to perform restore operations, which use Storage vMotion. vSphere Essentials or Essentials Plus licenses do not include Storage vMotion.

Note: It is recommended (but not required) to add SnapCenter Standard licenses to secondary destinations. If SnapCenter Standard licenses are not enabled on secondary systems, SnapCenter cannot be used after a failover operation. A FlexClone license on secondary storage is required to perform mount and attach operations. A SnapRestore license is required to perform restore operations.

Procedure 1. Deploy the SnapCenter Plug-In for VMware vSphere 4.8 using Ansible

Step 1. Clone the repository from https://github.com/NetApp/SnapCenter-Plug-in-for-VMware-vSphere.

Step 2. Follow the instructions in the README file in the repository to ensure the Ansible environment is configured properly.

Step 3. Update the following variable files:

```
hosts
group_vars/vcenter
vars/snapcenter_vmware_plugin_main.yml
```

Step 4. To invoke the ansible scripts, use the following command:

```
ansible-playbook -i hosts Setup_SnapCenter_VMware_Plugin.yml
```

Note: The above ansible playbook will install the SnapCenter Plug-in in vCenter and will also add ONTAP Storage System.

NetApp SnapCenter Plug-in 4.8 Configuration

Procedure 1. SnapCenter Plug-In for VMware vSphere in vCenter Server

Step 1. Navigate to VMware vSphere Web Client URL **https://<vCenter Server>.**

Note: If you're currently logged into vCenter, logoff, close the open tab and sign-on again to access the newly installed SnapCenter Plug-in for VMware vSphere.

Step 2. After logging on, a blue banner will be displayed indicating the SnapCenter plug-in was successfully deployed. Click **Refresh** to activate the plug-in.

Step 3. From the **VMware vSphere Web Client** page, select **Menu** > **SnapCenter Plug-in for VMware vSphere** to launch the SnapCenter Plug-in for VMware GUI.

Step 4. When the storage system is added, you can create backup policies and take scheduled backup of VMs and datastores. The SnapCenter plug-in for VMware vSphere allows backup, restore and on-demand backups.

For more information on backup policy configuration, refer to this CVD: https://www.cisco.com/c/en/us/td/docs/unified_computing/ucs/UCS_CVDs/flexpod_xseries_vmware_7u2.html#FlexPodManagementToolsSetup

Active IQ Unified Manager 9.12 Installation

Active IQ Unified Manager enables you to monitor and manage the health and performance of ONTAP storage systems and virtual infrastructure from a single interface. Unified Manager provides a graphical interface that displays the capacity, availability, protection, and performance status of the monitored storage systems. Active IQ Unified Manager is required to integrate NetApp storage with Cisco Intersight.

This subject describes the procedure to deploy NetApp Active IQ Unified Manager 9.12 as a virtual appliance. Table 10 lists the recommended configuration for the VM.

Table 10. Virtual Machine Configuration

Hardware Configuration	Recommended Settings
RAM	12 GB
Processors	4 CPUs
CPU Cycle Capacity	9572 MHz total
Free Disk Space/virtual disk size	5 GB - Thin provisioned 152 GB - Thick provisioned

Note: There is a limit to the number of nodes that a single instance of Active IQ Unified Manager can monitor before a second instance of Active IQ Unified Manager is needed. See the Unified Manager Best Practices Guide (TR-4621) for more details.

Procedure 1. Install NetApp Active IQ Unified Manager 9.12 using Ansible

Step 1. Clone the repository from https://github.com/NetApp/Active-IQ-Unified-Manager.

Step 2. Follow the instructions in the README file in the repository to ensure the Ansible environment is configured properly.

Step 3. Update the variable files as mentioned in the README document in the repository.

Step 4. To install AIQUM and add an ONTAP cluster, invoke the below ansible playbook:

```
ansible-playbook aiqum.yml -t aiqum_setup
```

Configure Active IQ Unified Manager

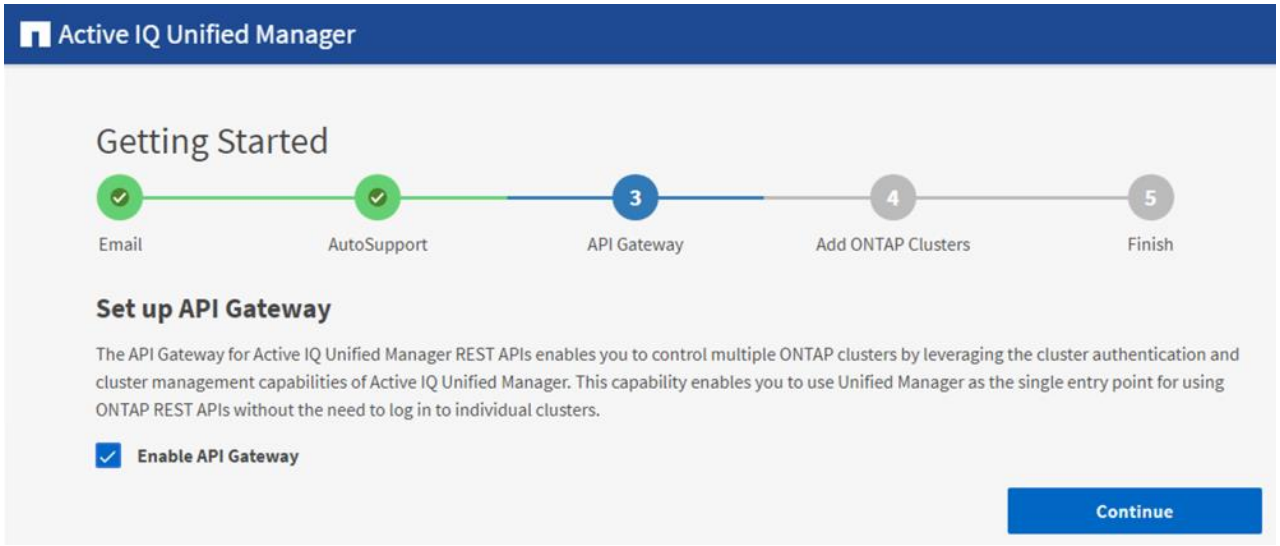
Procedure 1. Initial Setup

Step 1. Launch a web browser and log into **Active IQ Unified Manager** using the URL shown in the VM console and log in with the admin user.

Step 2. Enter the email address that Unified Manager will use to send alerts and the mail server configuration. Click **Continue**.

Step 3. Select **Agree and Continue** on the Set up AutoSupport configuration.

Step 4. Check the box for **Enable API Gateway** and click **Continue.**



Active IQ Unified Manager

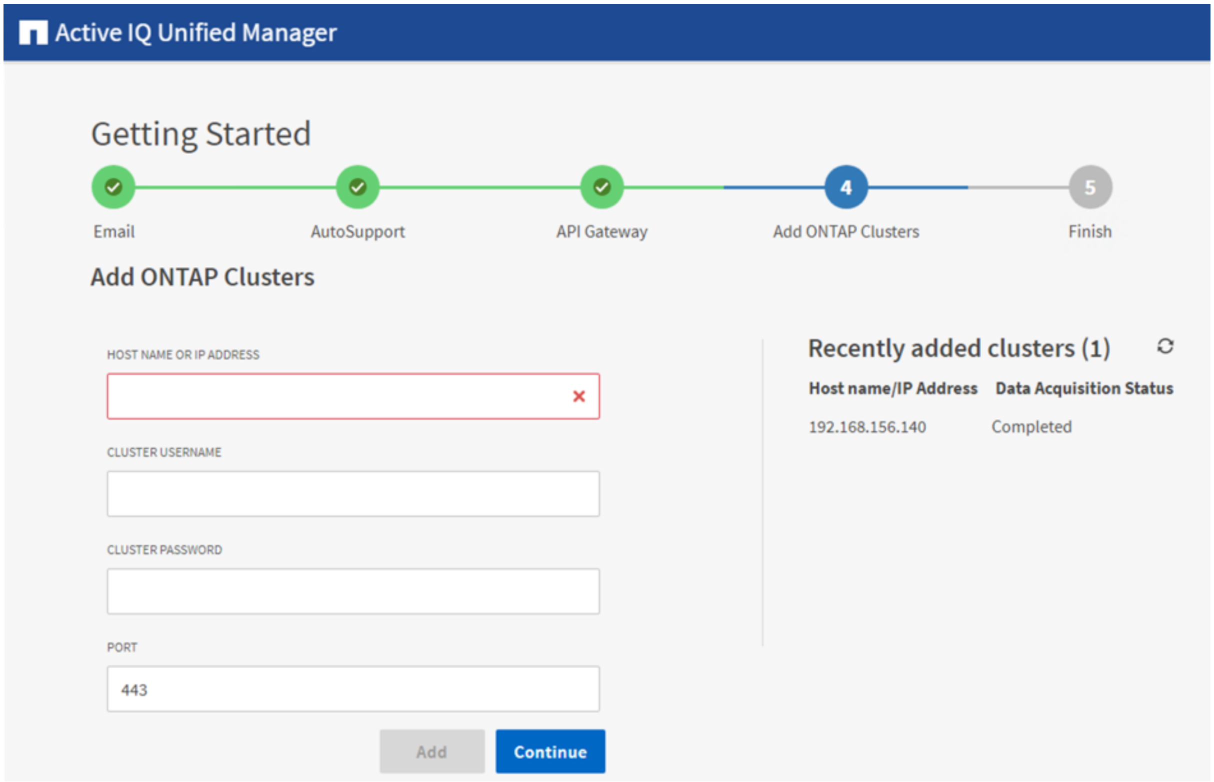
Getting Started

Set up API Gateway

The API Gateway for Active IQ Unified Manager REST APIs enables you to control multiple ONTAP clusters by leveraging the cluster authentication and cluster management capabilities of Active IQ Unified Manager. This capability enables you to use Unified Manager as the single entry point for using ONTAP REST APIs without the need to log in to individual clusters.

☑ Enable API Gateway

Step 5. Skip the following steps if the ONTAP cluster has already been added by the Ansible automation for deploying the AIQUM as shown in the recently added cluster below.


Active IQ Unified Manager

Getting Started

Add ONTAP Clusters

HOST NAME OR IP ADDRESS

CLUSTER USERNAME

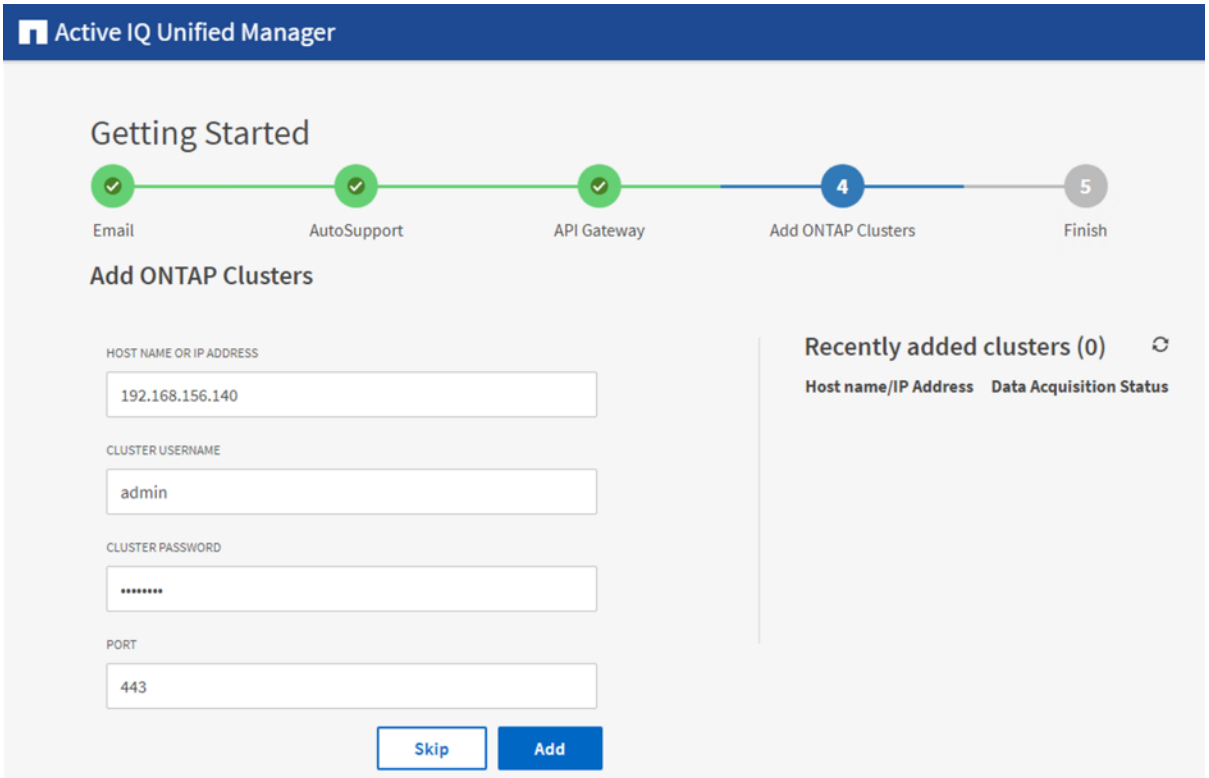
CLUSTER PASSWORD

PORT: 443

Recently added clusters (1)

Host name/IP Address	Data Acquisition Status
192.168.156.140	Completed

Step 6. Add the ONTAP cluster if needed by entering the ONTAP cluster hostname or IP address and the admin login credentials.


Active IQ Unified Manager

Getting Started

Add ONTAP Clusters

HOST NAME OR IP ADDRESS: 192.168.156.140

CLUSTER USERNAME: admin

CLUSTER PASSWORD: ••••••••

PORT: 443

Recently added clusters (0)

Host name/IP Address	Data Acquisition Status

Step 7. Click **Add**.

Step 8. Click **Yes** to trust the self-signed cluster certificate and finish adding the storage system.

Note: The initial discovery process can take up to 15 minutes to complete.

Step 9. Click **Finish** to complete initial AIQUM setup.

Procedure 2. Review Security Compliance with Active IQ Unified Manager

Active IQ Unified Manager identifies issues and makes recommendations to improve the security posture of ONTAP. Active IQ Unified Manager evaluates ONTAP storage based on recommendations made in the Security Hardening Guide for ONTAP 9. Items are identified according to their level of compliance with the recommendations. Review the Security Hardening Guide for NetApp ONTAP 9 (TR-4569) for additional information and recommendations for securing ONTAP 9.

Note: All events identified do not inherently apply to all environments, for example, FIPS compliance.

The status icons in the security cards have the following meanings in relation to their compliance:

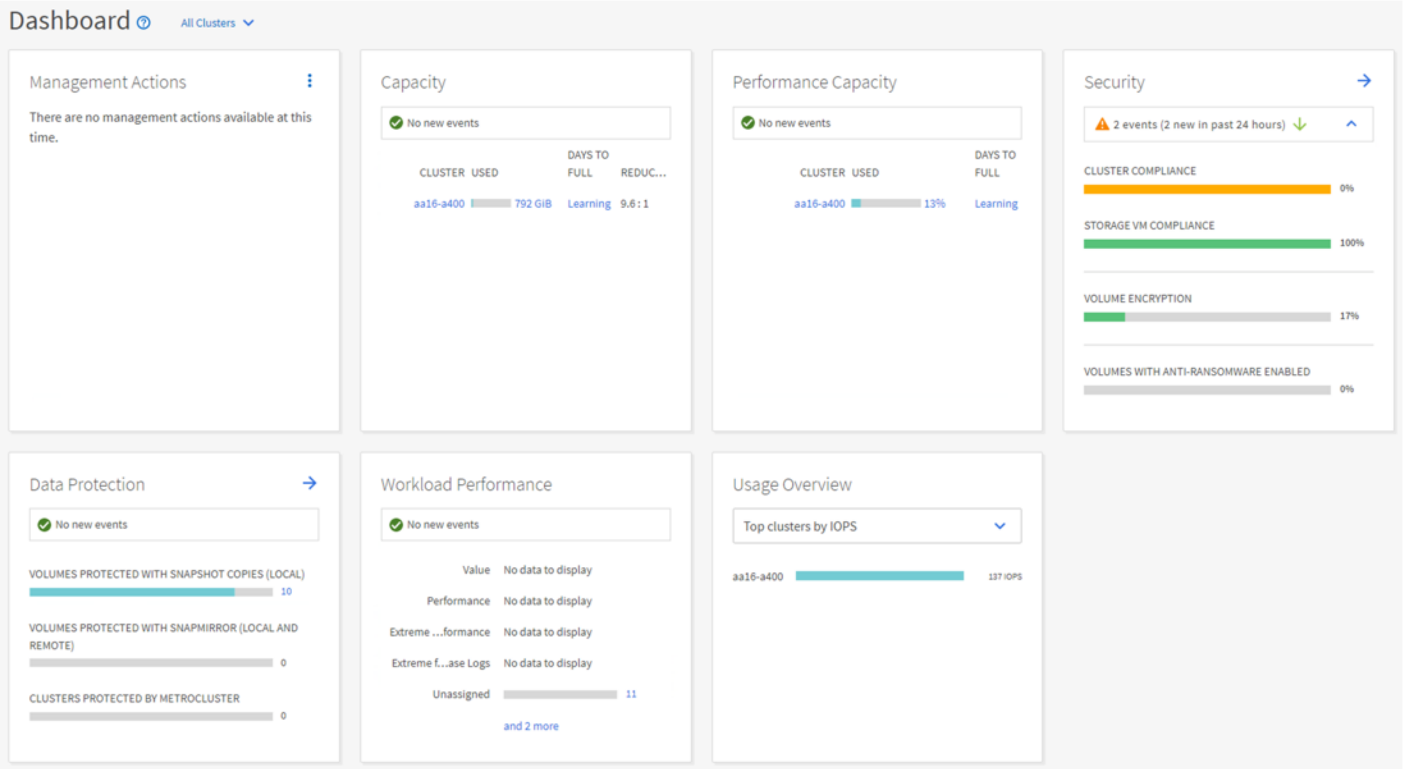
- ✓ - The parameter is configured as recommended.
- ⚠ - The parameter is not configured as recommended.
- ℹ - Either the functionality is not enabled on the cluster, or the parameter is not configured as recommended, but this parameter does not contribute to the compliance of the object.

Note that volume encryption status does not contribute to whether the cluster or SVM are considered compliant.

Step 1. Navigate to the URL of the **Active IQ Unified Manager** and **login**.

Step 2. Select the **Dashboard** from the left menu bar in Active IQ Unified Manager.

Step 3. Locate the **Security** card and note the compliance level of the cluster and SVM.



Dashboard

All Clusters

Management Actions

There are no management actions available at this time.

Capacity

✓ No new events

CLUSTER	USED	DAYS TO FULL	REDUC...
aa16-a400	792 GiB	Learning	9.6 : 1

Performance Capacity

✓ No new events

CLUSTER	USED	DAYS TO FULL
aa16-a400	13%	Learning

Security

⚠ 2 events (2 new in past 24 hours)

CLUSTER COMPLIANCE 0%

STORAGE VM COMPLIANCE 100%

VOLUME ENCRYPTION 17%

VOLUMES WITH ANTI-RANSOMWARE ENABLED 0%

Data Protection

✓ No new events

VOLUMES PROTECTED WITH SNAPSHOT COPIES (LOCAL) 10

VOLUMES PROTECTED WITH SNAPMIRROR (LOCAL AND REMOTE) 0

CLUSTERS PROTECTED BY METROCLUSTER 0

Workload Performance

✓ No new events

Value	No data to display
Performance	No data to display
Extreme ...formance	No data to display
Extreme f...ase Logs	No data to display
Unassigned	11

and 2 more

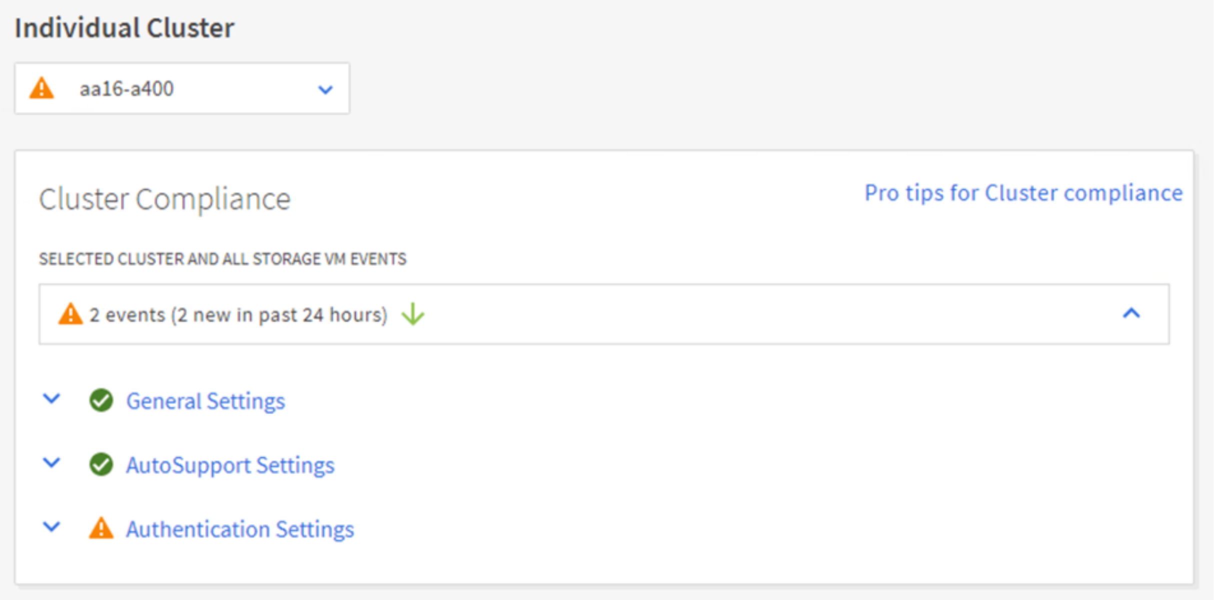
Usage Overview

Top clusters by IOPS

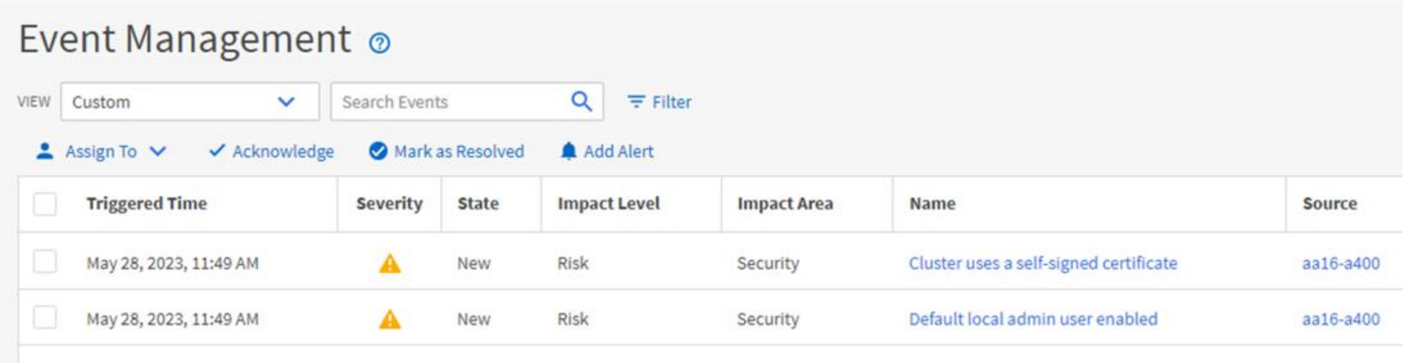
aa16-a400 137 IOPS

Step 4. Click the blue arrow to expand the findings.

Step 5. Locate Individual Cluster section and the Cluster Compliance card. From the drop-down list select **View All**.


Individual Cluster
aa16-a400
Cluster Compliance
Pro tips for Cluster compliance
SELECTED CLUSTER AND ALL STORAGE VM EVENTS
2 events (2 new in past 24 hours)
General Settings
AutoSupport Settings
Authentication Settings

Step 6. Select an event from the list and click the name of the event to view the remediation steps.

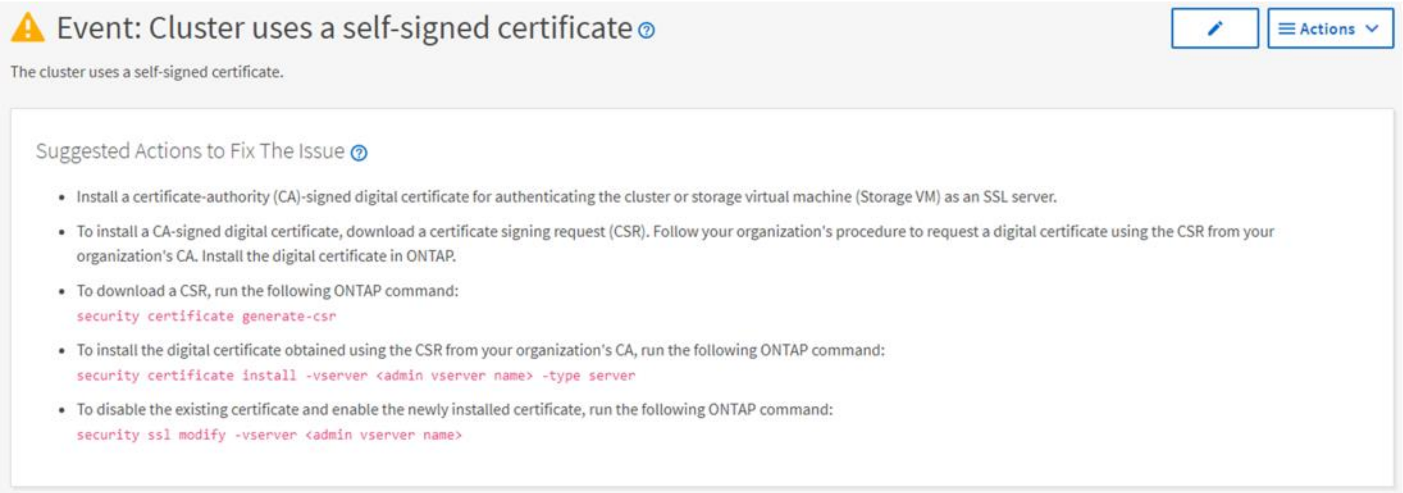


□	Triggered Time	Severity	State	Impact Level	Impact Area	Name	Source
□	May 28, 2023, 11:49 AM	⚠	New	Risk	Security	Cluster uses a self-signed certificate	aa16-a400
□	May 28, 2023, 11:49 AM	⚠	New	Risk	Security	Default local admin user enabled	aa16-a400

Step 7. Remediate the risk if applicable to current environment and perform the suggested actions to fix the issue.

Remediate Security Compliance Findings

Note: Active IQ identifies several security compliance risks after installation that can be immediately corrected to improve the security posture of ONTAP. Click on the event name to get more information and suggested actions to fix the issue.



The cluster uses a self-signed certificate.

Suggested Actions to Fix The Issue

- Install a certificate-authority (CA)-signed digital certificate for authenticating the cluster or storage virtual machine (Storage VM) as an SSL server.
- To install a CA-signed digital certificate, download a certificate signing request (CSR). Follow your organization's procedure to request a digital certificate using the CSR from your organization's CA. Install the digital certificate in ONTAP.
- To download a CSR, run the following ONTAP command:

```
security certificate generate-csr
```

- To install the digital certificate obtained using the CSR from your organization's CA, run the following ONTAP command:

```
security certificate install -vserver <admin vserver name> -type server
```

- To disable the existing certificate and enable the newly installed certificate, run the following ONTAP command:

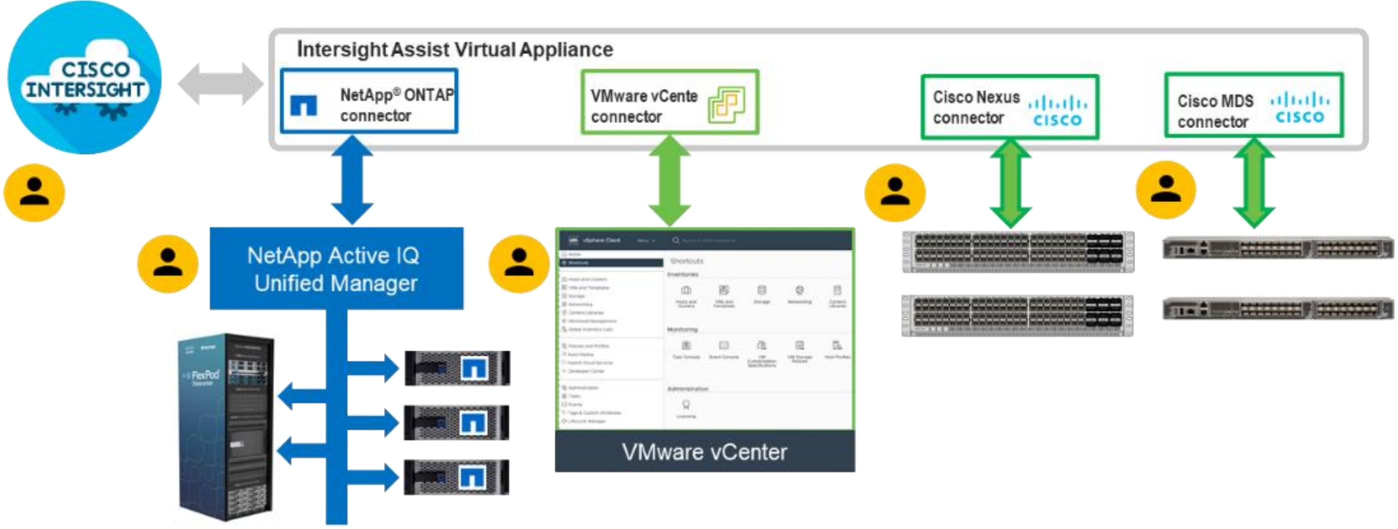
```
security ssl modify -vserver <admin vserver name>
```

Deploy Cisco Intersight Assist Appliance

Cisco Intersight works with NetApp's ONTAP storage and VMware vCenter using third-party device connectors and Cisco Nexus and MDS switches using Cisco device connectors. Since third-party infrastructure and Cisco switches do not contain any usable built-in Intersight device connector, Cisco Intersight Assist virtual appliance enables Cisco Intersight to communicate with these devices.

Note: A single Cisco Intersight Assist virtual appliance can support both NetApp ONTAP storage, VMware vCenter, and Cisco Nexus and MDS switches.

Figure 6. **Managing NetApp and VMware vCenter through Cisco Intersight using Cisco Intersight Assist**



Procedure 1. Install Cisco Intersight Assist

Step 1. To install Cisco Intersight Assist from an Open Virtual Appliance (OVA), download the latest release of the Cisco Intersight Virtual Appliance for vSphere from https://software.cisco.com/download/home/286319499/type/286323047/release/1.0.9-588.

Note: Download the latest release.

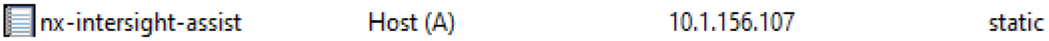
Procedure 2. Set up DNS entries

Step 1. Setting up Cisco Intersight Virtual Appliance requires an IP address and 2 hostnames for that IP address. The hostnames must be in the following formats:

- **myhost.mydomain.com**: A hostname in this format is used to access the GUI. This must be defined as an A record and PTR record in DNS. The PTR record is required for reverse lookup of the IP address. If an IP address resolves to multiple hostnames, the first one in the list is used.
- **dc-myhost.mydomain.com:** The dc- must be prepended to your hostname. This hostname must be defined as the CNAME of myhost.mydomain.com. Hostnames in this format are used internally by the appliance to manage device connections.

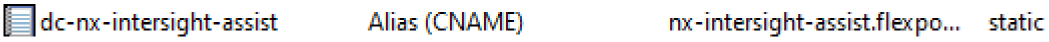
Step 2. In this lab deployment the following information was used to deploy a Cisco Intersight Assist VM:

- **Hostname:** nx-intersight-assist.flexpod.cisco.com
- **IP address**: 10.1.156.107
- **DNS Entries** (Windows AD/DNS):
  - A Record



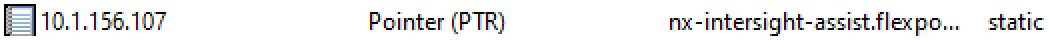
nx-intersight-assist	Host (A)	10.1.156.107	static

  - CNAME:



dc-nx-intersight-assist	Alias (CNAME)	nx-intersight-assist.flexpo...	static

  - PTR (reverse lookup):



10.1.156.107	Pointer (PTR)	nx-intersight-assist.flexpo...	static

For more information, go to: https://www.cisco.com/c/en/us/td/docs/unified_computing/Intersight/b_Cisco_Intersight_Appliance_Getting_Started_Guide/b_Cisco_Intersight_Appliance_Install_and_Upgrade_Guide_chapter_00.html.

Procedure 3. Deploy Cisco Intersight OVA

Note: Ensure that the appropriate entries of type A, CNAME, and PTR records exist in the DNS, as explained in the previous section.

Step 1. Log into the vSphere Client and select **Inventory.**

Step 2. In the Inventory list, right-click the cluster and click **Deploy OVF Template**.

Step 3. Select Local file and click **UPLOAD FILES**. Browse to and select the intersight-appliance-installer-vsphere-1.0.9-588.ova or the latest release file and click **Open**. Click **NEXT**.

Step 4. Name the Intersight Assist VM and select the location. Click **NEXT**.

Step 5. Select the cluster and click **NEXT**.

Step 6. Review details, click **Ignore**, and click **NEXT**.

Step 7. Select the **Assist** deployment configuration. Click **NEXT**.

Step 8. Select the appropriate datastore (for example, infra_datastore) for storage and select the **Thin Provision** virtual disk format. Click **NEXT**.

Step 9. Using the pulldown, select the appropriate management network (for example, IB-MGMT Network) for the OVA and click **OK**. Click **NEXT**.

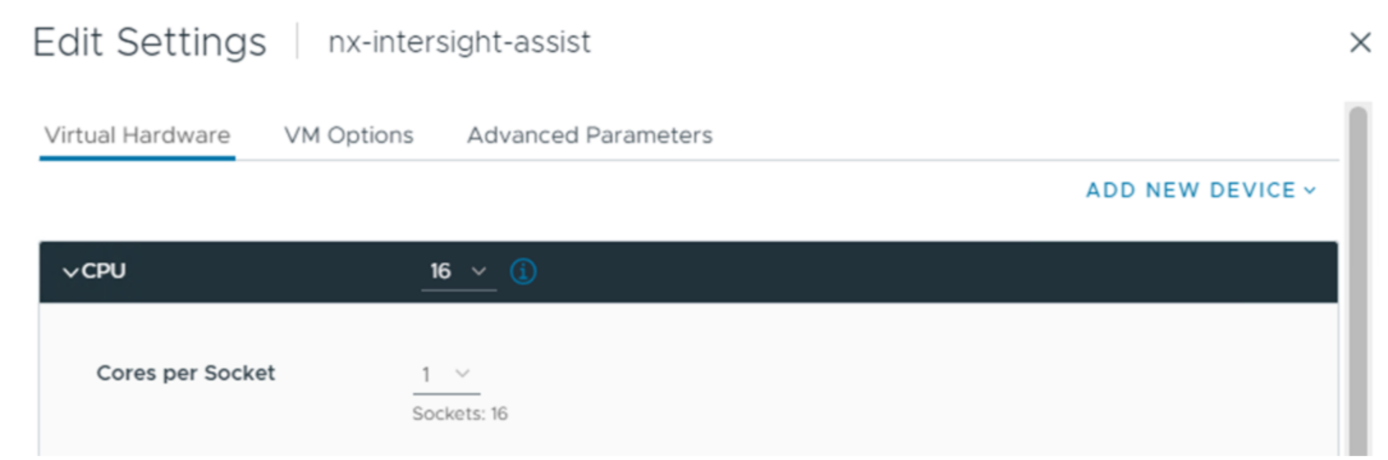
Note: The Cisco Intersight Assist VM must be able to access both the IB-MGMT network on FlexPod and Intersight.com. Select and configure the management network appropriately. If selecting IB-MGMT network on FlexPod, make sure the routing and firewall is setup correctly to access the Internet.

Step 10. Fill in all values to customize the template. Click **NEXT**.

Step 11. Review the deployment information and click **FINISH** to deploy the appliance.

Step 12. When the OVA deployment is complete, right-click the Intersight Assist VM and click **Edit Settings**.

Step 13. Expand CPU and verify the socket configuration. For example, in the following deployment, on a 2-socket system, the VM was configured for 16 sockets:



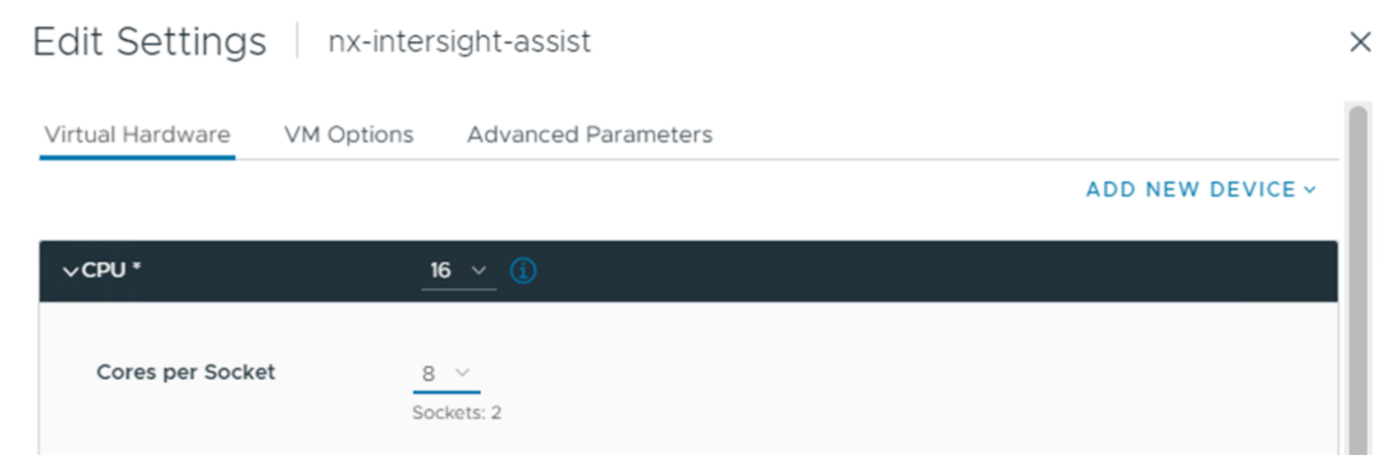
Edit Settings | nx-intersight-assist

CPU 16

Cores per Socket 1

Sockets: 16

Step 14. Adjust the Cores per Socket so that the number of Sockets matches the server CPU configuration (2 sockets in this deployment):



Edit Settings | nx-intersight-assist

CPU * 16

Cores per Socket 8

Sockets: 2

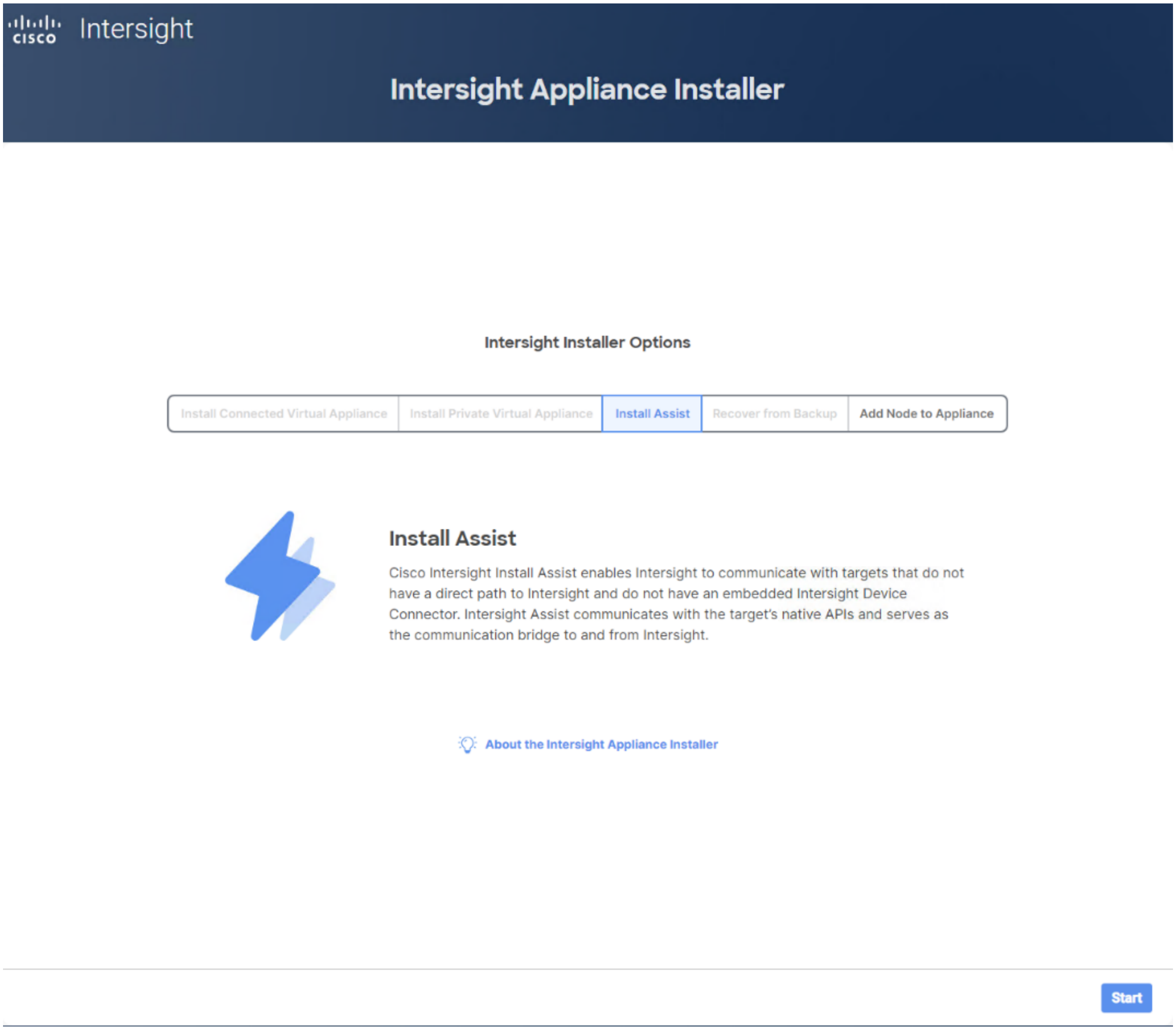
Step 15. Click **OK**.

Step 16. Right-click the Intersight Assist VM and select Power > Power On.

Step 17. When the VM powers on and login prompt is visible (use remote console), connect to https://intersight-assist-fqdn.

Note: It may take a few minutes for https://intersight-assist-fqdn to respond.

Step 18. Navigate the security prompts and select **Install Assist**. Click **Start**.


Intersight
Intersight Appliance Installer
Intersight Installer Options
Install Connected Virtual Appliance
Install Private Virtual Appliance
Install Assist
Recover from Backup
Add Node to Appliance

Install Assist

Cisco Intersight Install Assist enables Intersight to communicate with targets that do not have a direct path to Intersight and do not have an embedded Intersight Device Connector. Intersight Assist communicates with the target's native APIs and serves as the communication bridge to and from Intersight.

About the Intersight Appliance Installer
Start

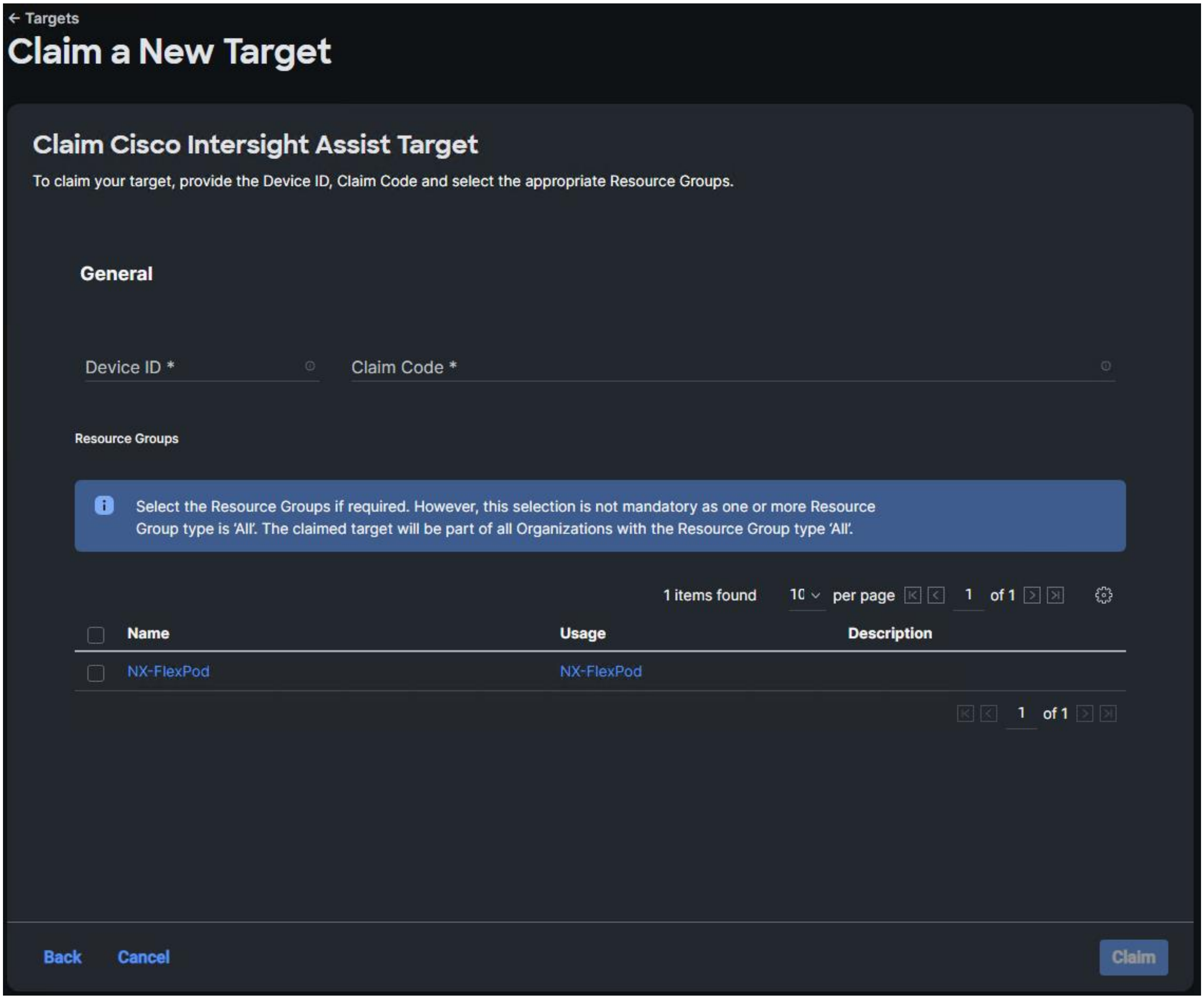
Note: The Cisco Intersight Assist VM needs to be claimed in Cisco Intersight using the Device ID and Claim Code information visible in the GUI.

Step 19. Log into **Cisco Intersight** and connect to the appropriate account.

Step 20. From Cisco Intersight, select **System**, then click **Admin** > **Targets**.

Step 21. Click **Claim a New Target**. Select Cisco Intersight Assist and click **Start**. Click **OK** to acknowledge the information about Cisco Intersight Workload Optimizer.

Step 22. Copy and paste the Device ID and Claim Code shown in the Intersight Assist web interface to the Cisco Intersight Device Claim window.



← Targets

Claim a New Target

Claim Cisco Intersight Assist Target

To claim your target, provide the Device ID, Claim Code and select the appropriate Resource Groups.

General

Device ID *

Claim Code *

Resource Groups

Select the Resource Groups if required. However, this selection is not mandatory as one or more Resource Group type is 'All'. The claimed target will be part of all Organizations with the Resource Group type 'All'.

1 items found 10 per page 1 of 1

□	Name	Usage	Description
□	NX-FlexPod	NX-FlexPod	

1 of 1

Step 23. Select the **Resource Group** and click **Claim**. Intersight Assist will now appear as a claimed device.

Step 24. In the Intersight Assist web interface, verify that Intersight Assist is Claimed Successfully, and click **Continue**.

Step 25. Verify success of the DNS Test and click **Next**.

Step 26. Accept the default Internal Network IP and click **Next**.

Note: The Cisco Intersight Assist software will now be downloaded and installed into the Intersight Assist VM. This can take up to an hour to complete.

Note: The Cisco Intersight Assist VM will reboot during the software download process. It will be necessary to refresh the Web Browser after the reboot is complete to follow the status of the download process.

Step 27. When the software download is complete, an Intersight Assist login screen will appear.

Step 28. Log into Intersight Assist with the admin user and the password supplied in the OVA installation. Check the Intersight Assist status and **log out** of Intersight Assist.

Claim VMware vCenter using Cisco Intersight Assist Appliance

Procedure 1. Claim the vCenter from Cisco Intersight

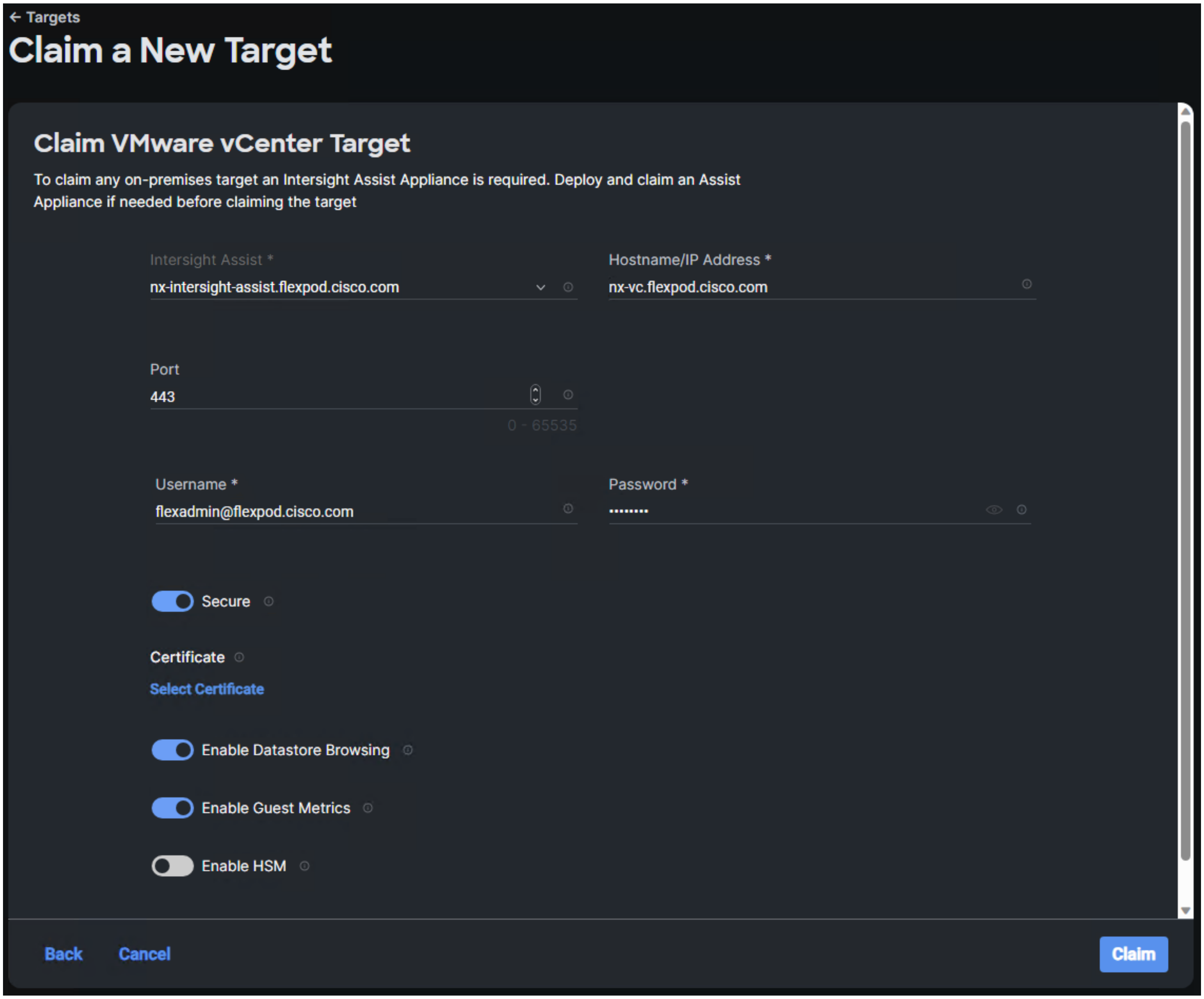
Step 1. Log into **Cisco Intersight** and connect to the account for this FlexPod.

Step 2. Go to **System** > **Admin** > **Targets** and click **Claim a New Target**.

Step 3. Under Select Target Type, select **VMware vCenter** under Hypervisor and click **Start**.

Step 4. In the **VMware vCenter** window, verify the correct Intersight Assist is selected.

Step 5. Fill in the vCenter information. It is recommended to use a user other than administrator@vsphere.local for this connection to remove visibility to the vCLS VMs. If Intersight Workflow Optimizer (IWO) will be used, turn on Datastore Browsing Enabled and Guest Metrics Enabled. Do not Enable HSM. Click **Claim**.



To claim any on-premises target an Intersight Assist Appliance is required. Deploy and claim an Assist Appliance if needed before claiming the target

Intersight Assist * nx-intersight-assist.flexpod.cisco.com

Hostname/IP Address * nx-vc.flexpod.cisco.com

Port 443 (0 - 65535)

Username * flexadmin@flexpod.cisco.com

Password * ••••••••

Secure: on

Certificate: Select Certificate

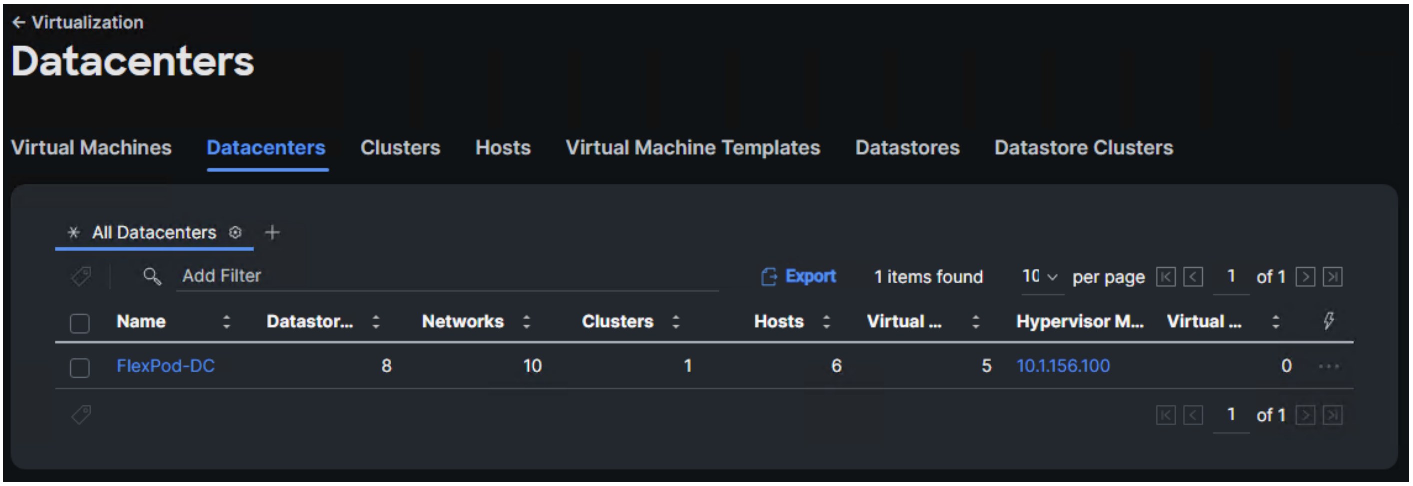
Enable Datastore Browsing: on

Enable Guest Metrics: on

Enable HSM: off

Step 6. After a few minutes, the VMware vCenter will show Connected in the Targets list and will also appear under **Infrastructure Service** > **Operate** > **Virtualization**.

Step 7. Detailed information obtained from the vCenter can now be viewed by clicking **Infrastructure Service** > **Operate** > **Virtualization** and selecting the Datacenters tab. Other VMware vCenter information can be obtained by navigating through the Virtualization tabs.



Name	Datastor...	Networks	Clusters	Hosts	Virtual ...	Hypervisor M...	Virtual ...
FlexPod-DC	8	10	1	6	5	10.1.156.100	0

Procedure 2. Interact with Virtual Machines

VMware vCenter integration with Cisco Intersight allows you to directly interact with the virtual machines (VMs) from the Cisco Intersight dashboard. In addition to obtaining in-depth information about a VM, including the operating system, CPU, memory, host name, and IP addresses assigned to the virtual machines, you can use Cisco Intersight to perform the following actions on the virtual machines:

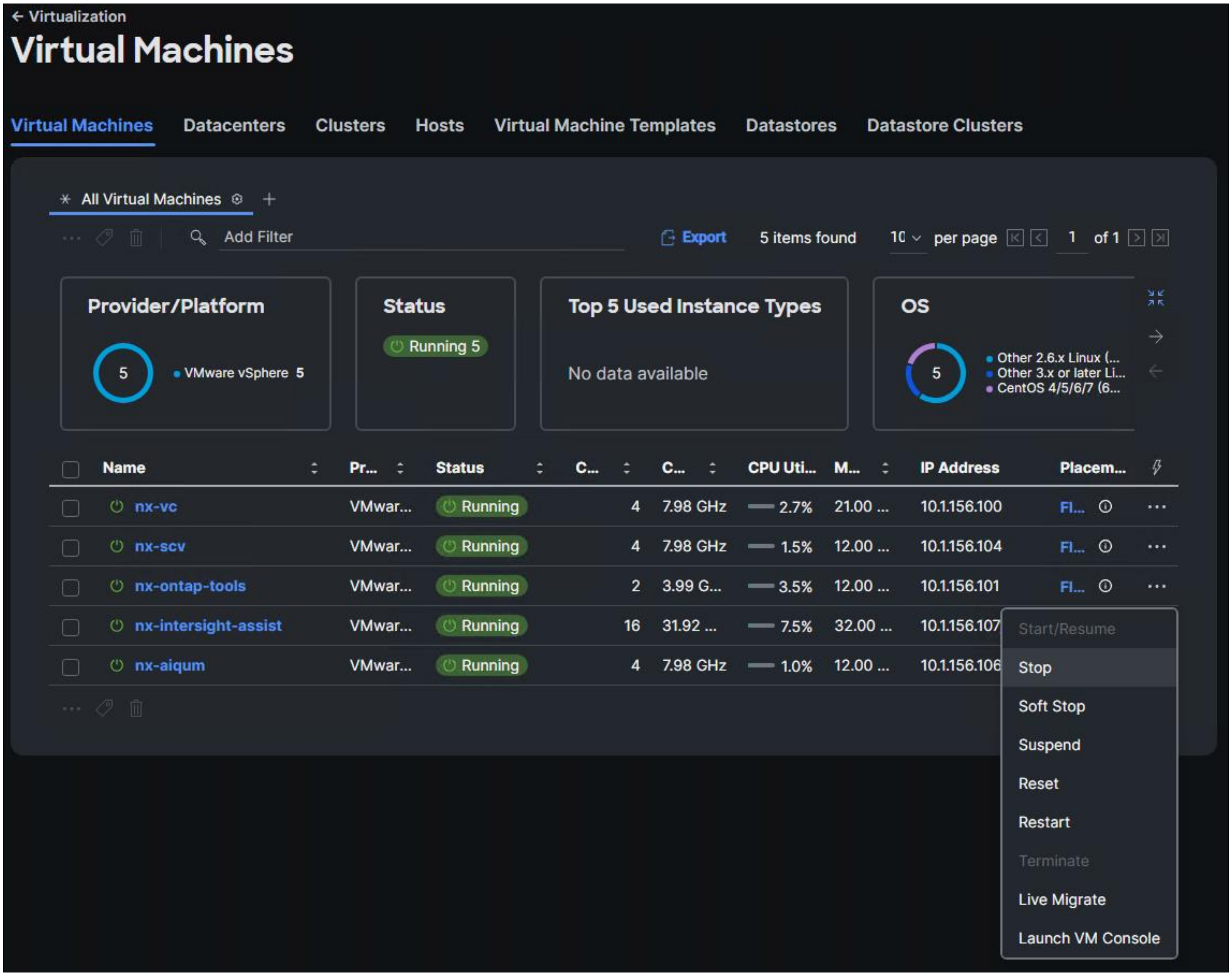
- Start/Resume
- Stop
- Soft Stop
- Suspend
- Reset
- Launch VM Console

Step 1. Log into **Cisco Intersight** and connect to the account for this FlexPod.

Step 2. Go to **Infrastructure Service** > **Operate** > **Virtualization.**

Step 3. Click the **Virtual Machines tab**.

Step 4. Click “**...**” to the right of a VM and interact with various VM options.



← Virtualization

Virtual Machines

Virtual Machines | Datacenters | Clusters | Hosts | Virtual Machine Templates | Datastores | Datastore Clusters

All Virtual Machines

Add Filter | Export | 5 items found | 10 per page | 1 of 1

Provider/Platform: 5 — VMware vSphere 5

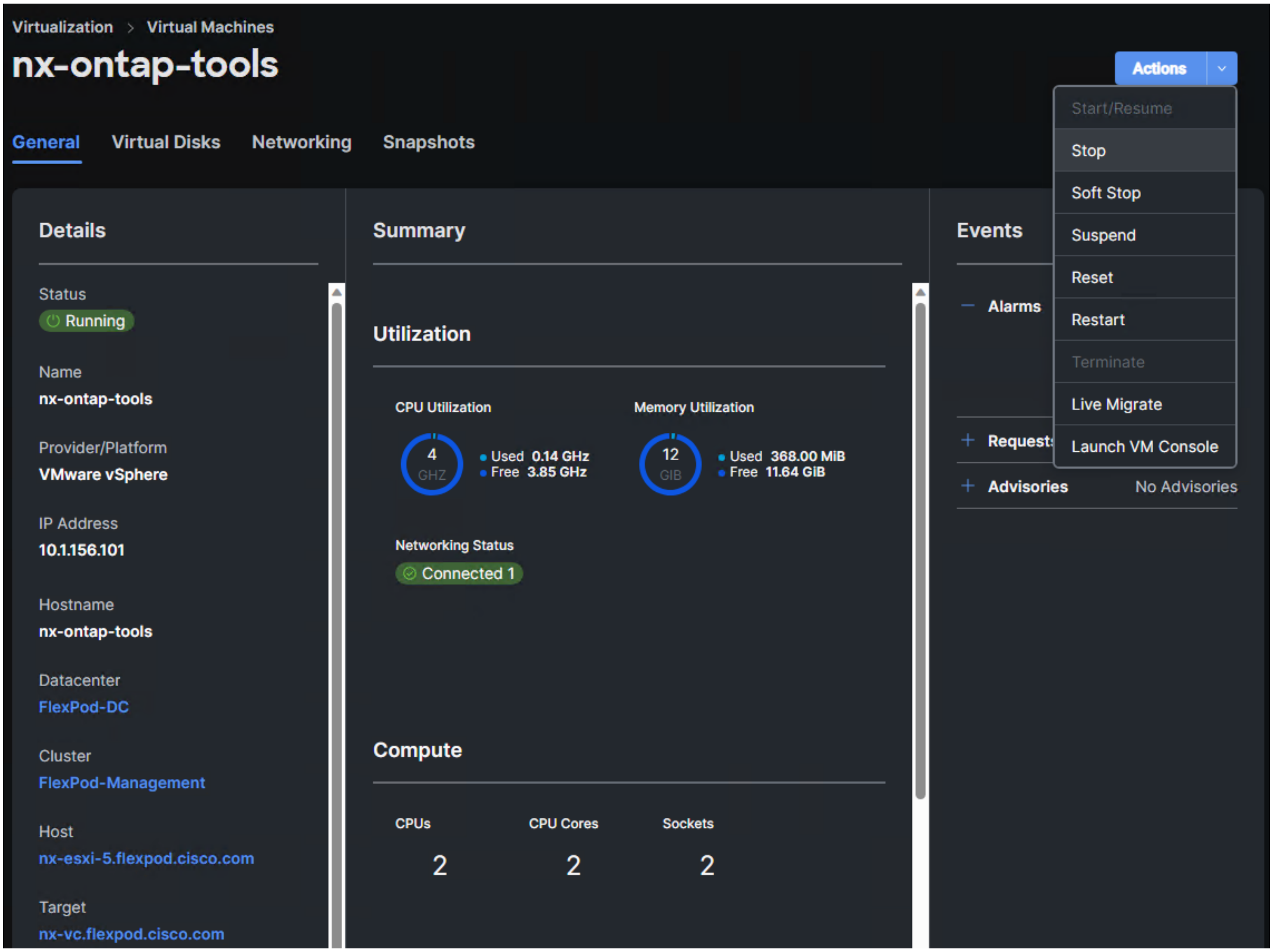
Status: Running 5

Top 5 Used Instance Types: No data available

OS: 5 — Other 2.6.x Linux (... | Other 3.x or later Li... | CentOS 4/5/6/7 (6...

Name	Pr...	Status	C...	C...	CPU Uti...	M...	IP Address	Placem...
nx-vc	VMwar...	Running	4	7.98 GHz	2.7%	21.00 ...	10.1.156.100	Fl...
nx-scv	VMwar...	Running	4	7.98 GHz	1.5%	12.00 ...	10.1.156.104	Fl...
nx-ontap-tools	VMwar...	Running	2	3.99 G...	3.5%	12.00 ...	10.1.156.101	Fl...
nx-intersight-assist	VMwar...	Running	16	31.92 ...	7.5%	32.00 ...	10.1.156.107	
nx-aiqum	VMwar...	Running	4	7.98 GHz	1.0%	12.00 ...	10.1.156.106	

Step 5. To gather more information about a VM, click a VM name. The same interactive options are available under **Actions.**



nx-ontap-tools

Status: Running

Name: nx-ontap-tools

Provider/Platform: VMware vSphere

IP Address: 10.1.156.101

Hostname: nx-ontap-tools

Datacenter: FlexPod-DC

Cluster: FlexPod-Management

Host: nx-esxi-5.flexpod.cisco.com

Target: nx-vc.flexpod.cisco.com

CPU Utilization: 4 GHZ, Used 0.14 GHz, Free 3.85 GHz

Memory Utilization: 12 GIB, Used 368.00 MiB, Free 11.64 GiB

Networking Status: Connected 1

CPUs: 2

CPU Cores: 2

Sockets: 2

Advisories: No Advisories

Claim NetApp Active IQ Manager using Cisco Intersight Assist Appliance

Procedure 1. Claim the NetApp Active IQ Unified Manager into Cisco Intersight

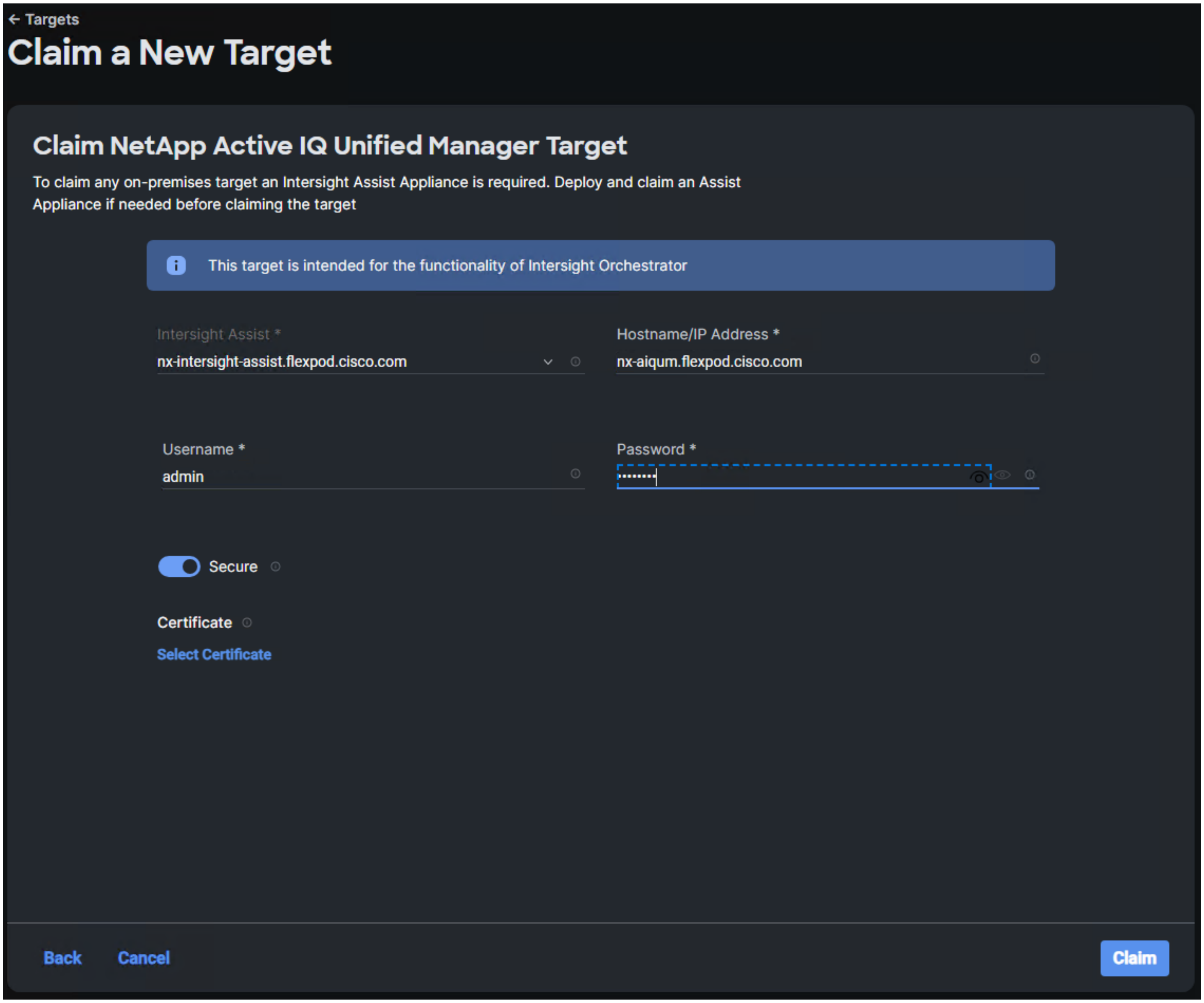
Step 1. Log into **Cisco Intersight** and connect to the account for this FlexPod.

Step 2. From Cisco Intersight, click **System** > **Admin** > **Targets**.

Step 3. Click **Claim a New Target**. In the Select Target Type window, select **NetApp Active IQ Unified Manager** under Storage and click **Start**.

Step 4. In the Claim NetApp Active IQ Unified Manager Target window, verify the correct Intersight Assist is selected.

Step 5. Fill in the NetApp Active IQ Unified Manager information and click **Claim**.



Claim a New Target

Claim NetApp Active IQ Unified Manager Target

To claim any on-premises target an Intersight Assist Appliance is required. Deploy and claim an Assist Appliance if needed before claiming the target

This target is intended for the functionality of Intersight Orchestrator

Intersight Assist * nx-intersight-assist.flexpod.cisco.com

Hostname/IP Address * nx-aiqum.flexpod.cisco.com

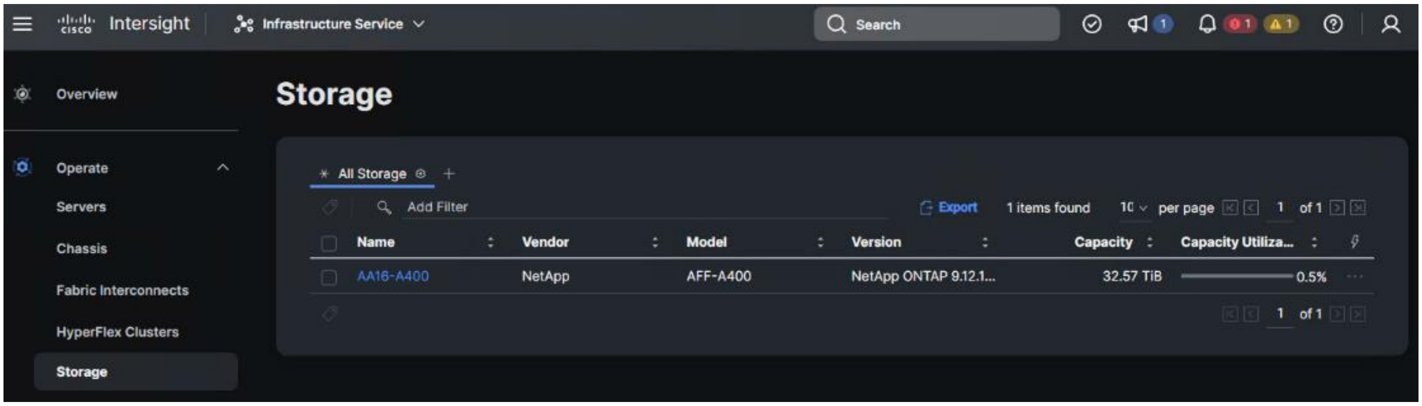
Username * admin

Password * ••••••••

Secure

Certificate

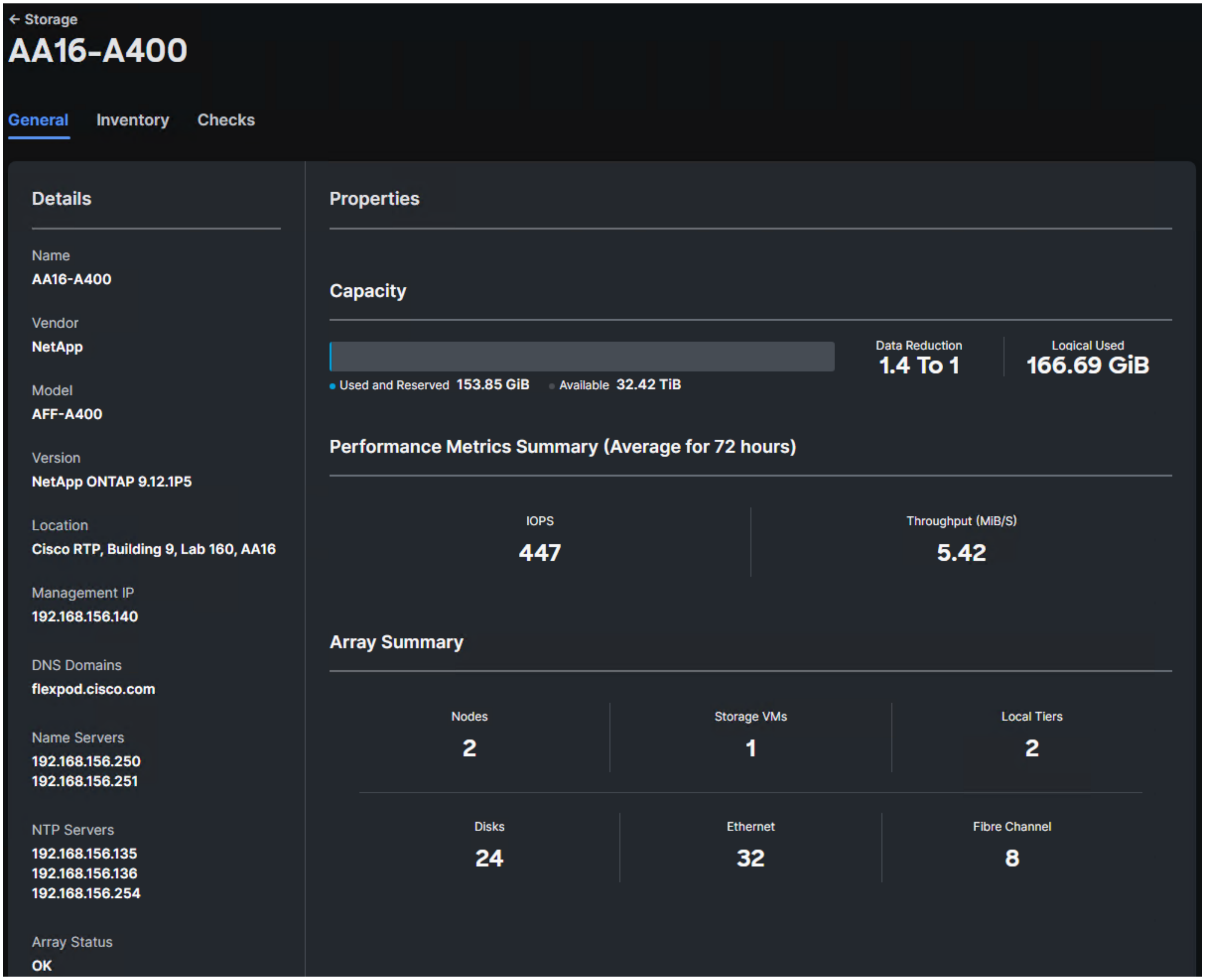
Step 6. After a few minutes, the NetApp ONTAP Storage configured in the Active IQ Unified Manager will appear under **Infrastructure Service** > **Operate** > **Storage** tab.



Storage

Name	Vendor	Model	Version	Capacity	Capacity Utiliza...
AA16-A400	NetApp	AFF-A400	NetApp ONTAP 9.12.1...	32.57 TiB	0.5%

Step 7. Click the storage cluster name to see detailed General, Inventory, and Checks information on the storage.


← Storage

AA16-A400

Details

Name	AA16-A400
Vendor	NetApp
Model	AFF-A400
Version	NetApp ONTAP 9.12.1P5
Location	Cisco RTP, Building 9, Lab 160, AA16
Management IP	192.168.156.140
DNS Domains	flexpod.cisco.com
Name Servers	192.168.156.250 192.168.156.251
NTP Servers	192.168.156.135 192.168.156.136 192.168.156.254
Array Status	OK

Properties

Capacity

Used and Reserved 153.85 GiB · Available 32.42 TiB

Data Reduction 1.4 To 1

Logical Used 166.69 GiB

Performance Metrics Summary (Average for 72 hours)

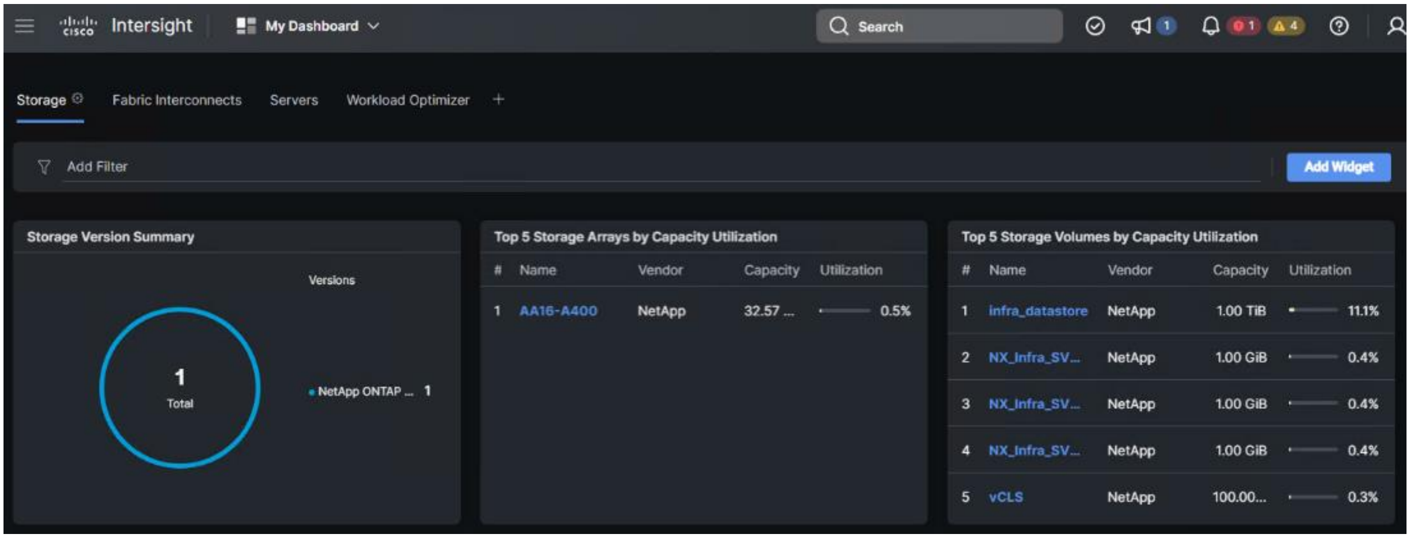
IOPS	Throughput (MiB/S)
447	5.42

Array Summary

Nodes	Storage VMs	Local Tiers
2	1	2

Disks	Ethernet	Fibre Channel
24	32	8

Step 8. Click **My Dashboard** > **Storage** to see storage monitoring widgets.



Storage Version Summary

NetApp ONTAP ... 1

Top 5 Storage Arrays by Capacity Utilization

#	Name	Vendor	Capacity	Utilization
1	AA16-A400	NetApp	32.57 ...	0.5%

Top 5 Storage Volumes by Capacity Utilization

#	Name	Vendor	Capacity	Utilization
1	infra_datastore	NetApp	1.00 TiB	11.1%
2	NX_Infra_SV...	NetApp	1.00 GiB	0.4%
3	NX_Infra_SV...	NetApp	1.00 GiB	0.4%
4	NX_Infra_SV...	NetApp	1.00 GiB	0.4%
5	vCLS	NetApp	100.00...	0.3%

Claim Cisco Nexus Switches using Cisco Intersight Assist Appliance

Procedure 1. Claim Cisco Nexus Switches

Step 1. Log into **Cisco Intersight** and connect to the account for this FlexPod.

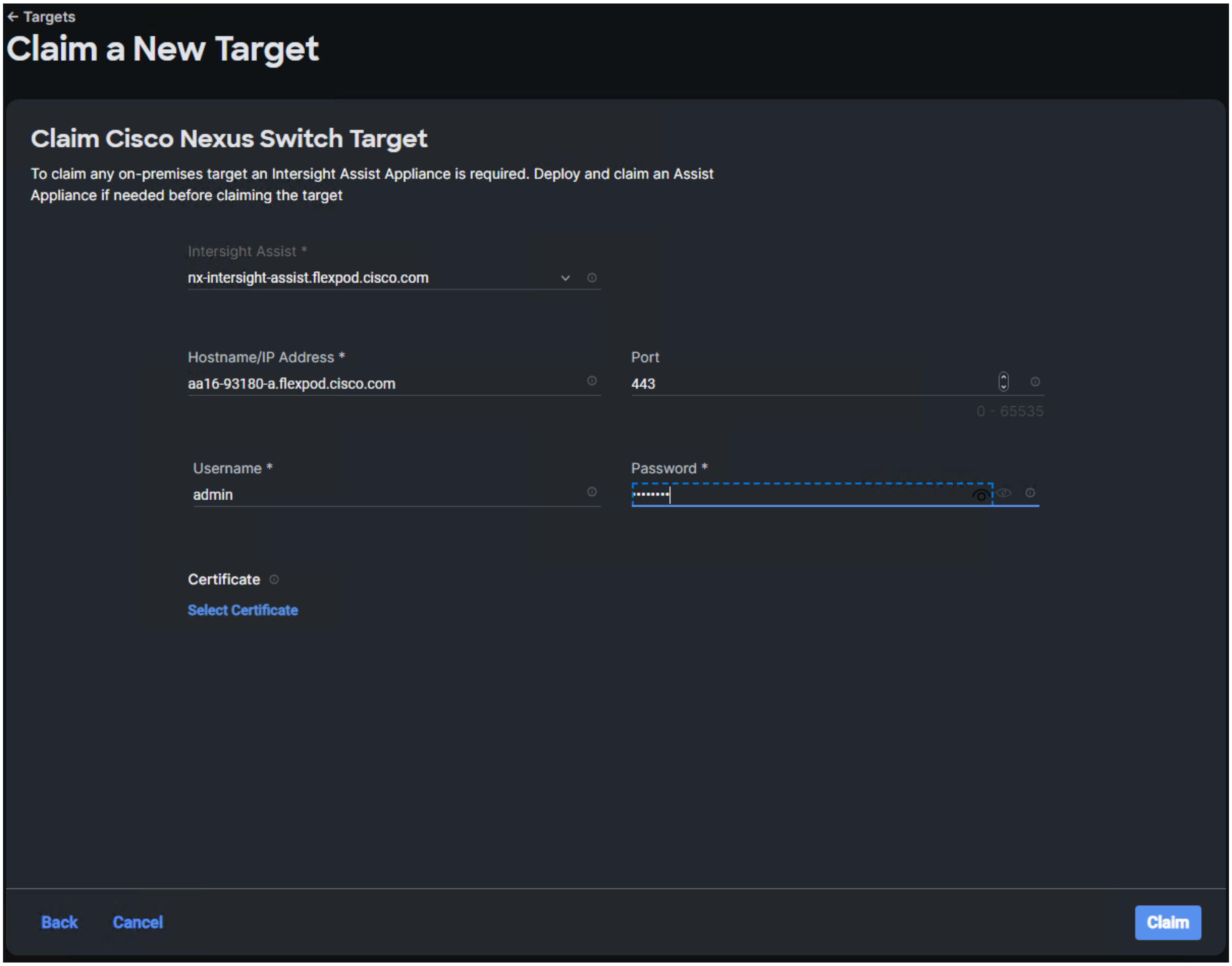
Step 2. From Cisco Intersight, click **System** > **Admin** > **Targets**.

Step 3. Click **Claim a New Target**. In the Select Target Type window, select Cisco Nexus Switch under Network and click **Start**.

Step 4. In the Claim Cisco Nexus Switch Target window, verify the correct Intersight Assist is selected.

Step 5. Fill in the Cisco Nexus Switch information and click **Claim**.

Note: You can use the admin user on the switch.



← Targets

Claim a New Target

Claim Cisco Nexus Switch Target

To claim any on-premises target an Intersight Assist Appliance is required. Deploy and claim an Assist Appliance if needed before claiming the target

Intersight Assist * nx-intersight-assist.flexpod.cisco.com

Hostname/IP Address * aa16-93180-a.flexpod.cisco.com

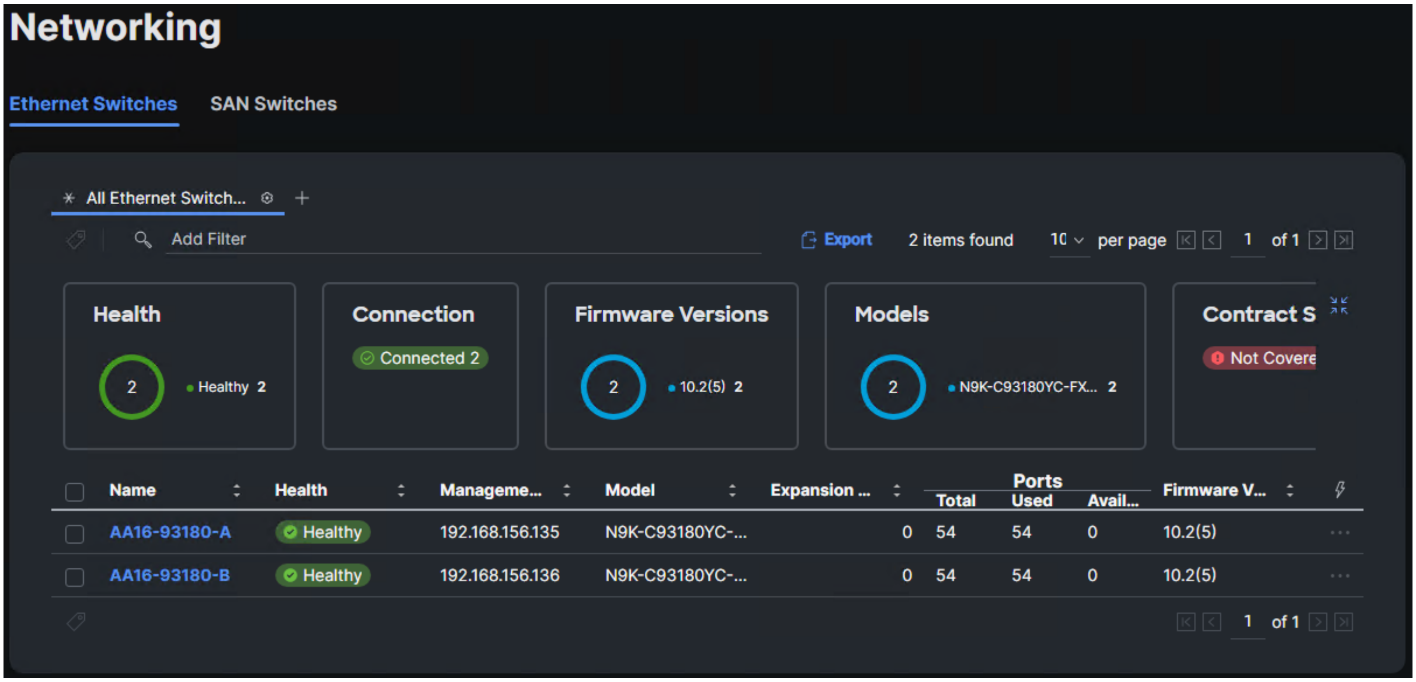
Port 443

Username * admin

Password * ••••••••

Step 6. Repeat steps 1 - 5 to add the second Cisco Nexus Switch.

Step 7. After a few minutes, the two switches will appear under **Infrastructure Service** > **Operate** > **Networking** > **Ethernet Switches**.



Networking

Ethernet Switches | SAN Switches

All Ethernet Switch...

Add Filter

Export | 2 items found | 10 per page | 1 of 1

Health: 2 · Healthy 2

Connection: Connected 2

Firmware Versions: 2 · 10.2(5) 2

Models: 2 · N9K-C93180YC-FX... 2

Contract S: Not Covere

Name	Health	Manageme...	Model	Expansion ...	Ports Total	Ports Used	Ports Avail...	Firmware V...
AA16-93180-A	Healthy	192.168.156.135	N9K-C93180YC-...	0	54	54	0	10.2(5)
AA16-93180-B	Healthy	192.168.156.136	N9K-C93180YC-...	0	54	54	0	10.2(5)

1 of 1

Step 8. Click one of the switch names to get detailed General and Inventory information on the switch.

Claim Cisco MDS Switches using Cisco Intersight Assist Appliance

Procedure 1. Claim Cisco MDS Switches (if they are part of the FlexPod)

Step 1. Log into **Cisco Intersight** and connect to the account for this FlexPod.

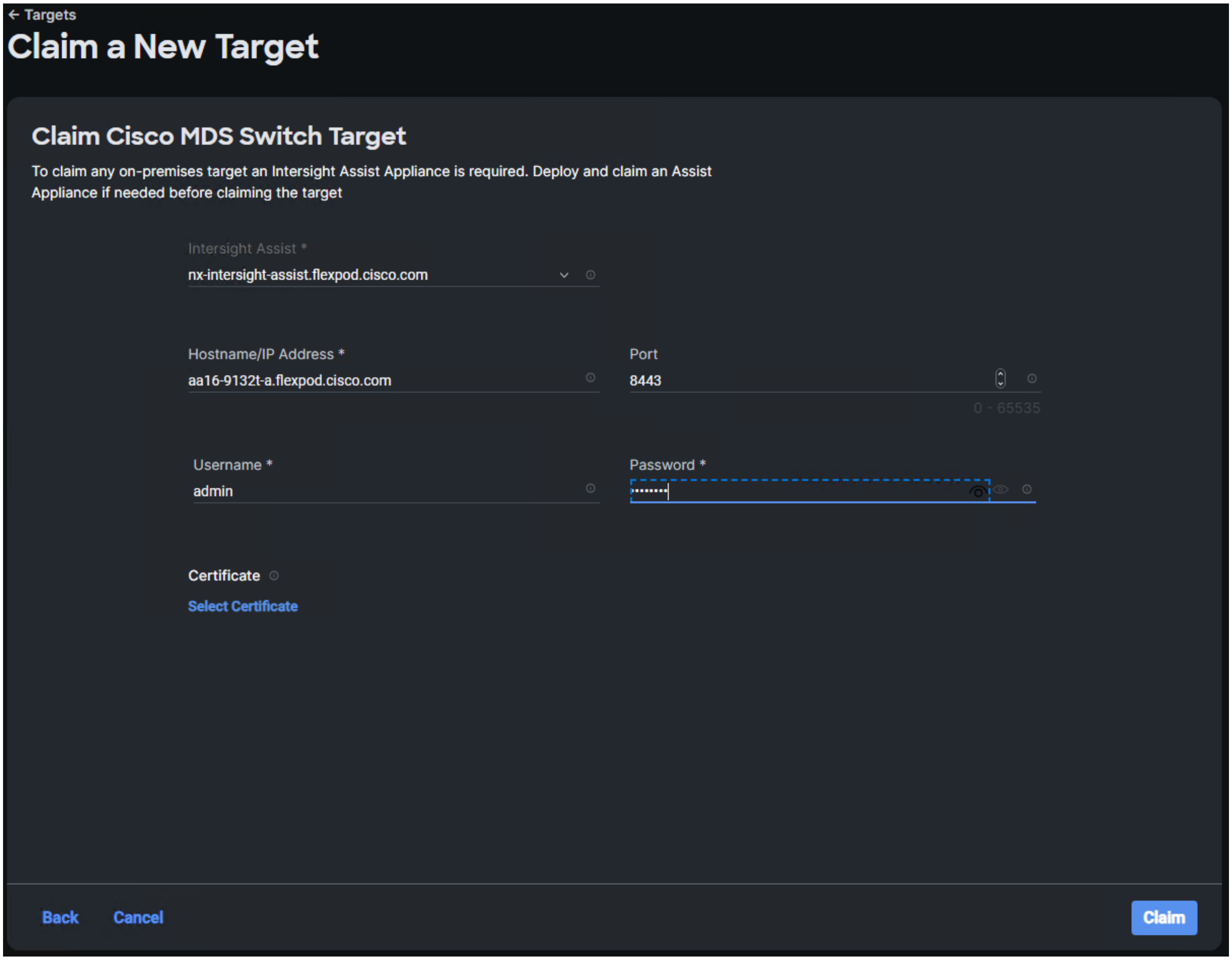
Step 2. From Cisco Intersight, click **System > Admin > Targets**.

Step 3. Click **Claim a New Target**. In the Select Target Type window, select Cisco MDS Switch under Network and click **Start**.

Step 4. In the Claim Cisco MDS Switch Target window, verify the correct Intersight Assist is selected.

Step 5. Fill in the Cisco MDS Switch information including use of Port 8443 and click **Claim**.

Note: You can use the admin user on the switch.



Claim a New Target

Claim Cisco MDS Switch Target

To claim any on-premises target an Intersight Assist Appliance is required. Deploy and claim an Assist Appliance if needed before claiming the target

Intersight Assist *: nx-intersight-assist.flexpod.cisco.com

Hostname/IP Address *: aa16-9132t-a.flexpod.cisco.com

Port: 8443 (0 - 65535)

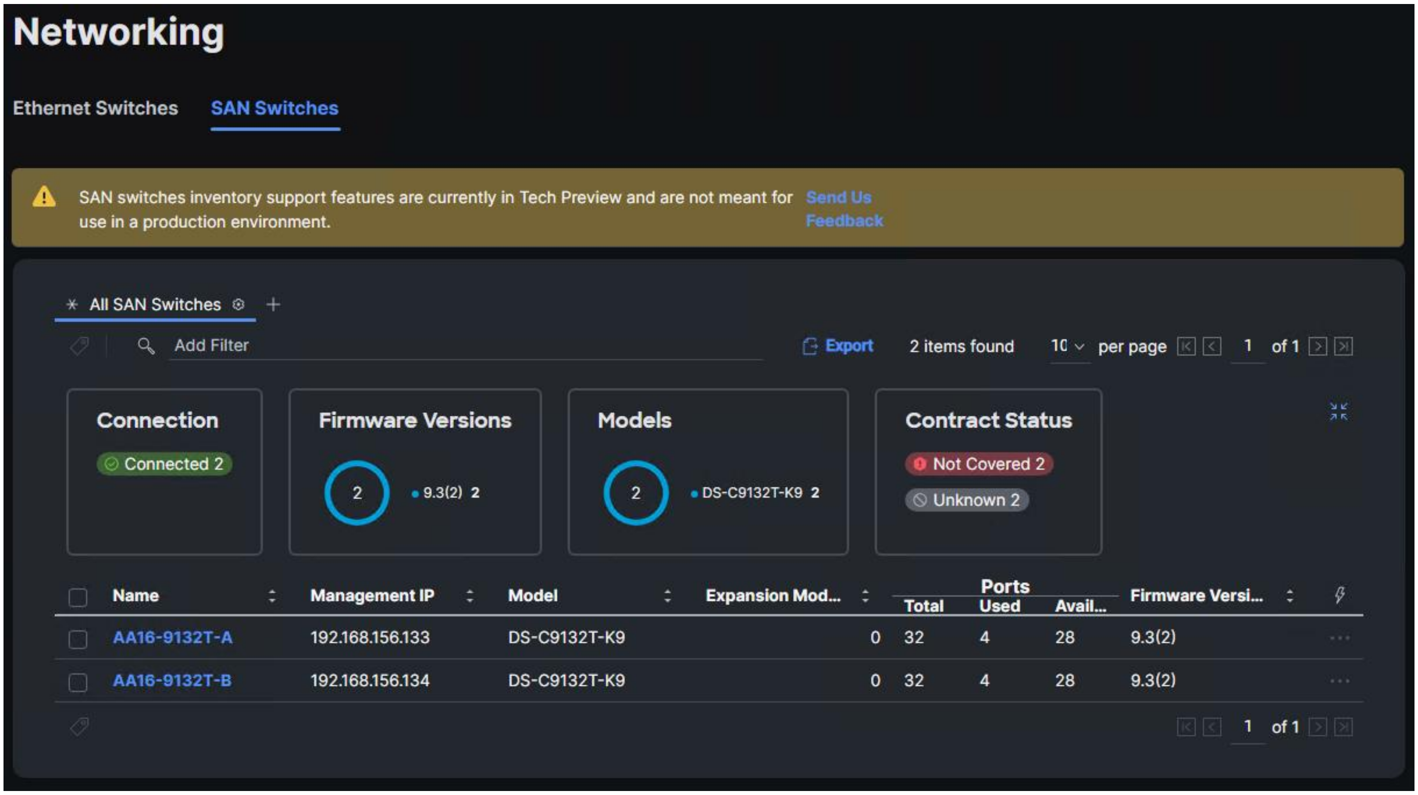
Username *: admin

Password *: ••••••••

Certificate

Step 6. Repeat the steps in this procedure to add the second Cisco MDS Switch.

Step 7. After a few minutes, the two switches will appear under **Infrastructure Service** > **Operate** > **Networking** > **SAN Switches.**



Networking

Ethernet Switches SAN Switches

⚠ SAN switches inventory support features are currently in Tech Preview and are not meant for use in a production environment. Send Us Feedback

All SAN Switches

Add Filter

Export 2 items found 10 per page 1 of 1

Connection: Connected 2

Firmware Versions: 2 — 9.3(2) 2

Models: 2 — DS-C9132T-K9 2

Contract Status: Not Covered 2, Unknown 2

	Name	Management IP	Model	Expansion Mod...	Ports			Firmware Versi...
					Total	Used	Avail...	
□	AA16-9132T-A	192.168.156.133	DS-C9132T-K9	0	32	4	28	9.3(2)
□	AA16-9132T-B	192.168.156.134	DS-C9132T-K9	0	32	4	28	9.3(2)

1 of 1

Note: Cisco MDS switches are still under Tech Preview in Intersight. Viewing information about the switches is fine, but if this is a production FlexPod, Intersight Cloud Orchestrator tasks and workflows should not be executed against these switches.

Step 8. Click one of the switch names to get detailed General and Inventory information on the switch.

Create a FlexPod Integrated System

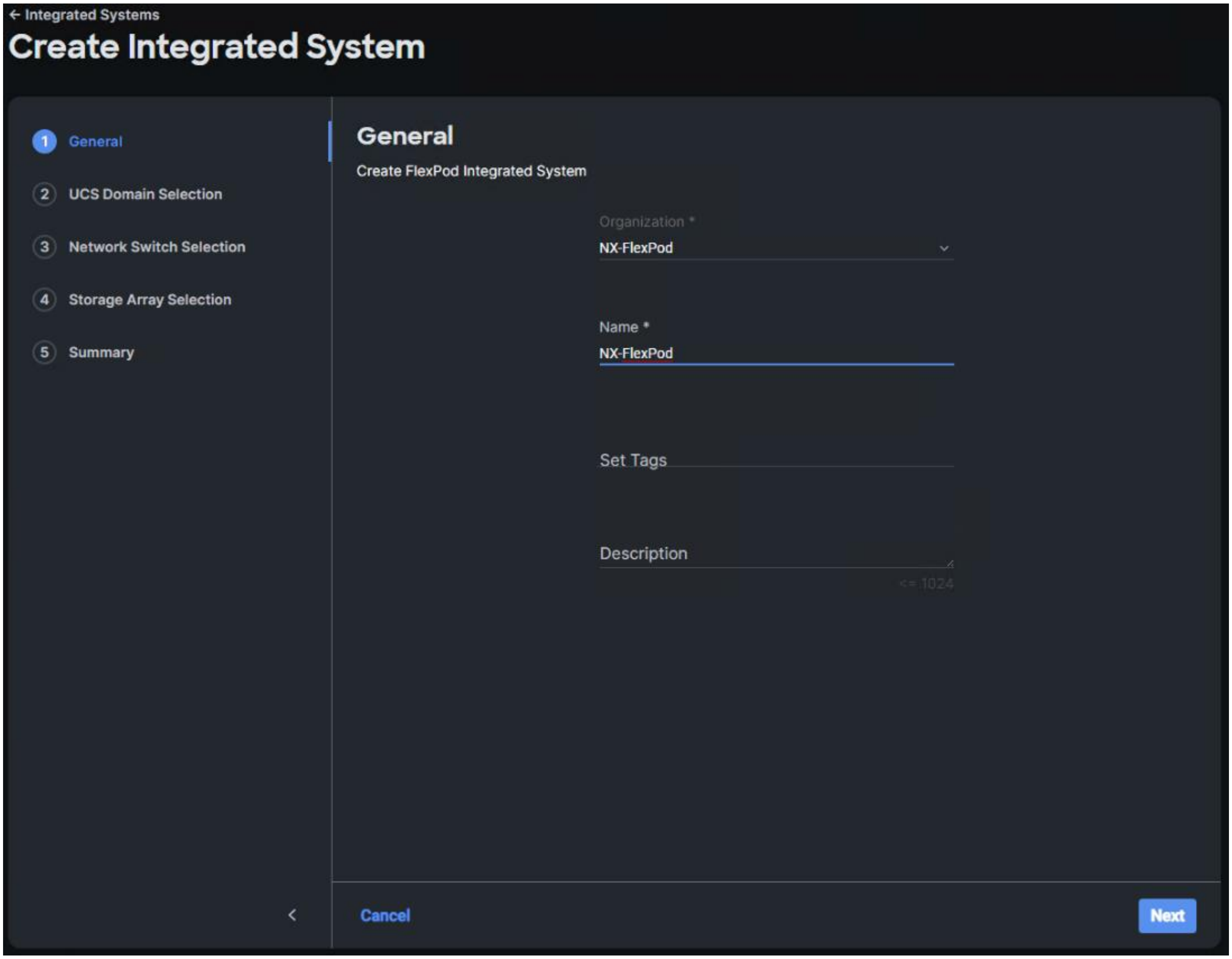
Procedure 1. Creating a FlexPod Integrated System

Step 1. Log into **Cisco Intersight** and connect to the account for this FlexPod.

Step 2. From **Cisco Intersight**, click **Infrastructure Service** > **Operate** > **Integrated Systems**.

Step 3. Click **Create Integrated System**. In the center pane, select **FlexPod** and click **Start**.

Step 4. Select the correct Organization, provide a suitable name, and optionally any Tags or a Description and click **Next**.



General

Create FlexPod Integrated System

Organization * NX-FlexPod

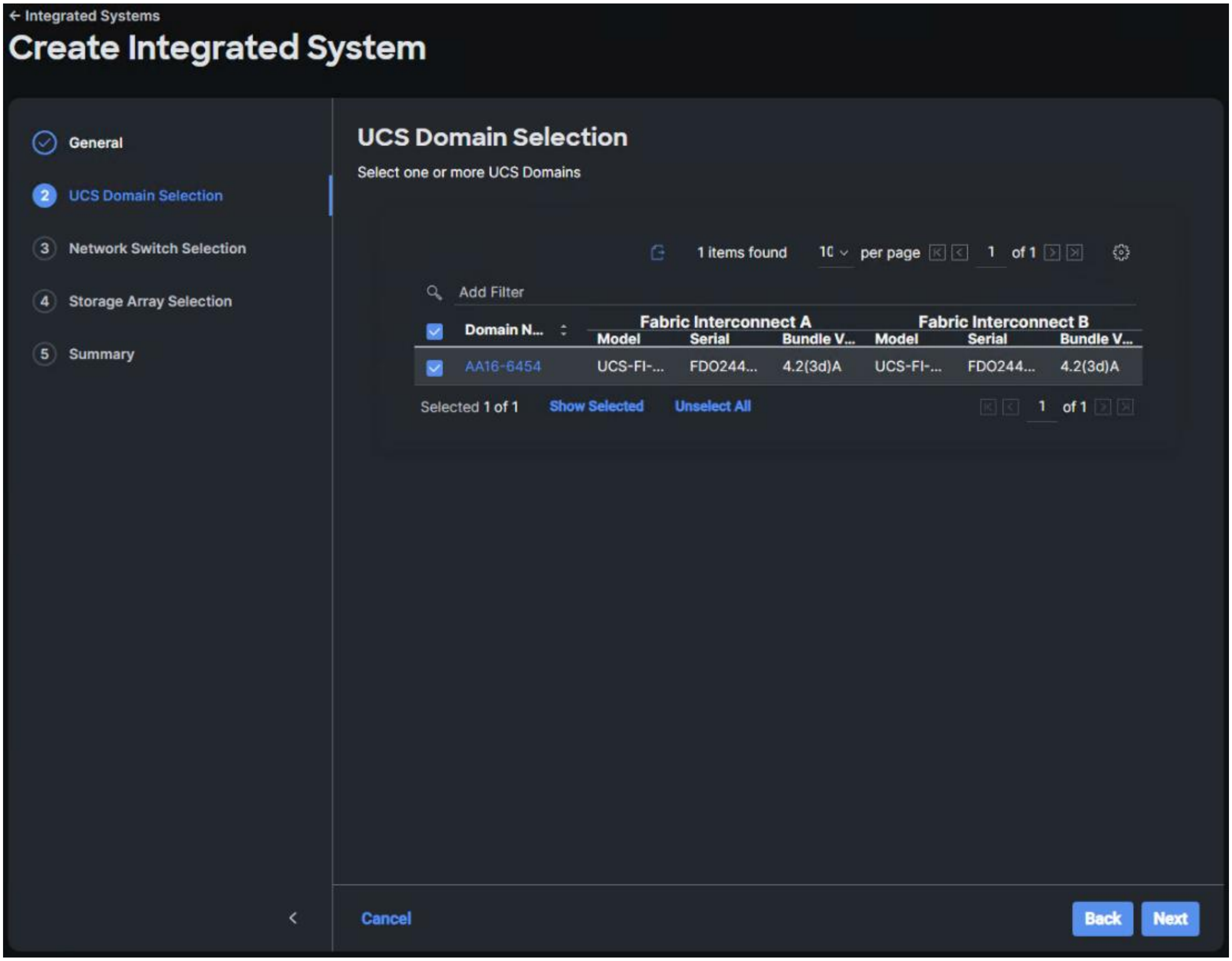
Name * NX-FlexPod

Set Tags

Description

<= 1024

Step 5. Select the UCS Domain used in this FlexPod and click **Next**.



UCS Domain Selection

Select one or more UCS Domains

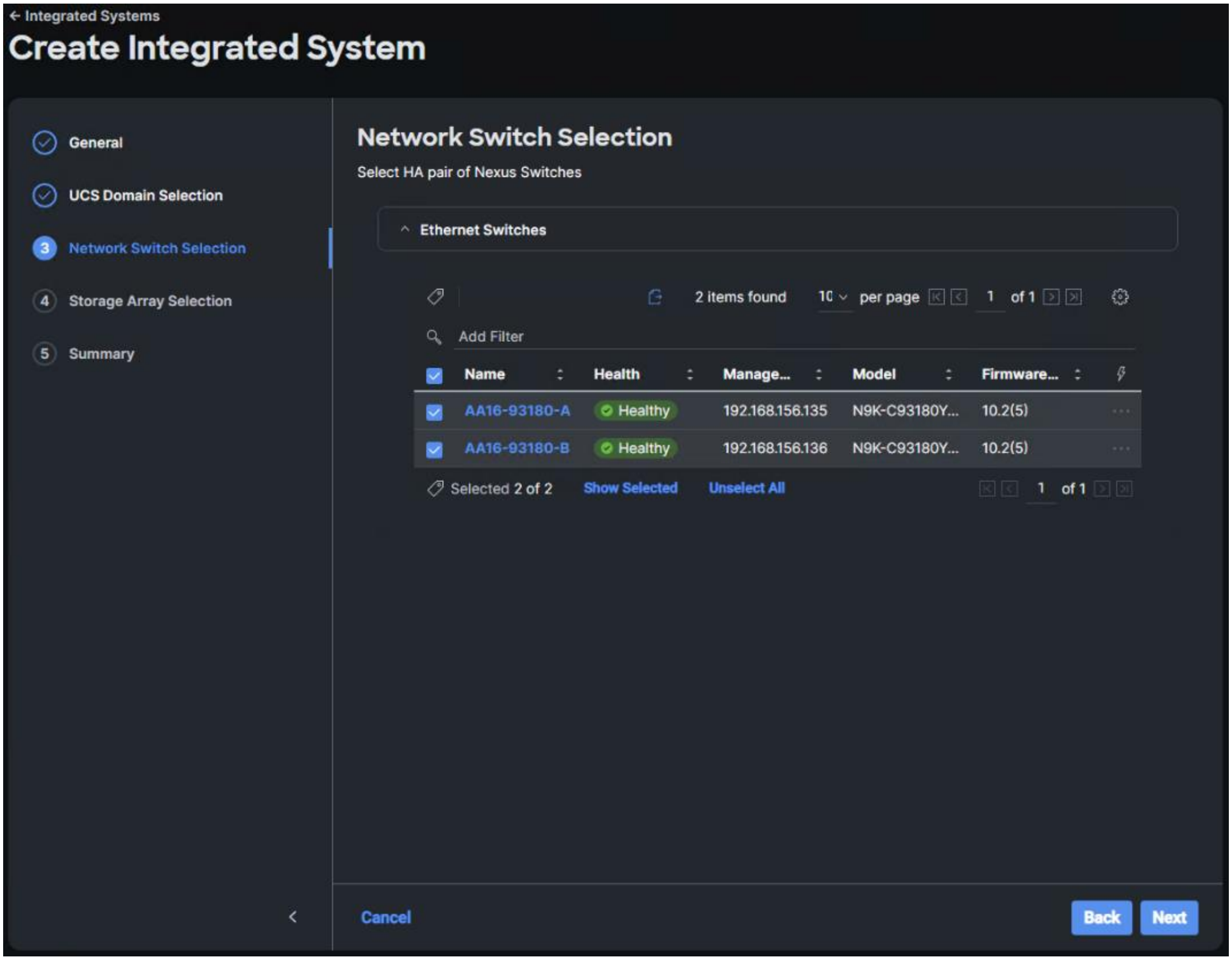
1 items found 10 per page 1 of 1

Add Filter

	Domain N...	Fabric Interconnect A			Fabric Interconnect B		
		Model	Serial	Bundle V...	Model	Serial	Bundle V...
☑	AA16-6454	UCS-FI-...	FDO244...	4.2(3d)A	UCS-FI-...	FDO244...	4.2(3d)A

Selected 1 of 1 Show Selected Unselect All 1 of 1

Step 6. Select the two Cisco Nexus switches used in this FlexPod and click **Next**.



Network Switch Selection

Select HA pair of Nexus Switches

Ethernet Switches

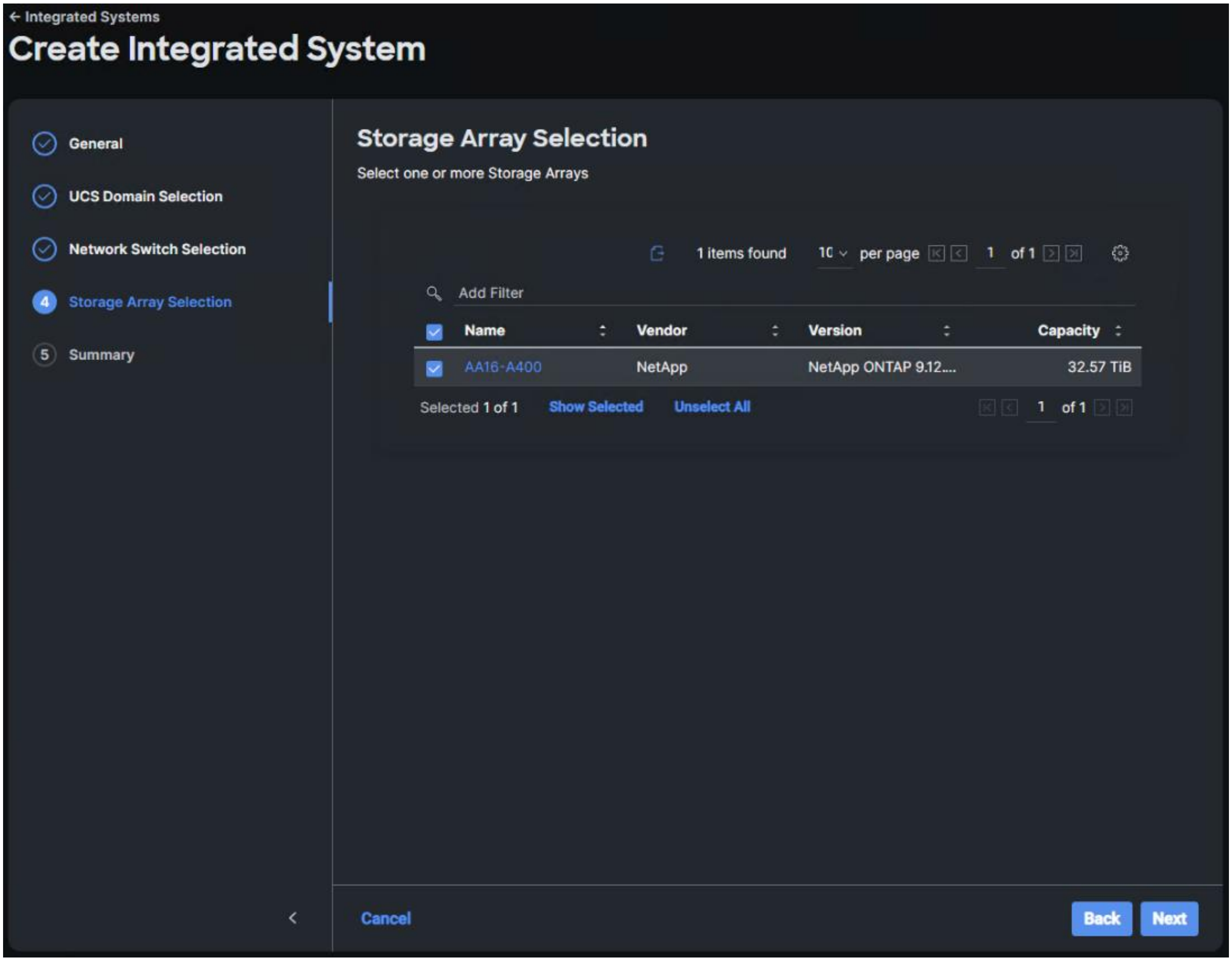
2 items found 10 per page 1 of 1

Add Filter

☑	Name	Health	Manage...	Model	Firmware...
☑	AA16-93180-A	Healthy	192.168.156.135	N9K-C93180Y...	10.2(5)
☑	AA16-93180-B	Healthy	192.168.156.136	N9K-C93180Y...	10.2(5)

Selected 2 of 2

Step 7. Select all NetApp storage used in this FlexPod and click **Next**.


← Integrated Systems

Create Integrated System

Storage Array Selection

Select one or more Storage Arrays

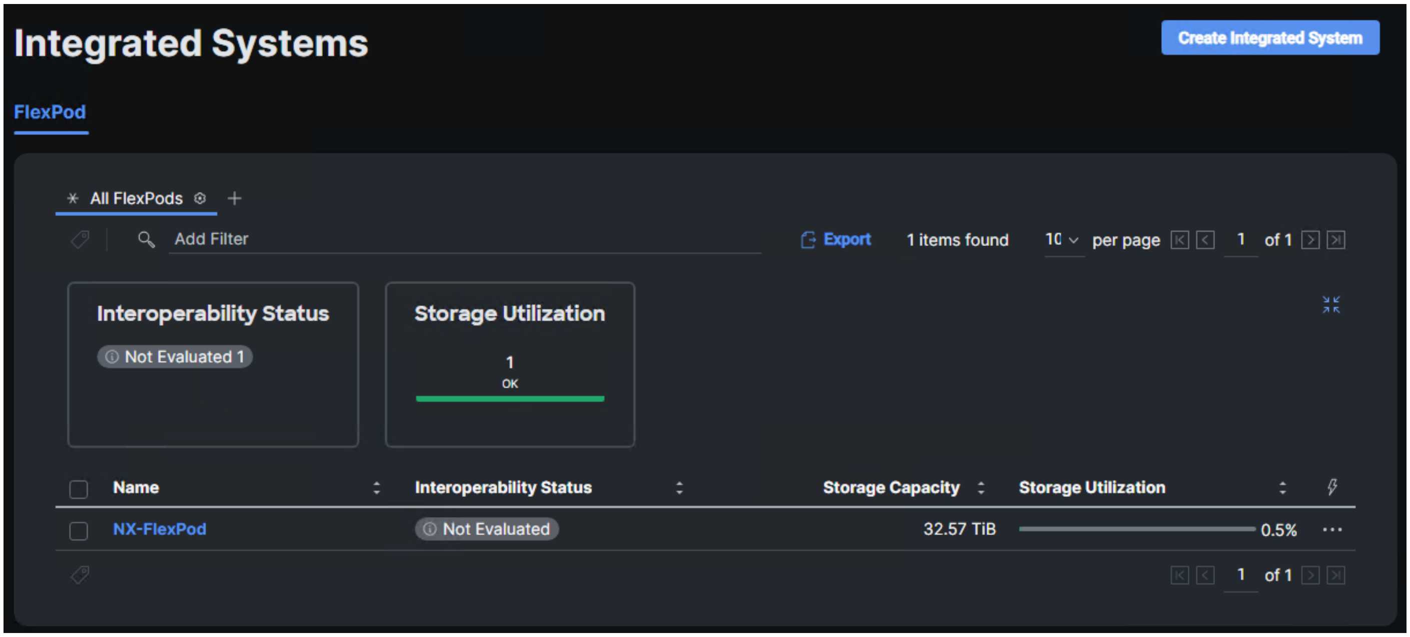
1 items found 10 per page 1 of 1

Add Filter

☑	Name	Vendor	Version	Capacity
☑	AA16-A400	NetApp	NetApp ONTAP 9.12....	32.57 TiB

Selected 1 of 1 Show Selected Unselect All 1 of 1

Step 8. Review the Summary information and click **Create**. After a few minutes, the FlexPod Integrated System will appear under Integrated Systems.



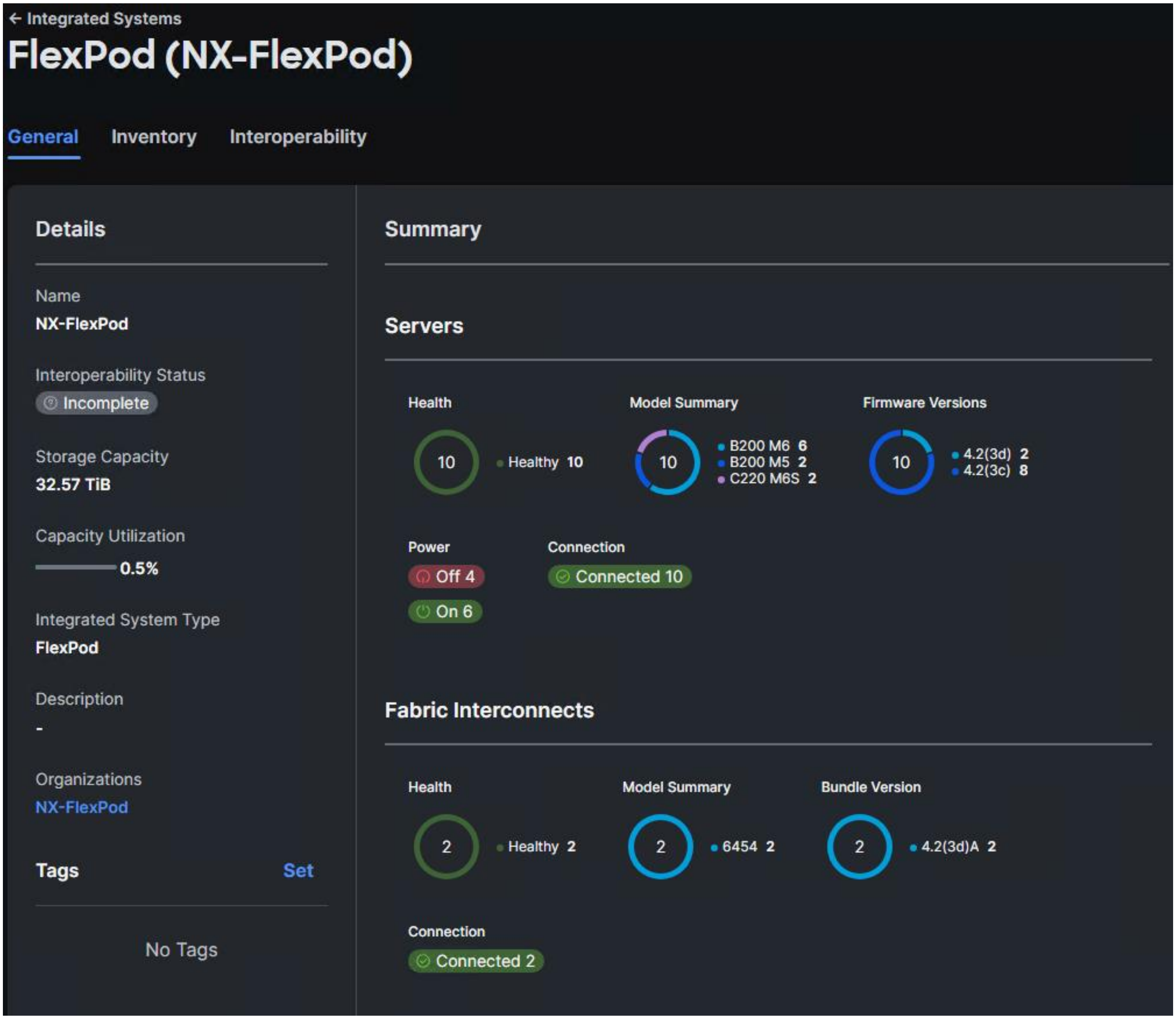
Interoperability Status: Not Evaluated 1

Storage Utilization: 1 OK

Name	Interoperability Status	Storage Capacity	Storage Utilization
NX-FlexPod	Not Evaluated	32.57 TiB	0.5%

Note: You can click the "**...**" to the right of the FlexPod name and run an Interoperability check on the FlexPod. This check will take information on the FlexPod already checked against the Cisco UCS Hardware Compatibility List (HCL) and also check this information against the NetApp Interoperability Matrix Tool (IMT).

Step 9. Click the FlexPod name to see detailed General, Inventory, and Interoperability data on the FlexPod Integrated System.



← Integrated Systems

FlexPod (NX-FlexPod)

General | Inventory | Interoperability

Details

Name: NX-FlexPod

Interoperability Status: Incomplete

Storage Capacity: 32.57 TiB

Capacity Utilization: 0.5%

Integrated System Type: FlexPod

Description: -

Organizations: NX-FlexPod

Tags — Set

No Tags

Summary

Servers

Health: 10 — Healthy 10

Model Summary: 10 — B200 M6 6, B200 M5 2, C220 M6S 2

Firmware Versions: 10 — 4.2(3d) 2, 4.2(3c) 8

Power: Off 4, On 6

Connection: Connected 10

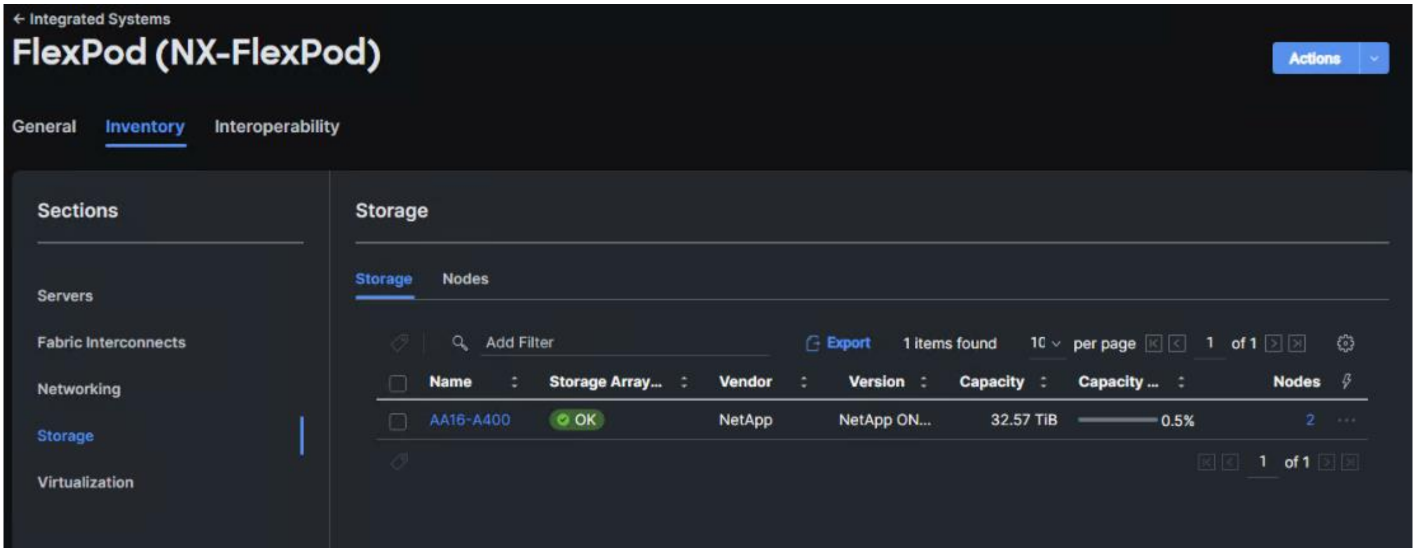
Fabric Interconnects

Health: 2 — Healthy 2

Model Summary: 2 — 6454 2

Bundle Version: 2 — 4.2(3d)A 2

Connection: Connected 2



← Integrated Systems

FlexPod (NX-FlexPod)

General | Inventory | Interoperability

Sections

- Servers
- Fabric Interconnects
- Networking
- Storage
- Virtualization

Storage

Storage | Nodes

Add Filter — Export — 1 items found — 10 per page — 1 of 1

Name	Storage Array...	Vendor	Version	Capacity	Capacity ...	Nodes
AA16-A400	OK	NetApp	NetApp ON...	32.57 TiB	0.5%	2

1 of 1

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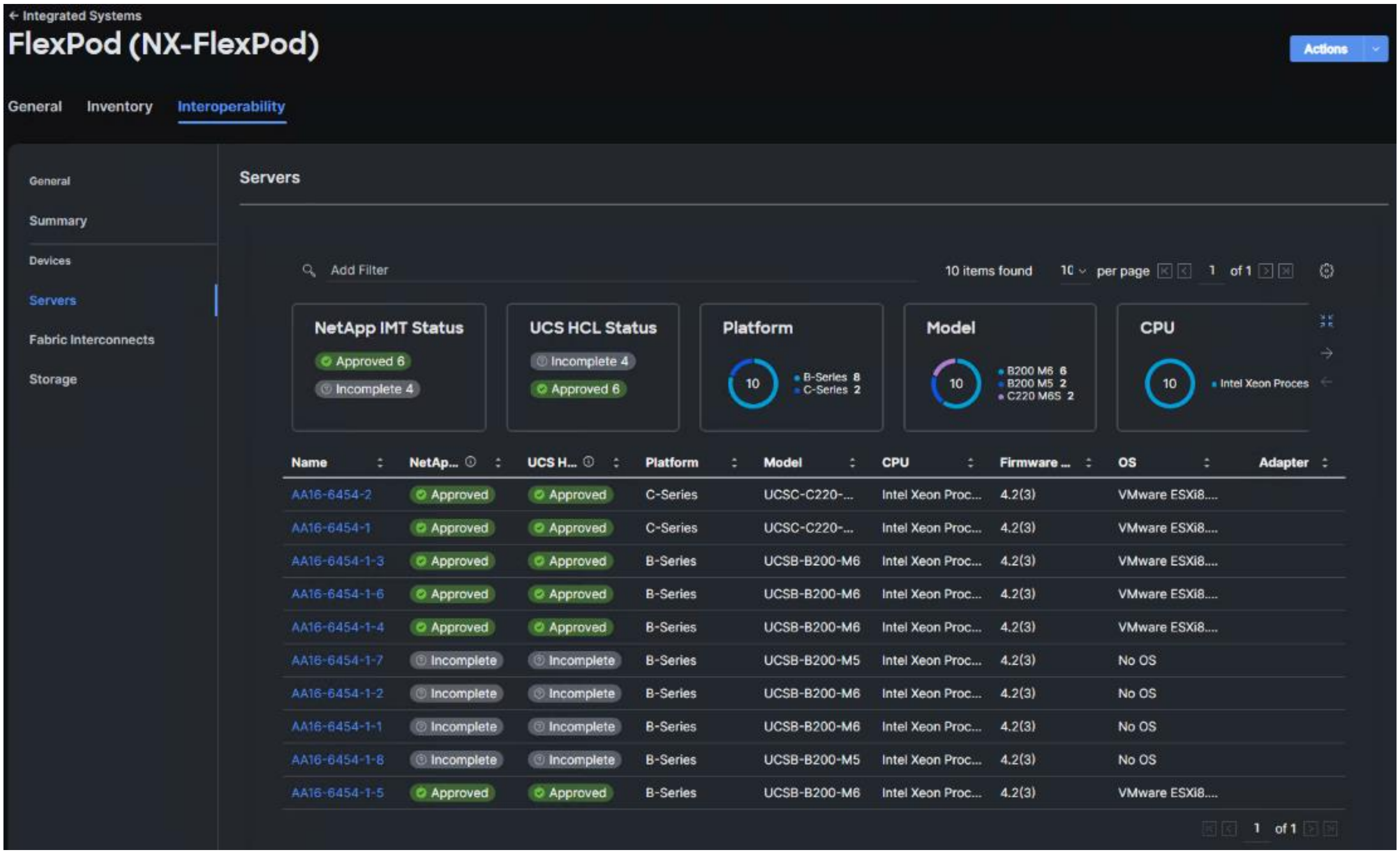


Name	NetAp...	UCS H...	Platform	Model	CPU	Firmware ...	OS	Adapter
AA16-6454-2	Approved	Approved	C-Series	UCSC-C220-...	Intel Xeon Proc...	4.2(3)	VMware ESXi8....	
AA16-6454-1	Approved	Approved	C-Series	UCSC-C220-...	Intel Xeon Proc...	4.2(3)	VMware ESXi8....	
AA16-6454-1-3	Approved	Approved	B-Series	UCSB-B200-M6	Intel Xeon Proc...	4.2(3)	VMware ESXi8....	
AA16-6454-1-6	Approved	Approved	B-Series	UCSB-B200-M6	Intel Xeon Proc...	4.2(3)	VMware ESXi8....	
AA16-6454-1-4	Approved	Approved	B-Series	UCSB-B200-M6	Intel Xeon Proc...	4.2(3)	VMware ESXi8....	
AA16-6454-1-7	Incomplete	Incomplete	B-Series	UCSB-B200-M5	Intel Xeon Proc...	4.2(3)	No OS	
AA16-6454-1-2	Incomplete	Incomplete	B-Series	UCSB-B200-M6	Intel Xeon Proc...	4.2(3)	No OS	
AA16-6454-1-1	Incomplete	Incomplete	B-Series	UCSB-B200-M6	Intel Xeon Proc...	4.2(3)	No OS	
AA16-6454-1-8	Incomplete	Incomplete	B-Series	UCSB-B200-M5	Intel Xeon Proc...	4.2(3)	No OS	
AA16-6454-1-5	Approved	Approved	B-Series	UCSB-B200-M6	Intel Xeon Proc...	4.2(3)	VMware ESXi8....	

Note: The servers that were not powered on during Run Interoperability Check were categorized as Incomplete Devices in the Interoperability Summary view.

Cisco Nexus Dashboard Fabric Controller (NDFC)-SAN

If you have fibre-channel SAN in your FlexPod, Cisco NDFC-SAN can be used to monitor, configure, and analyze Cisco fibre channel fabrics. This configuration will setup a single-node Nexus Dashboard on a Cisco UCS server and then deploy NDFC-SAN. SAN Analytics can be added to provide insights into your fabric by allowing you to monitor, analyze, identify, and troubleshoot performance issues.

Prerequisites

The following prerequisites need to be configured:

- Licensing. Cisco NDFC-SAN includes a 60-day server-based trial license that can be used to monitor and configure Cisco MDS Fibre Channel switches and Cisco Nexus switches utilizing Nexus SAN switching. Both NDFC or DCNM server-based and switch-based licenses can be purchased. Additionally, SAN Insights and SAN Analytics requires an additional switch-based license on each switch. Cisco MDS 32Gbps Fibre Channel switches provide a 120-day grace period to trial SAN Analytics.

Note: If using Cisco Nexus 93360YC-FX2, 93360YC-FX2, or 9336C-FX2-E for SAN switching, the Nexus switch does not support SAN Analytics.

- Passwords. Cisco NDFC-SAN passwords should adhere to the following password requirements:
  - It must be at least eight characters long and contain at least one alphabet and one numeral.
  - It can contain a combination of alphabets, numerals, and special characters.
  - Do not use any of these special characters in the DCNM password for all platforms: <SPACE> " & $ % ' ^ = < > ; : ` \ | / , .*

- NDFC SNMPv3 user on switches. Each switch (both Cisco MDS and Nexus) needs an SNMPv3 user added for NDFC to use to query and configure the switch. On each switch, enter the following command in configure terminal mode (in the example, the userid is snmpuser):

```
snmp-server user snmpadmin network-admin auth sha <password> priv aes-128 <privacy-password>
```

- On Cisco MDS switches, type show run. If snmpadmin passphrase lifetime 0 is present, enter username snm-padmin passphrase lifetime 99999 warntime 14 gracetime 3.

Note: It is important to use auth type sha and privacy auth aes-128 for both the switch and UCS snmpadmin users.

- Type “**copy run start**” on all switches to save the running configuration to the startup configuration.
- In Cisco UCS Manager, select **Admin** > **Communication Management** > **Communication Services**. Set the SNMP Admin State to **Enabled**. Under SNMP Users, add the same snmpadmin user with SHA and AES-128 with the same passwords set in the switches. Click **Save Changes** and then click **OK** to confirm this.

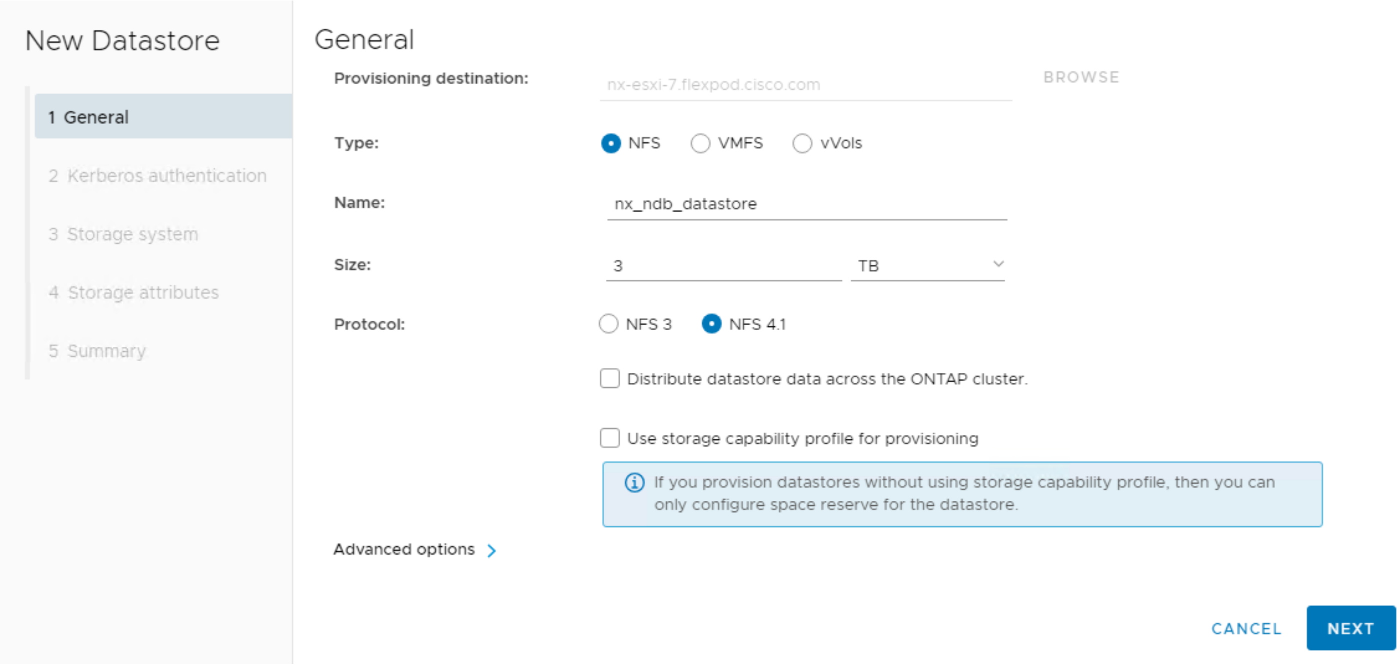
Procedure 1. Deploy the Cisco Nexus Dashboard OVA and then NDFC-SAN

Step 1. Download the Cisco Nexus Dashboard VM Image 2.3(2d) from https://software.cisco.com/download/home/281722751/type/282088134/release/12.1.2e.

Step 2. The single-node Nexus Dashboard should be installed on a server that is not part of a cluster since Nexus Dashboard does not support vMotion or VMware DRS. If an extra server was provisioned for this purpose, move it out to the Datacenter level in vCenter. Otherwise, follow the procedures in this document to provision a server at the Datacenter level. Make sure that it has a VMkernel port in the Infra-NFS subnet. For manual configuration of an ESXi host in a FlexPod, you can refer to https://www.cisco.com/c/en/us/td/docs/unified_computing/ucs/UCS_CVDs/flexpod_ucs_xseries_e2e_ontap_manual_deploy.html for everything except provisioning a Service Profile from template.

Step 3. Since Nexus Dashboard requires 3TB of disk space, it is recommended to place it in a separate datastore. Create a 3TB NFS datastore by right-clicking the Nexus Dashboard ESXi host and selecting **NetApp ONTAP Tools** > **Provision Datastore.**

Step 4. Name the datastore and set the size to 3TB. Select the NFS protocol in use in your environment and uncheck **Use storage capability profile for provisioning**. Click **NEXT**.



New Datastore

1 General

2 Kerberos authentication

3 Storage system

4 Storage attributes

5 Summary

General

Provisioning destination: nx-esxi-7.flexpod.cisco.com BROWSE

Type: ● NFS ○ VMFS ○ vVols

Name: nx_ndb_datastore

Size: 3 TB

Protocol: ○ NFS 3 ● NFS 4.1

□ Distribute datastore data across the ONTAP cluster.

□ Use storage capability profile for provisioning

If you provision datastores without using storage capability profile, then you can only configure space reserve for the datastore.

Advanced options >

CANCEL NEXT

Step 5. If using NFS 4.1, leave “Don’t use Kerberos authentication” selected and click **NEXT**.

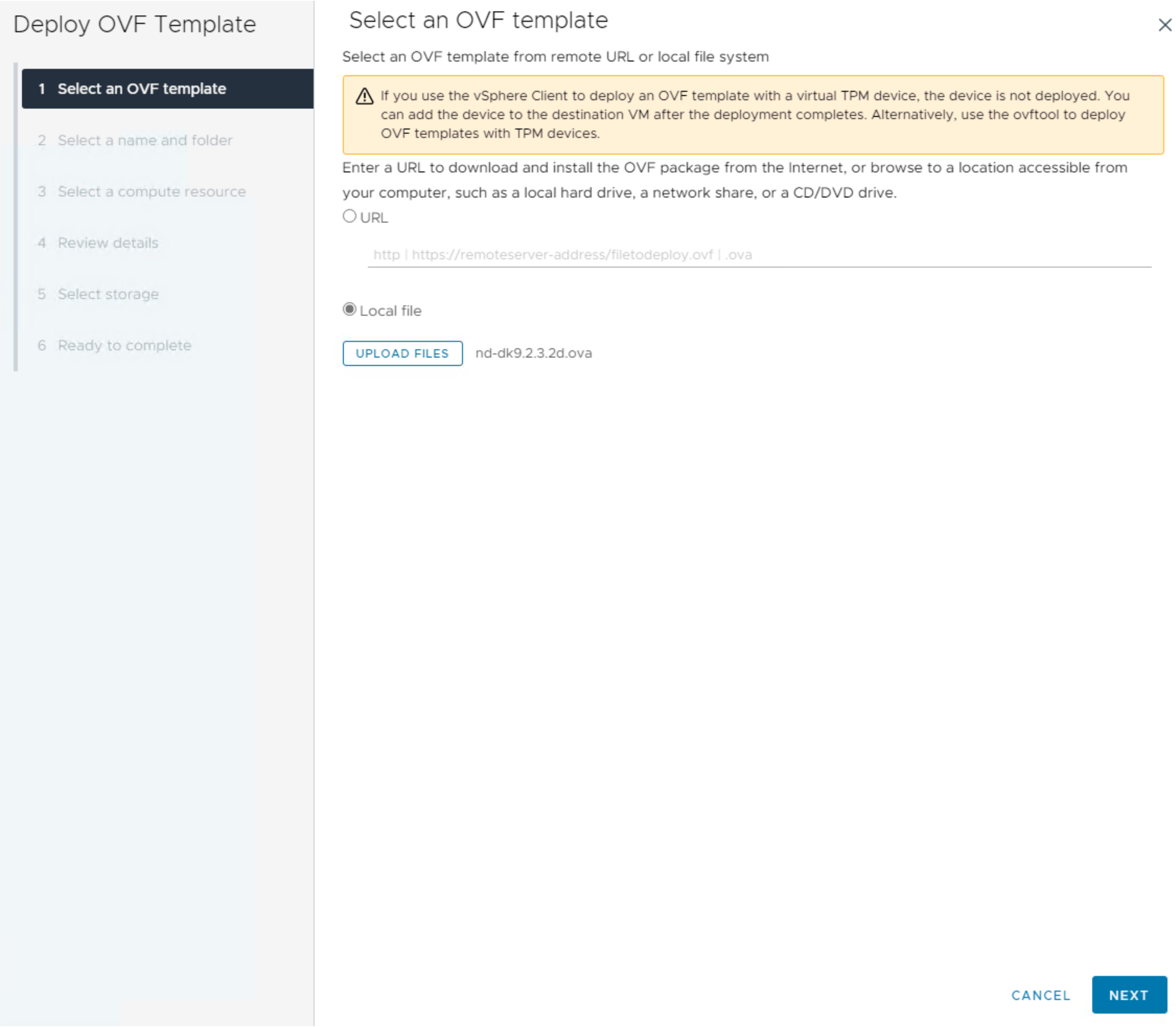
Step 6. Select the storage controller for this FlexPod and the Infra-SVM and click **NEXT**.

Step 7. Select the aggregate with the freest space. Expand Advanced options and make sure Space reserve is set to Thin. Click **NEXT**.

Step 8. Review the Summary and click **FINISH** and **OK**. ONTAP Tools will provision and mount the datastore on the Nexus Dashboard ESXi host.

Step 9. Right-click the Nexus Dashboard ESXi host and select **Deploy OVF Template**.

Step 10. Select Local file then click **UPLOAD FILES**. Navigate to select nd-dk9.2.3.2d.ova and click **Open**. Click **NEXT**.



Deploy OVF Template

1 Select an OVF template

2 Select a name and folder

3 Select a compute resource

4 Review details

5 Select storage

6 Ready to complete

Select an OVF template

Select an OVF template from remote URL or local file system

⚠ If you use the vSphere Client to deploy an OVF template with a virtual TPM device, the device is not deployed. You can add the device to the destination VM after the deployment completes. Alternatively, use the ovftool to deploy OVF templates with TPM devices.

Enter a URL to download and install the OVF package from the Internet, or browse to a location accessible from your computer, such as a local hard drive, a network share, or a CD/DVD drive.

○ URL

http | https://remoteserver-address/filetodeploy.ovf | .ova

● Local file

UPLOAD FILES nd-dk9.2.3.2d.ova

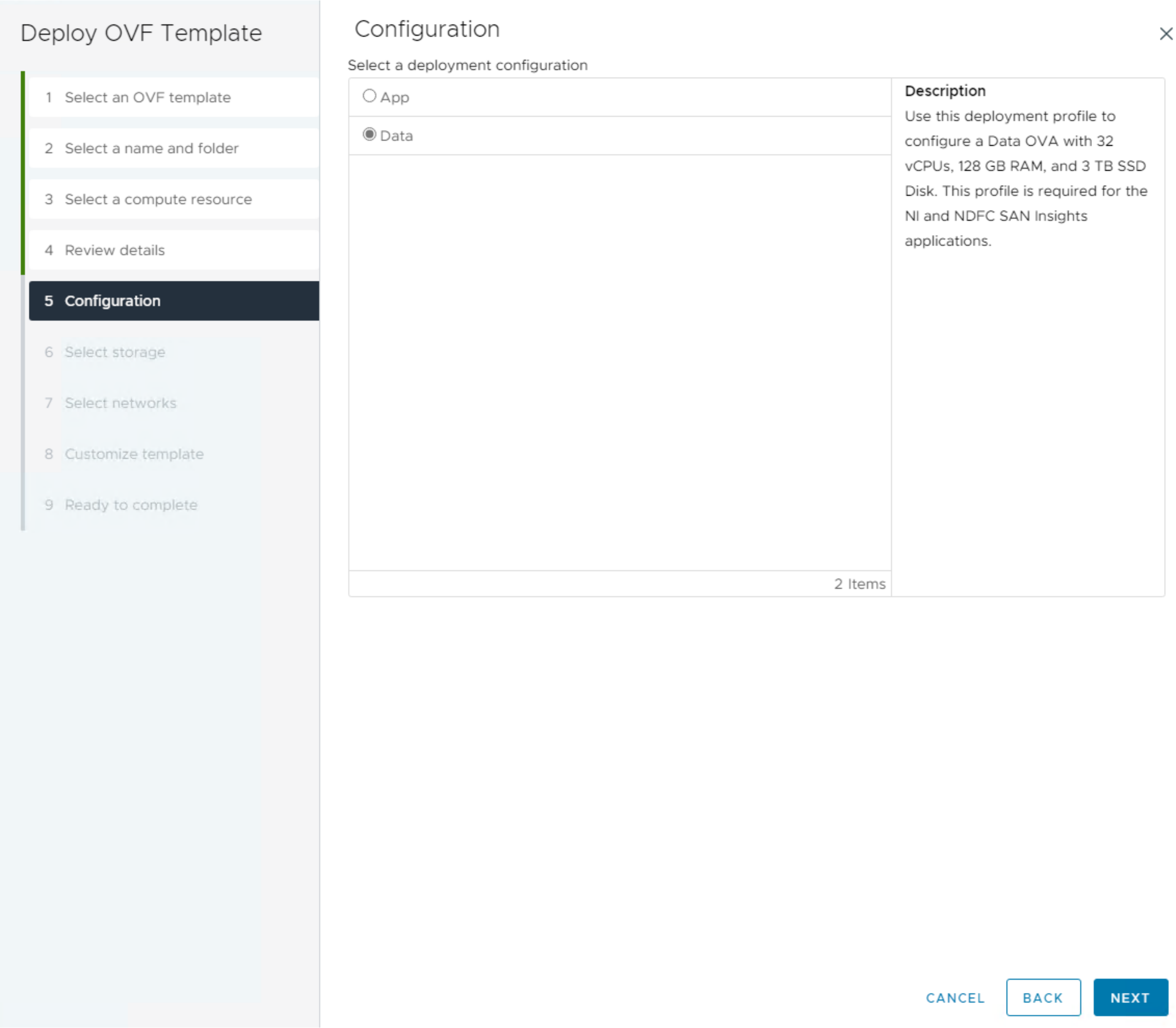
Step 11. Name the virtual machine and select the FlexPod-DC datacenter. Click **NEXT**.

Step 12. Select the Nexus Dashboard ESXi host and click **NEXT**.

Step 13. Review the details and click **NEXT**.

Step 14. Select the appropriate deployment configuration size and click **NEXT**.

Note: If using the SAN Insights and SAN Analytics feature, it is recommended to use the Data deployment.



Configuration

Select a deployment configuration

○ App

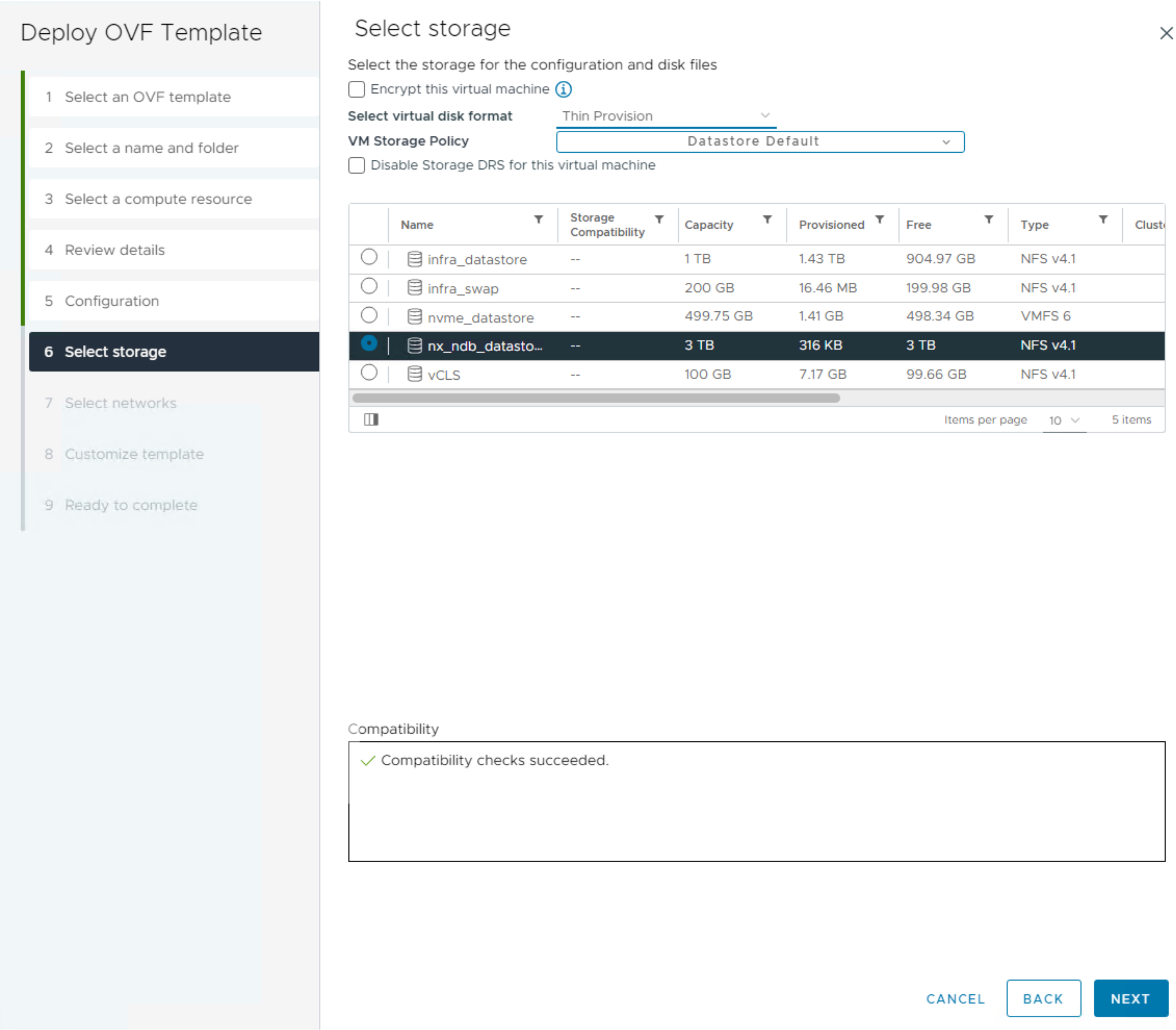
● Data

2 Items

Description

Use this deployment profile to configure a Data OVA with 32 vCPUs, 128 GB RAM, and 3 TB SSD Disk. This profile is required for the NI and NDFC SAN Insights applications.

Step 15. Select the datastore previously configured and the Thin Provision virtual disk format. Click **NEXT**.



Select storage

Select the storage for the configuration and disk files

□ Encrypt this virtual machine

Select virtual disk format: Thin Provision

VM Storage Policy: Datastore Default

□ Disable Storage DRS for this virtual machine

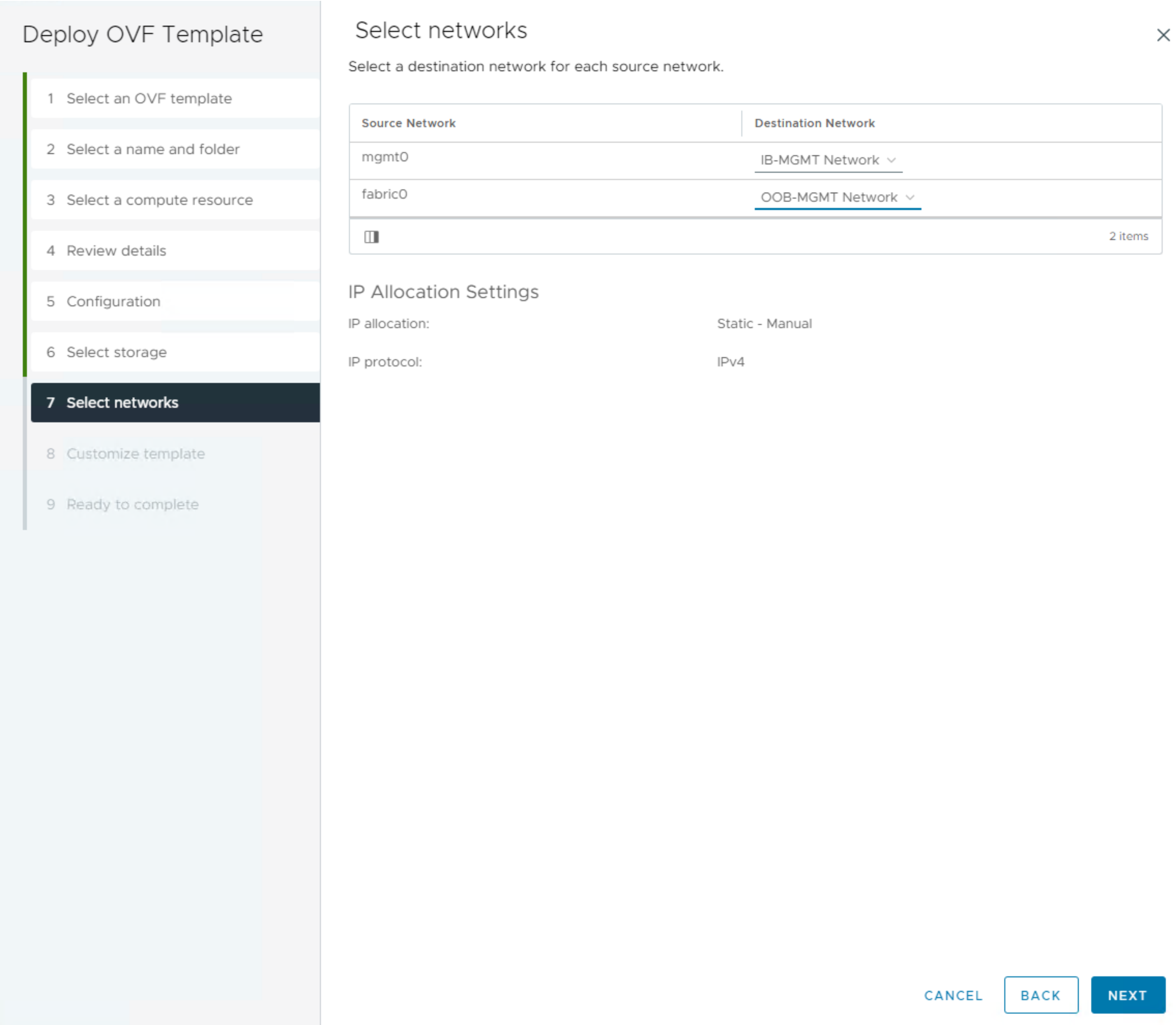
	Name	Storage Compatibility	Capacity	Provisioned	Free	Type	Clust
○	infra_datastore	--	1 TB	1.43 TB	904.97 GB	NFS v4.1	
○	infra_swap	--	200 GB	16.46 MB	199.98 GB	NFS v4.1	
○	nvme_datastore	--	499.75 GB	1.41 GB	498.34 GB	VMFS 6	
●	nx_ndb_datasto...	--	3 TB	316 KB	3 TB	NFS v4.1	
○	vCLS	--	100 GB	7.17 GB	99.66 GB	NFS v4.1	

Items per page 10   5 items

Compatibility

✓ Compatibility checks succeeded.

Step 16. Select **IB-MGMT Network** for the mgmt0 Source Network. Select **OOB-MGMT Network** for the fabric0 Source Network. Click **NEXT**.



Deploy OVF Template

Select networks

Select a destination network for each source network.

Source Network	Destination Network
mgmt0	IB-MGMT Network
fabric0	OOB-MGMT Network

2 items

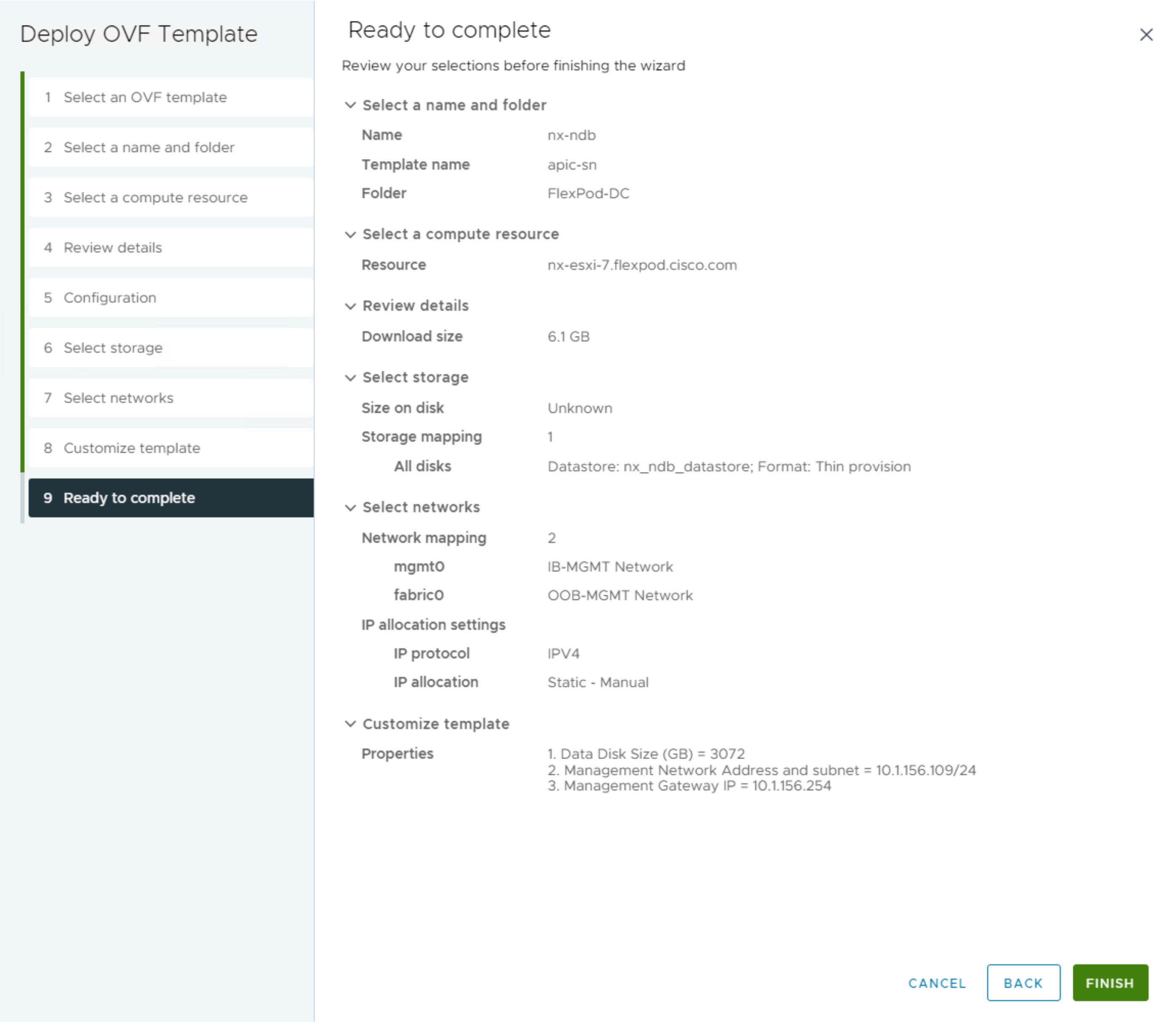
IP Allocation Settings

IP allocation: Static - Manual

IP protocol: IPv4

Step 17. Leave the Data Disk Size set to **3072**. Fill in the rescue-user password, the management network address and subnet, and the management network gateway. Click **NEXT**.

Step 18. Review the settings and click **FINISH** to deploy the OVA.



Ready to complete

Review your selections before finishing the wizard

Select a name and folder

Name	nx-ndb
Template name	apic-sn
Folder	FlexPod-DC

Select a compute resource

Resource	nx-esxi-7.flexpod.cisco.com

Review details

Download size	6.1 GB

Select storage

Size on disk	Unknown
Storage mapping	1
All disks	Datastore: nx_ndb_datastore; Format: Thin provision

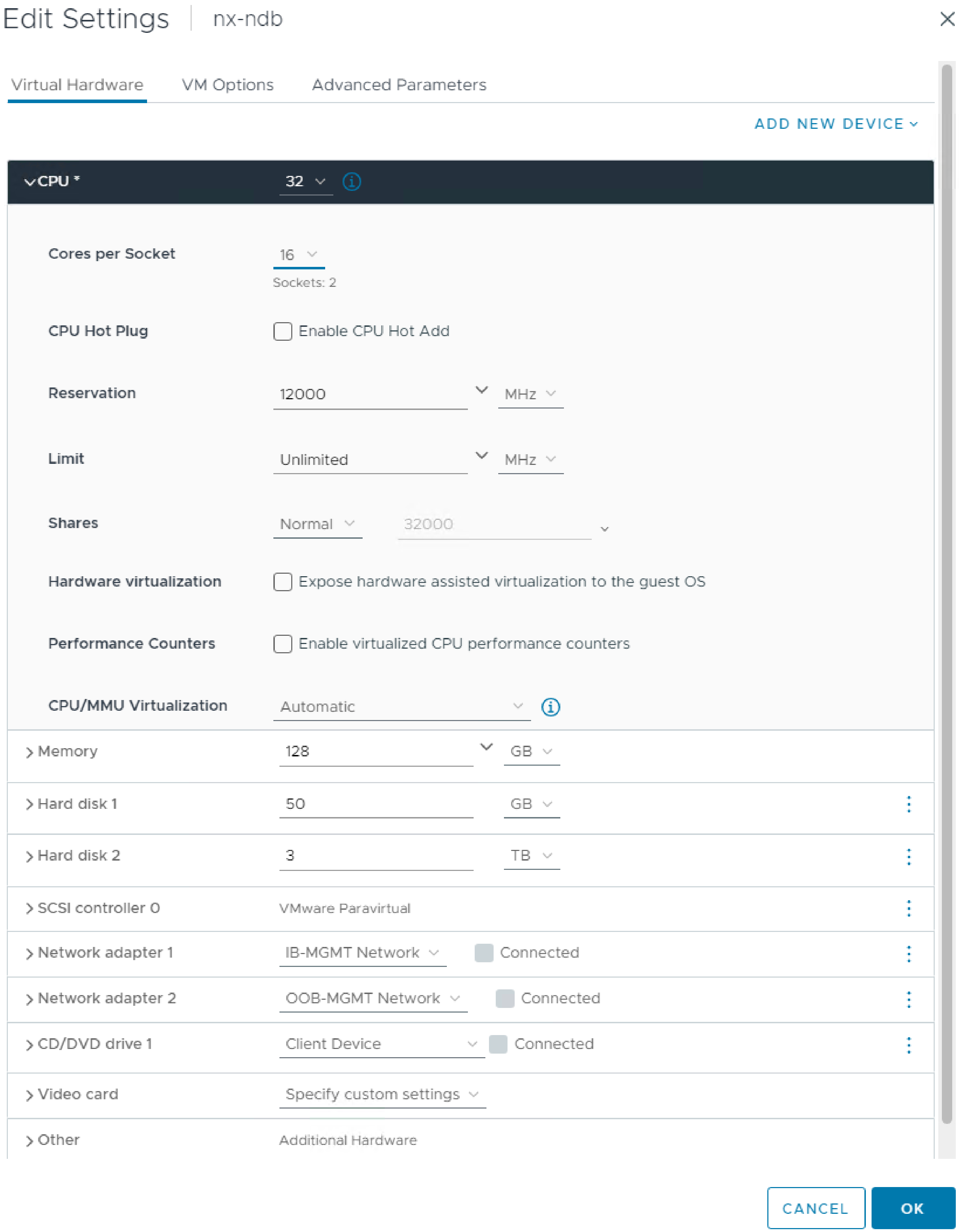
Select networks

Network mapping	2
mgmt0	IB-MGMT Network
fabric0	OOB-MGMT Network
IP allocation settings	
IP protocol	IPV4
IP allocation	Static - Manual

Customize template

Properties	1. Data Disk Size (GB) = 3072 2. Management Network Address and subnet = 10.1.156.109/24 3. Management Gateway IP = 10.1.156.254

Step 19. After deployment is complete, right-click the newly deployed Nexus Dashboard VM and click **Edit Settings.** Expand CPU and adjust the Cores per Socket setting until the number of Sockets is set to match the number of CPUs in the UCS servers used in this deployment. The following example shows 2 sockets. Click **OK.**



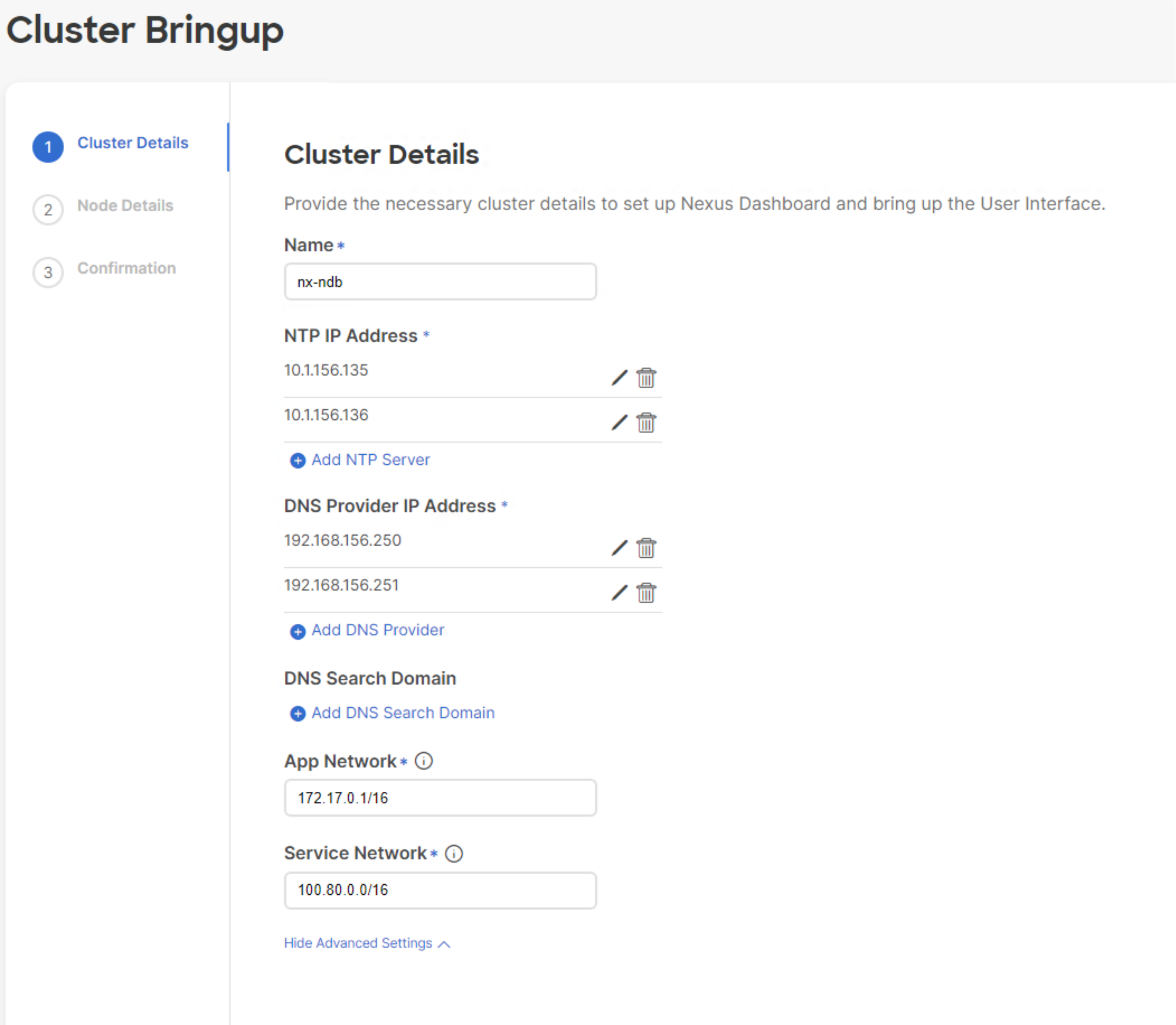
Edit Settings | nx-ndb

CPU *	32		
Cores per Socket	16 Sockets: 2		
CPU Hot Plug	□ Enable CPU Hot Add		
Reservation	12000	MHz	
Limit	Unlimited	MHz	
Shares	Normal	32000	
Hardware virtualization	□ Expose hardware assisted virtualization to the guest OS		
Performance Counters	□ Enable virtualized CPU performance counters		
CPU/MMU Virtualization	Automatic		
Memory	128	GB	
Hard disk 1	50	GB	
Hard disk 2	3	TB	
SCSI controller 0	VMware Paravirtual		
Network adapter 1	IB-MGMT Network	□ Connected	
Network adapter 2	OOB-MGMT Network	□ Connected	
CD/DVD drive 1	Client Device	□ Connected	
Video card	Specify custom settings		
Other	Additional Hardware		

Step 20. Right-click the newly deployed Nexus Dashboard VM and click **Open Remote Console**. Once the console is up, click the green arrow to power on the VM. When the VM has powered up, open a web browser, and enter the URL displayed on the console.

Step 21. Navigate the security prompts, enter the password from the OVA deployment and click **Begin Setup**.

Step 22. Enter the Nexus Dashboard name, add NTP server IPs, and DNS server IPs. If your network does not have a proxy server, click the ⓘ to the right of Proxy Server and select **Skip**. Click **Confirm** on the Warning. **Expand View Advanced Settings**. Add the DNS Search Domain and click **Next**.



Cluster Bringup

Cluster Details

Provide the necessary cluster details to set up Nexus Dashboard and bring up the User Interface.

Name *: nx-ndb

NTP IP Address *: 10.1.156.135, 10.1.156.136

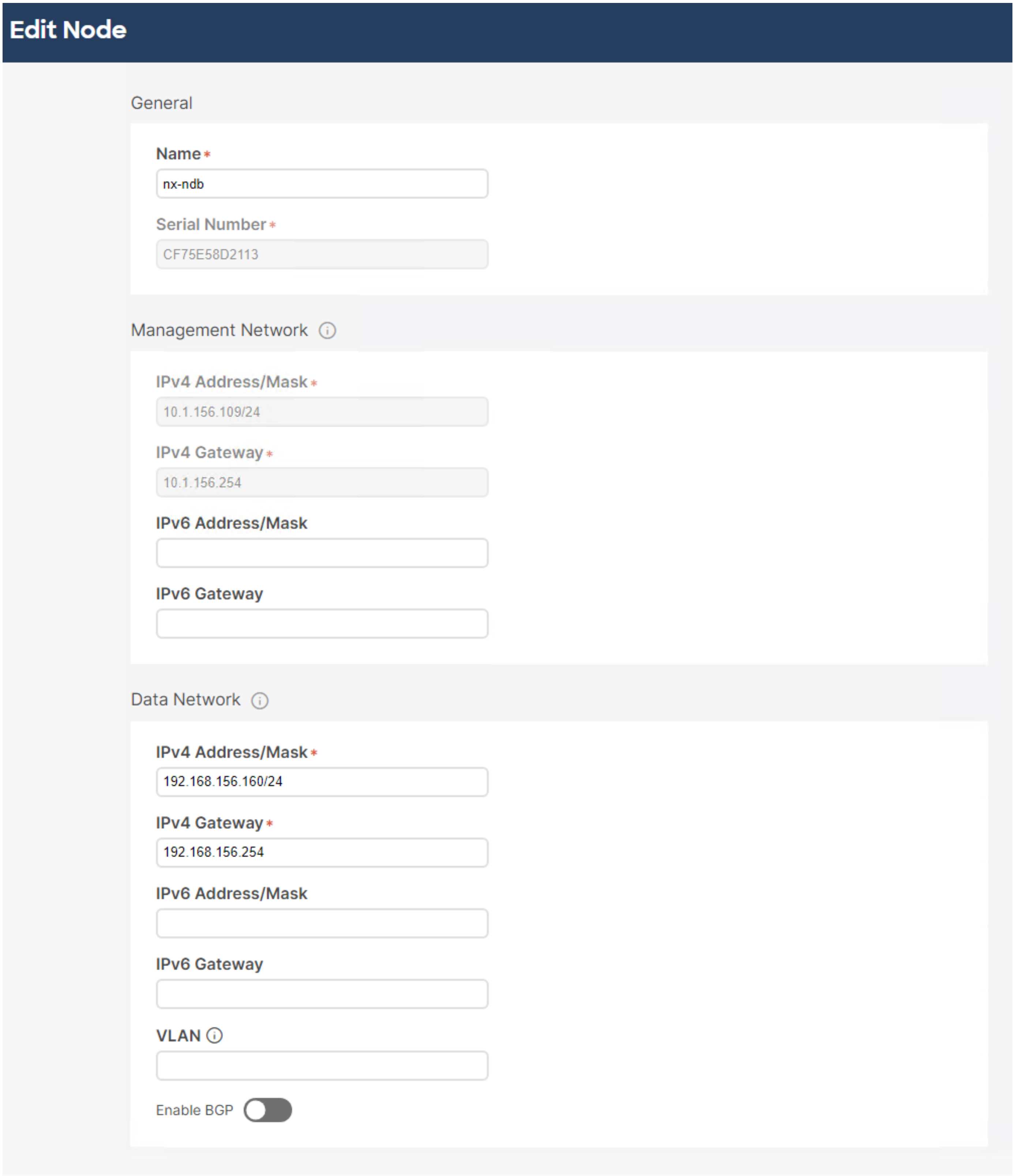
DNS Provider IP Address *: 192.168.156.250, 192.168.156.251

DNS Search Domain

App Network * ⓘ: 172.17.0.1/16

Service Network * ⓘ: 100.80.0.0/16

Step 23. The IB-MGMT Network information should already be filled in for the one Nexus Dashboard node being provisioned. Click the **pencil icon** to the right and fill in the **Node Name**, **IPv4 Address/Mask** and **Gateway** for the OOB-MGMT subnet interface. Click **Update**.



Edit Node

General

Name*

nx-ndb

Serial Number*

CF75E58D2113

Management Network

IPv4 Address/Mask*

10.1.156.109/24

IPv4 Gateway*

10.1.156.254

IPv6 Address/Mask

IPv6 Gateway

Data Network

IPv4 Address/Mask*

192.168.156.160/24

IPv4 Gateway*

192.168.156.254

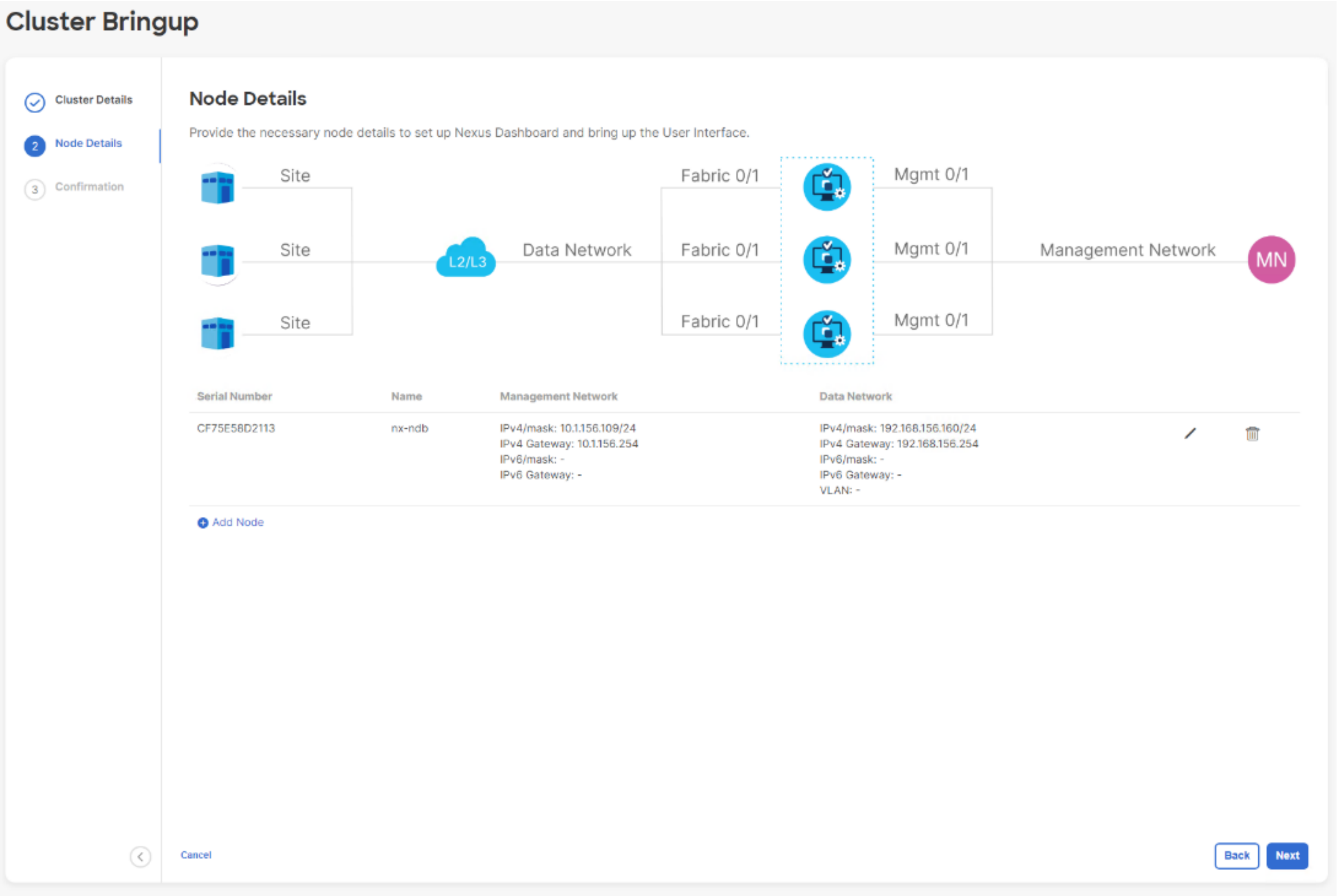
IPv6 Address/Mask

IPv6 Gateway

VLAN

Enable BGP

Step 24. Click **Next.**



Cluster Bringup

Node Details

Provide the necessary node details to set up Nexus Dashboard and bring up the User Interface.

Serial Number	Name	Management Network	Data Network
CF75E58D2113	nx-ndb	IPv4/mask: 10.1.156.109/24 IPv4 Gateway: 10.1.156.254 IPv6/mask: - IPv6 Gateway: -	IPv4/mask: 192.168.156.160/24 IPv4 Gateway: 192.168.156.254 IPv6/mask: - IPv6 Gateway: - VLAN: -

Step 25. Click **Confirm Installation** to confirm that a one-node Nexus Dashboard is being installed.

Step 26. Click **Configure** to begin the installation.

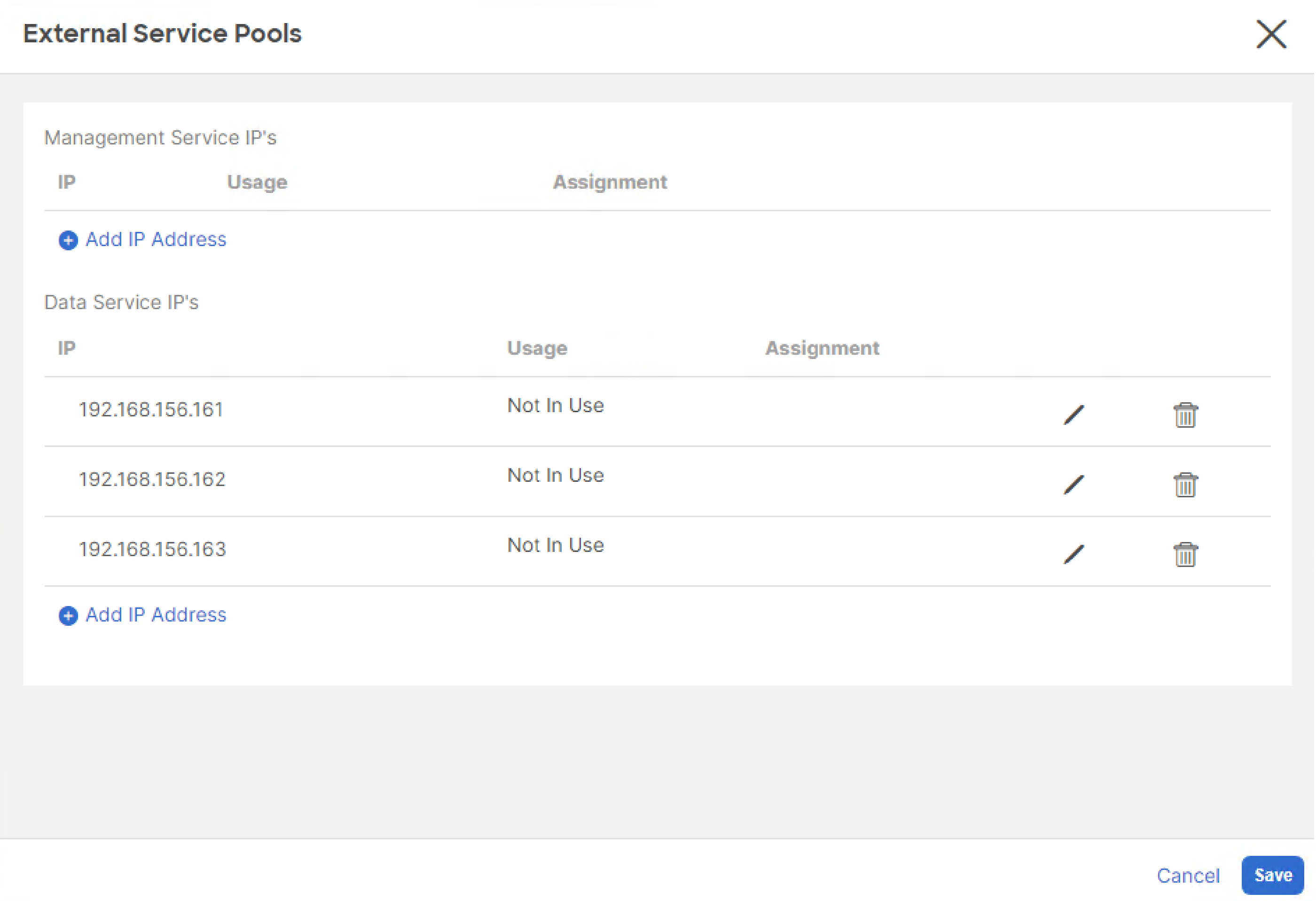
Step 27. Wait for the installation and Cluster Deployment to complete. You will need to refresh the browser and negotiate the security prompts to get the Welcome to Nexus Dashboard page.

Step 28. On the Welcome to Nexus Dashboard page, enter the admin Username and the password entered in the OVA installation and click **Login**.

Step 29. Click Let's Go then click Do not show on login. Click Get Started.

Step 30. Click **Done** then click **Go To Dashboard**. At the top of the window, use the One View drop-down list to select **Admin Console**.

Step 31. On the left select **Infrastructure** then select **Cluster Configuration**. Click the pencil icon to the right of External Service Pools to add Data Service IP's from the OOB-MGMT subnet. Add 3 Data Service IP's from the OOB-MGMT subnet and click **Save**.



External Service Pools

Management Service IP's

IP	Usage	Assignment

Data Service IP's

IP	Usage	Assignment
192.168.156.161	Not In Use	
192.168.156.162	Not In Use	
192.168.156.163	Not In Use	

Step 32. On the left select **Services**. Select the **App Store** tab. Install NDFC by clicking **Install** under Nexus Dashboard Fabric Controller.

Step 33. Enter your Cisco ID and password and navigate Single Sign On (SSO).

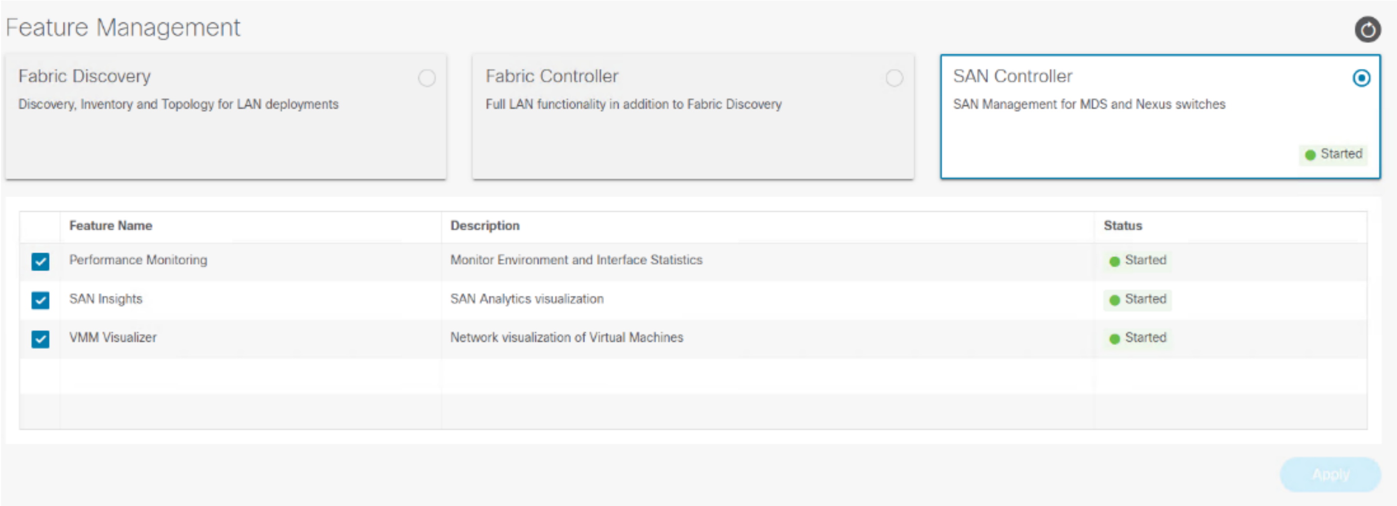
Step 34. Close the Cookies window then click **Agree** and **Download** to accept the License Agreement and download NDFC. NDFC will progress through Downloading to Installing and finally to Installed.

Step 35. Select the **Installed Services** tab. Under Nexus Dashboard Fabric Controller, click **Enable**. The service will take a few minutes to enable.

Step 36. When Enable is replaced by Open under Nexus Dashboard Fabric Controller, click **Open**.

Step 37. Review the Nexus Dashboard Fabric Controller SAN Prerequisites which indicate 3 IPs in the OOB-MGMT subnet will be needed. Check **Do not show this message again** and click **Get started**.

Step 38. Click the circle to the right of SAN Controller, select **Cisco** as the OEM vendor, and click **Confirm**. Select all features that you plan to use and click **Apply** to start the SAN Controller. Wait until the SAN Controller and all Features are Started and have a green status indicator.



Feature Management

○ Fabric Discovery	Discovery, Inventory and Topology for LAN deployments
○ Fabric Controller	Full LAN functionality in addition to Fabric Discovery
● SAN Controller	SAN Management for MDS and Nexus switches ● Started

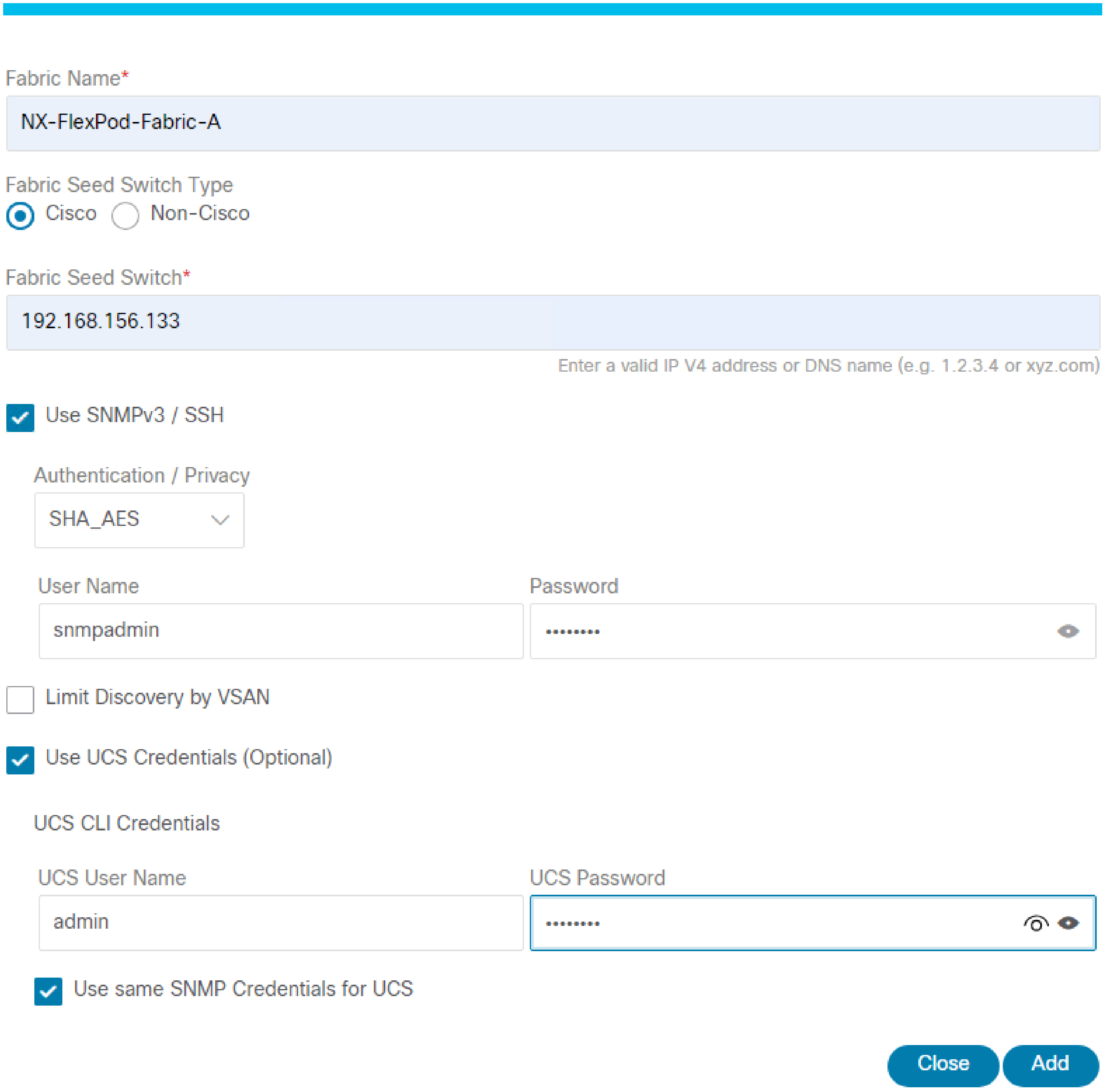
	Feature Name	Description	Status
☑	Performance Monitoring	Monitor Environment and Interface Statistics	● Started
☑	SAN Insights	SAN Analytics visualization	● Started
☑	VMM Visualizer	Network visualization of Virtual Machines	● Started

Procedure 2. Configure NDFC-SAN

Step 1. When the NDFC-SAN installation is complete, the browser should redirect to the SAN Controller.

Step 2. Click **SAN > Fabrics** to add the two SAN Fabrics. Under Actions, select **Add Fabric**.

Step 3. Proved a name for the A-side fabric. For the Fabric Seed Switch, enter the IP address of the Fabric A MDS or Nexus SAN switch. Leave **Use SNMPv3/SSH** checked and select **SHA_AES** for Authentication/Privacy. Enter the **snmpadmin User Name** and associated **password**. Check **Use UCS Credentials**. Enter **admin** for the UCS User Name and the associated **password**. Leave **Use same SNMP credentials for UCS** checked. Click **Add**.



Fabric Name*

NX-FlexPod-Fabric-A

Fabric Seed Switch Type

● Cisco ○ Non-Cisco

Fabric Seed Switch*

192.168.156.133

Enter a valid IP V4 address or DNS name (e.g. 1.2.3.4 or xyz.com)

☑ Use SNMPv3 / SSH

Authentication / Privacy

SHA_AES

User Name	Password
snmpadmin	•••••••••

□ Limit Discovery by VSAN

☑ Use UCS Credentials (Optional)

UCS CLI Credentials

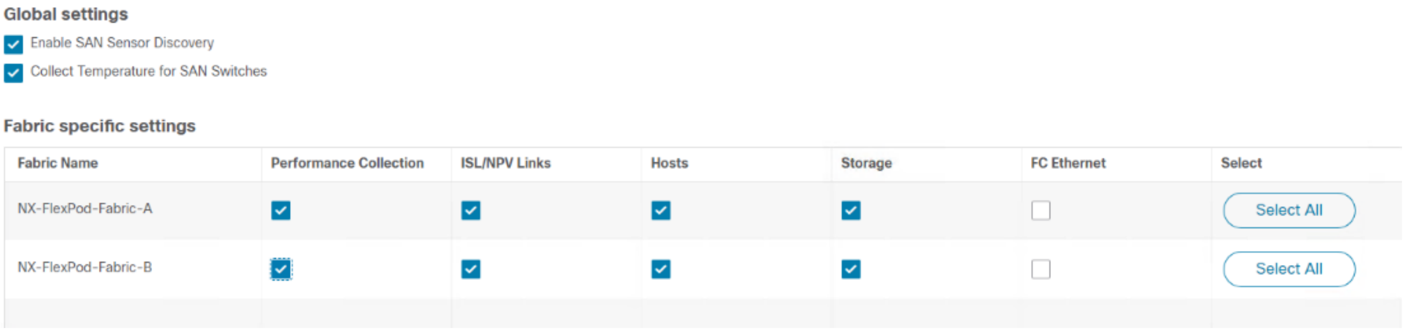
UCS User Name	UCS Password
admin	•••••••••

☑ Use same SNMP Credentials for UCS

Step 4. Once the A-side fabric has been added, repeat Step 3 to add the B-side fabric.

Step 5. If you have purchased NDFC or DCNM server-based or switch-based licenses, follow the instructions that came with the licenses to install them. A new NDFC installation also has a 60-day trial license.

Step 6. Select **SAN** > **Fabrics.** Use the checkbox to select both Fabrics and under Actions select Configure Performance. Enable all desired Performance Data Collection Settings and click **Apply** then click **Confirm.**



Global settings

☑ Enable SAN Sensor Discovery

☑ Collect Temperature for SAN Switches

Fabric specific settings

Fabric Name	Performance Collection	ISL/NPV Links	Hosts	Storage	FC Ethernet	Select
NX-FlexPod-Fabric-A	☑	☑	☑	☑	□	Select All
NX-FlexPod-Fabric-B	☑	☑	☑	☑	□	Select All

Step 7. If you have purchased and installed SAN Analytics licenses on your MDS switches, use the checkbox to select **Fabric A** and under Actions select **Configure SAN Insights**. Click **Next**. Select your Fabric A Cisco MDS switch. Under Subscriptions select the appropriate subscription. Under Install Query select **Storage**. Click **Next**. Click **Next**. On the ports connected to storage, select the type of metrics to be collected. Click **Next**. Click **Commit** to setup the storage ports on the MDS and to install the query and configure telemetry in the MDS. When both tasks have a status of Success, click **Close**. Repeat this process for Fabric B. After a few minutes, select **Dashboards** > **SAN Insights**. You should see that the SAN Controller is receiving SAN Insights records.

Step 8. ssh into each of the MDS switches and type “show license usage”. If you enable SAN Analytics in Step 7, each switch should show usage of a DCNM-SAN license and a SAN Analytics license.

Step To configure Device Aliases for a fabric, go to **SAN** > **Fabrics**, click on the **Fabric Name**. On the right, click ⧉ to pop out to the Fabric. Select the **Device Aliases** tab. Here, you can use a checkbox to select an existing Device Alias and under Actions either Edit or Delete it. To Add a Device Alias, under Actions select **Add device alias**. The first window shows WWPNs that have logged into the Fabric. If you want to add a Device Alias for one of these WWPNs, use the checkbox to select it and click **Next**. If your WWPN does not appear here, click **Next** to Pre-provision the device alias. When you have either edited or Pre-provisioned all device aliases, click **Save Aliases** to save them.

Step 10. To configure Zoning for a fabric, go to **SAN** > **Zoning** then select the appropriate Fabric, VSAN, and Switch. Select the Zoneset and then under Actions select **Edit zones & members**. You can then select a Zone on the left and see its members on the right. Under Actions, you can Add existing members to the zone. Select **Device Alias** and then add any needed Device Aliases to the zone. Zoning by Enhanced Device Alias is what has been setup in this FlexPod, and it is important to continue to add members by Device Alias. When you have changed the zones, you will need to Activate the Zoneset to implement the changes.

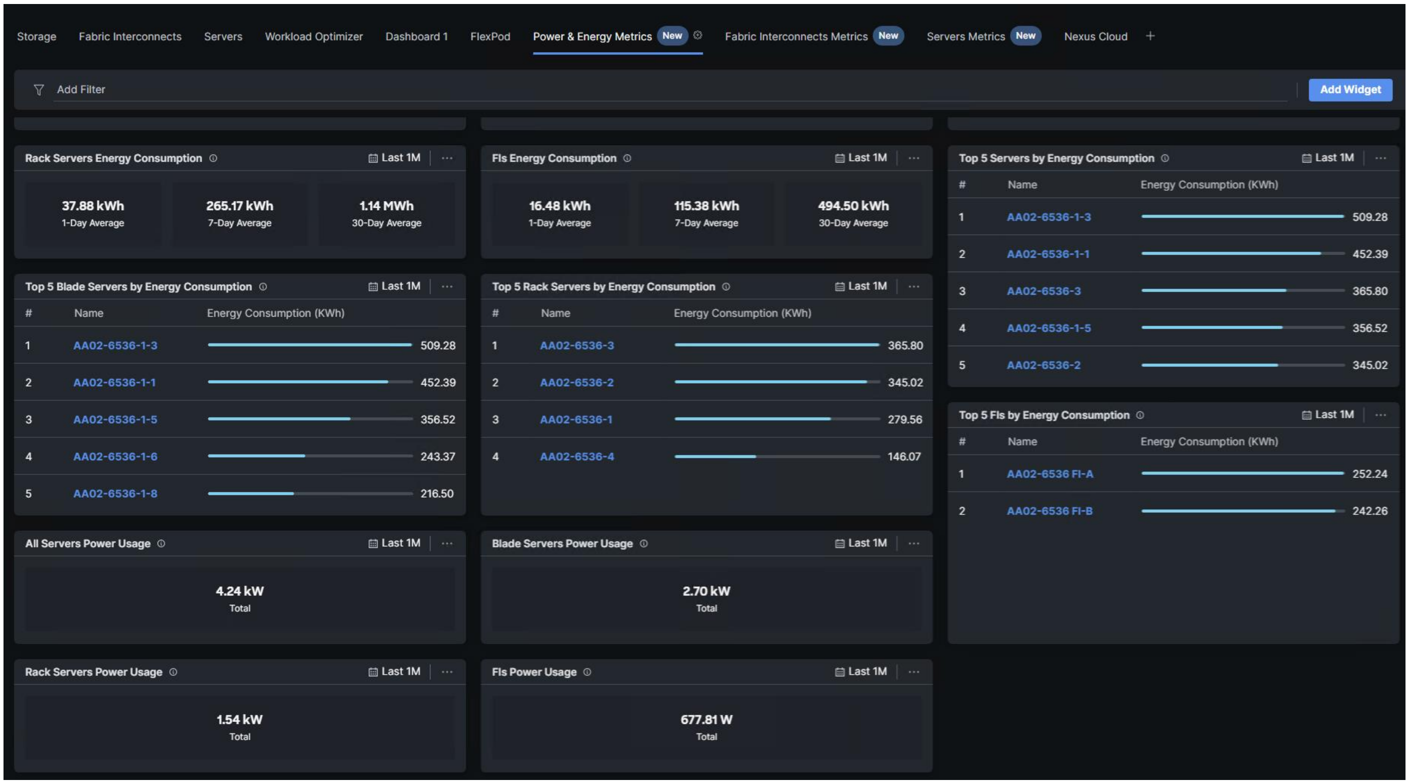
Note: For more information, see Cisco NDFC-SAN Controller Configuration Guide, Release 12.1.2e.

Cisco Intersight Metrics

Cisco Intersight has recently added several metrics dashboards under My Dashboard. The My Dashboard service is a great place to start to get a summary of health and what needs attention when you first login and you can drill down from there to get additional details or take action. Recent additions include Power & Energy Metrics (Sustainability), Fabric Interconnect Metrics, and Server Metrics.

Procedure 1. View Metrics Dashboards

Step 1. To view the Power & Energy Metrics Dashboard, in **Cisco Intersight** select **My Dashboard** then the **Power & Energy Metrics tab**. Widgets showing energy consumption of both Blade and Rack servers will be shown.



Rack Servers Energy Consumption

37.88 kWh	265.17 kWh	1.14 MWh
1-Day Average	7-Day Average	30-Day Average

FIs Energy Consumption

16.48 kWh	115.38 kWh	494.50 kWh
1-Day Average	7-Day Average	30-Day Average

Top 5 Servers by Energy Consumption

#	Name	Energy Consumption (KWh)
1	AA02-6536-1-3	509.28
2	AA02-6536-1-1	452.39
3	AA02-6536-3	365.80
4	AA02-6536-1-5	356.52
5	AA02-6536-2	345.02

Top 5 Blade Servers by Energy Consumption

#	Name	Energy Consumption (KWh)
1	AA02-6536-1-3	509.28
2	AA02-6536-1-1	452.39
3	AA02-6536-1-5	356.52
4	AA02-6536-1-6	243.37
5	AA02-6536-1-8	216.50

Top 5 Rack Servers by Energy Consumption

#	Name	Energy Consumption (KWh)
1	AA02-6536-3	365.80
2	AA02-6536-2	345.02
3	AA02-6536-1	279.56
4	AA02-6536-4	146.07

Top 5 FIs by Energy Consumption

#	Name	Energy Consumption (KWh)
1	AA02-6536 FI-A	252.24
2	AA02-6536 FI-B	242.26

All Servers Power Usage

4.24 kW
Total

Blade Servers Power Usage

2.70 kW
Total

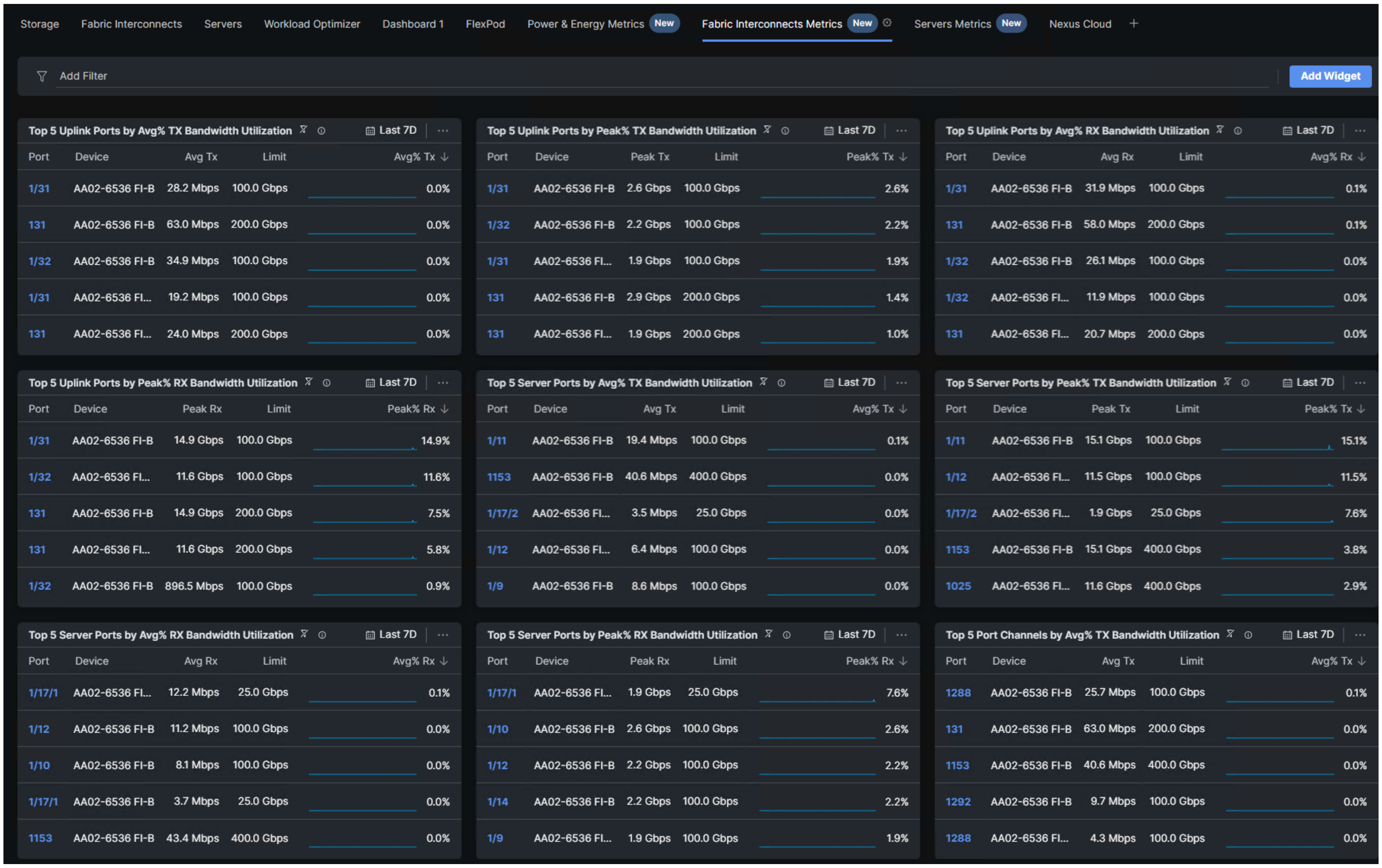
Rack Servers Power Usage

1.54 kW
Total

FIs Power Usage

677.81 W
Total

Step 2. To view the Fabric Interconnects Metrics Dashboard, in Cisco Intersight select My Dashboard then the Fabric Interconnects Metrics tab. Widgets showing fabric interconnect network statistics will be shown.



Top 5 Uplink Ports by Avg% TX Bandwidth Utilization

Port	Device	Avg Tx	Limit	Avg% Tx ↓
1/31	AA02-6536 FI-B	28.2 Mbps	100.0 Gbps	0.0%
131	AA02-6536 FI-B	63.0 Mbps	200.0 Gbps	0.0%
1/32	AA02-6536 FI-B	34.9 Mbps	100.0 Gbps	0.0%
1/31	AA02-6536 FI...	19.2 Mbps	100.0 Gbps	0.0%
131	AA02-6536 FI...	24.0 Mbps	200.0 Gbps	0.0%

Top 5 Uplink Ports by Peak% TX Bandwidth Utilization

Port	Device	Peak Tx	Limit	Peak% Tx ↓
1/31	AA02-6536 FI-B	2.6 Gbps	100.0 Gbps	2.6%
1/32	AA02-6536 FI-B	2.2 Gbps	100.0 Gbps	2.2%
1/31	AA02-6536 FI...	1.9 Gbps	100.0 Gbps	1.9%
131	AA02-6536 FI-B	2.9 Gbps	200.0 Gbps	1.4%
131	AA02-6536 FI...	1.9 Gbps	200.0 Gbps	1.0%

Top 5 Uplink Ports by Avg% RX Bandwidth Utilization

Port	Device	Avg Rx	Limit	Avg% Rx ↓
1/31	AA02-6536 FI-B	31.9 Mbps	100.0 Gbps	0.1%
131	AA02-6536 FI-B	58.0 Mbps	200.0 Gbps	0.1%
1/32	AA02-6536 FI-B	26.1 Mbps	100.0 Gbps	0.0%
1/32	AA02-6536 FI...	11.9 Mbps	100.0 Gbps	0.0%
131	AA02-6536 FI...	20.7 Mbps	200.0 Gbps	0.0%

Top 5 Uplink Ports by Peak% RX Bandwidth Utilization

Port	Device	Peak Rx	Limit	Peak% Rx ↓
1/31	AA02-6536 FI-B	14.9 Gbps	100.0 Gbps	14.9%
1/32	AA02-6536 FI...	11.6 Gbps	100.0 Gbps	11.6%
131	AA02-6536 FI-B	14.9 Gbps	200.0 Gbps	7.5%
131	AA02-6536 FI...	11.6 Gbps	200.0 Gbps	5.8%
1/32	AA02-6536 FI-B	896.5 Mbps	100.0 Gbps	0.9%

Top 5 Server Ports by Avg% TX Bandwidth Utilization

Port	Device	Avg Tx	Limit	Avg% Tx ↓
1/11	AA02-6536 FI-B	19.4 Mbps	100.0 Gbps	0.1%
1153	AA02-6536 FI-B	40.6 Mbps	400.0 Gbps	0.0%
1/17/2	AA02-6536 FI...	3.5 Mbps	25.0 Gbps	0.0%
1/12	AA02-6536 FI...	6.4 Mbps	100.0 Gbps	0.0%
1/9	AA02-6536 FI-B	8.6 Mbps	100.0 Gbps	0.0%

Top 5 Server Ports by Peak% TX Bandwidth Utilization

Port	Device	Peak Tx	Limit	Peak% Tx ↓
1/11	AA02-6536 FI-B	15.1 Gbps	100.0 Gbps	15.1%
1/12	AA02-6536 FI...	11.5 Gbps	100.0 Gbps	11.5%
1/17/2	AA02-6536 FI...	1.9 Gbps	25.0 Gbps	7.6%
1153	AA02-6536 FI-B	15.1 Gbps	400.0 Gbps	3.8%
1025	AA02-6536 FI...	11.6 Gbps	400.0 Gbps	2.9%

Top 5 Server Ports by Avg% RX Bandwidth Utilization

Port	Device	Avg Rx	Limit	Avg% Rx ↓
1/17/1	AA02-6536 FI...	12.2 Mbps	25.0 Gbps	0.1%
1/12	AA02-6536 FI-B	11.2 Mbps	100.0 Gbps	0.0%
1/10	AA02-6536 FI-B	8.1 Mbps	100.0 Gbps	0.0%
1/17/1	AA02-6536 FI-B	3.7 Mbps	25.0 Gbps	0.0%
1153	AA02-6536 FI-B	43.4 Mbps	400.0 Gbps	0.0%

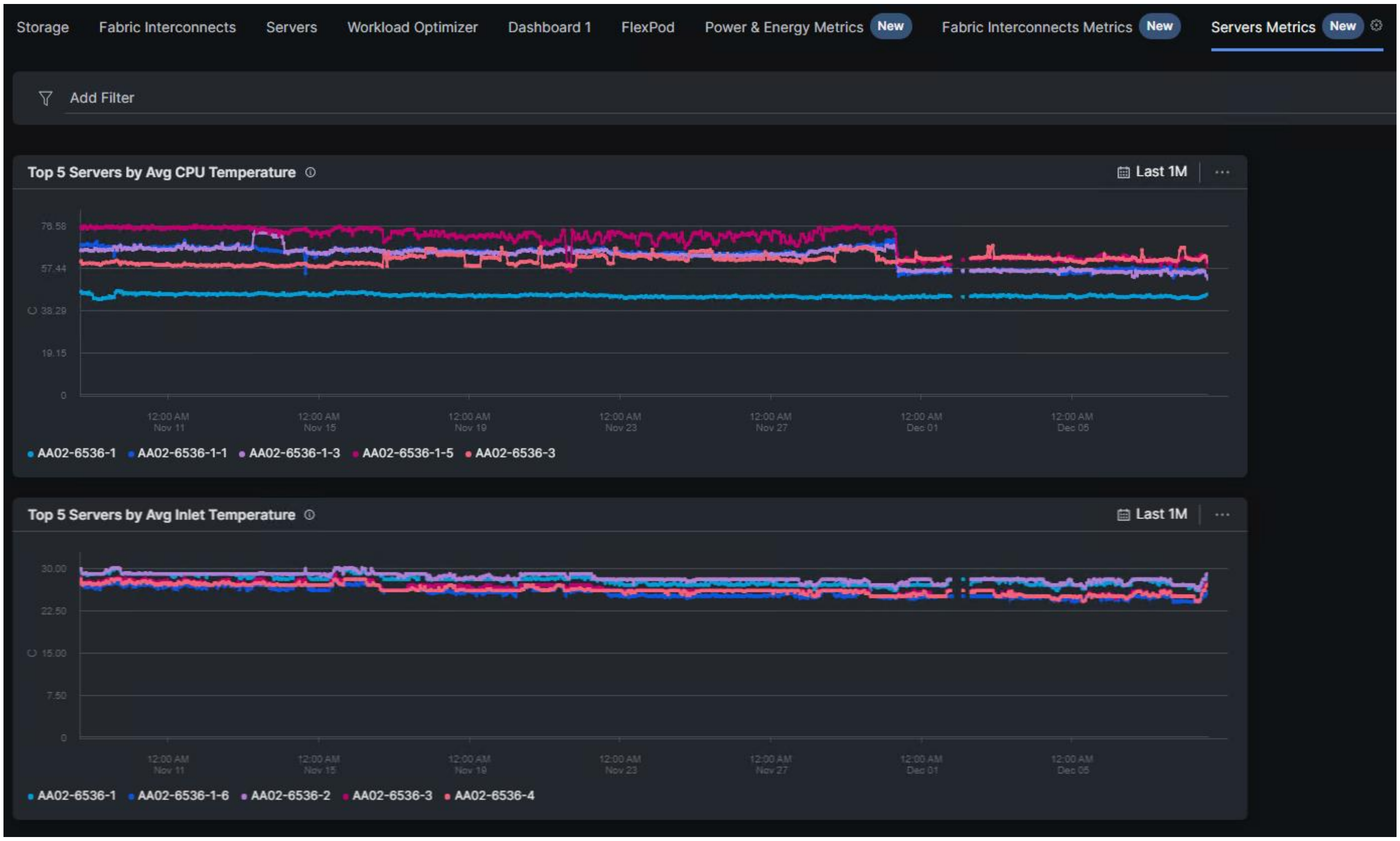
Top 5 Server Ports by Peak% RX Bandwidth Utilization

Port	Device	Peak Rx	Limit	Peak% Rx ↓
1/17/1	AA02-6536 FI...	1.9 Gbps	25.0 Gbps	7.6%
1/10	AA02-6536 FI-B	2.6 Gbps	100.0 Gbps	2.6%
1/12	AA02-6536 FI-B	2.2 Gbps	100.0 Gbps	2.2%
1/14	AA02-6536 FI-B	2.2 Gbps	100.0 Gbps	2.2%
1/9	AA02-6536 FI...	1.9 Gbps	100.0 Gbps	1.9%

Top 5 Port Channels by Avg% TX Bandwidth Utilization

Port	Device	Avg Tx	Limit	Avg% Tx ↓
1288	AA02-6536 FI-B	25.7 Mbps	100.0 Gbps	0.1%
131	AA02-6536 FI-B	63.0 Mbps	200.0 Gbps	0.0%
1153	AA02-6536 FI-B	40.6 Mbps	400.0 Gbps	0.0%
1292	AA02-6536 FI-B	9.7 Mbps	100.0 Gbps	0.0%
1288	AA02-6536 FI...	4.3 Mbps	100.0 Gbps	0.0%

Step 3. To view the Servers Metrics Dashboard, in Cisco Intersight select My Dashboard then the servers Metrics tab. Widgets showing server temperature statistics will be shown.



About the Authors

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John has been involved in designing, developing, validating, and supporting the FlexPod Converged Infrastructure since it was developed 13 years ago. Before his role with FlexPod, he supported and administered a large worldwide training network and VPN infrastructure. John holds a master's degree in Computer Engineering from Clemson University.

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Acknowledgements

For their support and contribution to the design, validation, and creation of this Cisco Validated Design, the authors would like to thank:

- Haseeb Niazi, Principal Technical Marketing Engineer, Cisco Systems, Inc.
- Paniraja Koppa, Technical Marketing Engineer, Cisco Systems, Inc.

Appendix

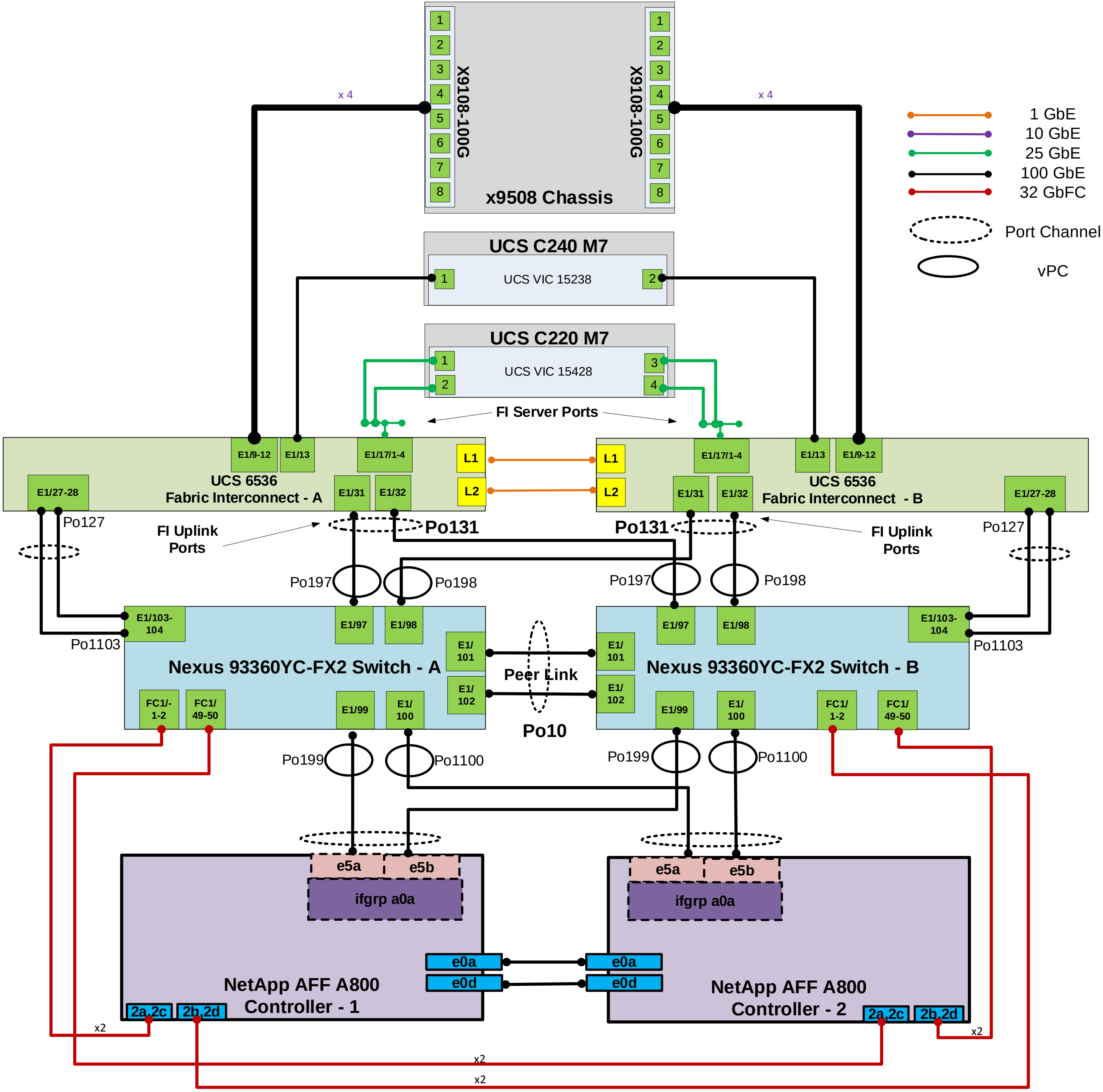
This appendix contains the following:

Note: The features and functionality explained in this Appendix are optional configurations which can be helpful in configuring and managing the FlexPod deployment.

FlexPod with Cisco Nexus SAN Switching Configuration – Part 1

If the Cisco Nexus switches are to be used for both LAN and SAN switching in the FlexPod configuration, either an automated configuration with Ansible or a manual configuration can be done. For either configuration method, the following base switch setup must be done manually. Figure 7 shows the validation lab cabling for this setup.

Figure 7. Cisco Nexus SAN Switching Cabling with FCoE Fabric Interconnect Uplinks



FlexPod Cisco Nexus 93360YC-FX2 SAN Switching Base Configuration

The following procedures describe how to configure the Cisco Nexus 93360YC-FX2 switches for use in a base FlexPod environment that uses the switches for both LAN and SAN switching. This procedure assumes you're using Cisco Nexus 9000 10.2(5)M. This procedure also assumes that you have created an FCoE Uplink Port Channel on the appropriate ports in the Cisco UCS IMM Port Policies for each UCS fabric interconnect.

Procedure 1. Set Up Initial Configuration in Cisco Nexus 93360YC-FX2 A

Step 1. Configure the switch:

Note: On initial boot and connection to the serial or console port of the switch, the NX-OS setup should automatically start and attempt to enter Power on Auto Provisioning.

```
Abort Power On Auto Provisioning [yes - continue with normal setup, skip - bypass password and basic
configuration, no - continue with Power On Auto Provisioning] (yes/skip/no)[no]: yes
Disabling POAP.......Disabling POAP
poap: Rolling back, please wait... (This may take 5-15 minutes)

         ---- System Admin Account Setup ----

Do you want to enforce secure password standard (yes/no) [y]: Enter
Enter the password for "admin": <password>
Confirm the password for "admin": <password>
Would you like to enter the basic configuration dialog (yes/no): yes
Create another login account (yes/no) [n]: Enter
Configure read-only SNMP community string (yes/no) [n]: Enter
Configure read-write SNMP community string (yes/no) [n]: Enter
Enter the switch name: <nexus-A-hostname>
Continue with Out-of-band (mgmt0) management configuration? (yes/no) [y]: Enter
Mgmt0 IPv4 address: <nexus-A-mgmt0-ip>
Mgmt0 IPv4 netmask: <nexus-A-mgmt0-netmask>
Configure the default gateway? (yes/no) [y]: Enter
IPv4 address of the default gateway: <nexus-A-mgmt0-gw>
Configure advanced IP options? (yes/no) [n]: Enter
Enable the telnet service? (yes/no) [n]: Enter
Enable the ssh service? (yes/no) [y]: Enter
Type of ssh key you would like to generate (dsa/rsa) [rsa]: Enter
Number of rsa key bits <1024-2048> [1024]: Enter
Configure the ntp server? (yes/no) [n]: Enter
Configure default interface layer (L3/L2) [L2]: Enter
Configure default switchport interface state (shut/noshut) [noshut]: shut
Enter basic FC configurations (yes/no) [n]: y
Configure default physical FC switchport interface state (shut/noshut) [shut]: Enter
Configure default switchport trunk mode (on/off/auto) [on]: auto
Configure default zone policy (permit/deny) [deny]: Enter
Enable full zoneset distribution? (yes/no) [n]: y
Configure CoPP system profile (strict/moderate/lenient/dense) [strict]: Enter
Would you like to edit the configuration? (yes/no) [n]: Enter
```

Step 2. Review the configuration summary before enabling the configuration:

```
Use this configuration and save it? (yes/no) [y]: Enter
```

Procedure 2. Set Up Initial Configuration in Cisco Nexus 93360YC-FX2 B

Step 1. Configure the switch:

Note: On initial boot and connection to the serial or console port of the switch, the NX-OS setup should automatically start and attempt to enter Power on Auto Provisioning.

```
Abort Power On Auto Provisioning [yes - continue with normal setup, skip - bypass password and basic
configuration, no - continue with Power On Auto Provisioning] (yes/skip/no)[no]: yes
Disabling POAP.......Disabling POAP
poap: Rolling back, please wait... (This may take 5-15 minutes)

         ---- System Admin Account Setup ----

Do you want to enforce secure password standard (yes/no) [y]: Enter
Enter the password for "admin": <password>
Confirm the password for "admin": <password>
Would you like to enter the basic configuration dialog (yes/no): yes
Create another login account (yes/no) [n]: Enter
Configure read-only SNMP community string (yes/no) [n]: Enter
Configure read-write SNMP community string (yes/no) [n]: Enter
Enter the switch name: <nexus-B-hostname>
Continue with Out-of-band (mgmt0) management configuration? (yes/no) [y]: Enter
Mgmt0 IPv4 address: <nexus-B-mgmt0-ip>
Mgmt0 IPv4 netmask: <nexus-B-mgmt0-netmask>
Configure the default gateway? (yes/no) [y]: Enter
IPv4 address of the default gateway: <nexus-B-mgmt0-gw>
Configure advanced IP options? (yes/no) [n]: Enter
```

```
Enable the telnet service? (yes/no) [n]: Enter
Enable the ssh service? (yes/no) [y]: Enter
Type of ssh key you would like to generate (dsa/rsa) [rsa]: Enter
Number of rsa key bits <1024-2048> [1024]: Enter
Configure the ntp server? (yes/no) [n]: Enter
Configure default interface layer (L3/L2) [L2]: Enter
Configure default switchport interface state (shut/noshut) [noshut]: shut
Enter basic FC configurations (yes/no) [n]: y
Configure default physical FC switchport interface state (shut/noshut) [shut]: Enter
Configure default switchport trunk mode (on/off/auto) [on]: auto
Configure default zone policy (permit/deny) [deny]: Enter
Enable full zoneset distribution? (yes/no) [n]: y
Configure CoPP system profile (strict/moderate/lenient/dense) [strict]: Enter
Would you like to edit the configuration? (yes/no) [n]: Enter
```

Step 2. Review the configuration summary before enabling the configuration:

```
Use this configuration and save it? (yes/no) [y]: Enter
```

Note: SAN switching requires both the SAN_ENTERPRISE_PKG and FC_PORT_ACTIVATION_PKG licenses. Ensure these licenses are installed on each Nexus switch.

Note: This section is structured as a green field switch setup. If existing switches that are switching active traffic are being setup, execute this procedure down through Perform TCAM Carving and Configure Unified Ports in Cisco Nexus 93360YC-FX22 A and B first on one switch and then when that is completed, execute on the other switch.

Procedure 3. Install feature-set fcoe in Cisco Nexus 93360YC-FX2 A and B

Step 1. Run the following commands to set global configurations:

```
config t
install feature-set fcoe
feature-set fcoe
system default switchport trunk mode auto
system default switchport mode F
```

Note: These steps are provided in case the basic FC configurations were not configured in the switch setup script de-tailed in the previous section.

Procedure 4. Set System-Wide QoS Configurations in Cisco Nexus 93360YC-FX2 A and B

Step 1. Run the following commands to set global configurations:

```
config t
system qos
service-policy type queuing input default-fcoe-in-que-policy
service-policy type queuing output default-fcoe-8q-out-policy
service-policy type network-qos default-fcoe-8q-nq-policy
copy run start
```

Procedure 5. Perform TCAM Carving and Configure Unified Ports (UP) in Cisco Nexus 93360YC-FX2 A and B

Note: SAN switching requires TCAM carving for lossless fibre channel no-drop support. Also, unified ports need to be converted to fc ports.

Note: On the Cisco Nexus 93360YC-FX2, UP ports are converted to FC in groups of 4 in columns, for example, 1,2,49,50.

Step 1. Run the following commands:

```
hardware access-list tcam region ing-racl 1536
hardware access-list tcam region ing-ifacl 256
hardware access-list tcam region ing-redirect 256
slot 1
port 1-8 type fc
copy running-config startup-config
```

```
reload
This command will reboot the system. (y/n)?  [n] y
```

Step 2. After the switch reboots, log back in as admin. Run the following commands:

```
show hardware access-list tcam region |i i ing-racl
show hardware access-list tcam region |i i ing-ifacl
show hardware access-list tcam region |i i ing-redirect
show int status
```

FlexPod Cisco Nexus 93360YC-FX2 SAN Switching Ethernet Switching Automated Configuration

For the automated configuration of the Ethernet part of the Cisco Nexus 93360YC-FX2 switches when using the switches for SAN switching, once the base configuration is set, return to Ansible Nexus Switch Configuration, and execute from there.

FlexPod with Cisco Nexus 93360YC-FX2 SAN Switching Configuration – Part 2

Note: If the Cisco Nexus 93360YC-FX2 switch is being used for SAN Switching, this section should be completed in place of the Cisco MDS section of this document.

Procedure 1. FlexPod Cisco Nexus 93360YC-FX2 SAN Switching Automated Configuration

Automate the configuration of the SAN part of the Cisco Nexus 93360YC-FX2 switches when using the switches for SAN switching.

Step 1. Verify Nexus switch ssh keys are in /home/admin/.ssh/known_hosts. Adjust known_hosts as necessary if errors occur.

```
ssh admin@<nexus-A-mgmt0-ip>
exit
ssh admin@<nexus-B-mgmt0-ip>
exit
```

Step 2. Edit the FlexPod-IMM-VMware/FlexPod-IMM-VMware/inventory file putting the Cisco Nexus A information in for MDS A and the Cisco Nexus B information in for MDS B.

Step 3. Edit the following variable files to ensure proper Cisco Nexus SAN variables are entered:

- FlexPod-IMM-VMware/FlexPod-IMM-VMware/group_vars/secrets.yml
- FlexPod-IMM-VMware/FlexPod-IMM-VMware/group_vars/all.yml
- FlexPod-IMM-VMware/FlexPod-IMM-VMware/host_vars/mdsA.yml
- FlexPod-IMM-VMware/FlexPod-IMM-VMware/host_vars/mdsB.yml
- FlexPod-IMM-VMware/FlexPod-IMM-VMware/roles/NEXUSSANconfig/defaults/main.yml

Note: The SAN variables and port descriptions from the mdsA.yml and mdsB.yml files will be used for the SAN configuration in the Cisco Nexus 93360YC-FX2 switches.

Step 4. From FlexPod-IMM-VMware/FlexPod-IMM-VMware, run the Setup_NexusSAN.yml Ansible playbook.

```
ansible-playbook ./Setup_NexusSAN.yml -i inventory
```

Procedure 2. Switch Testing Commands

Step 1. The following commands can be used to check for correct switch configuration:

Note: Some of these commands need to run after further configuration of the FlexPod components are complete to see complete results.

```
show run
show run int
show int
show int status
show int brief
show flogi database
show device-alias database
show zone
show zoneset
show zoneset active
```

Create a FlexPod ESXi Custom ISO using VMware vCenter

In this Cisco Validated Design (CVD), the Cisco Custom Image for ESXi 8.0 Install CD was used to install VMware ESXi. After this installation, the NetApp NFS Plug-in for VMware VAAI and Cisco UCS Tool had to be installed or updated during the FlexPod deployment. vCenter 8.0 or later can be used to produce a FlexPod custom ISO containing the updated drivers. This ISO can be used to install VMware ESXi 8.0 without having to do any additional driver updates. In previous FlexPod CVD documents, VMware Image Builder was used to produce this ISO. In this document, the capability to manage an ESXi cluster with a single image under VMware Lifecycle Manager will be used to produce this ISO.

Procedure 1. Create a FlexPod ESXi Custom ISO using VMware vCenter Lifecycle Manager

Step 1. Download the following listed .zip files:

- NetApp NFS Plug-in for VMware VAAI 2.0.1 – From this downloaded file, extract the NetAppNasPlugin2.0.1.zip file.

- UCS Tools VIB for ESXi 8.0 – ucs-tool-esxi_1.3.1-1OEM.zip

Step 2. Log into the VMware vCenter HTML5 Client as administrator@vsphere.local.

Step 3. Under the Menu on the upper left, select **Lifecycle Manager**.

Step 4. Under ACTIONS, select Import Updates.

Step 5. In the Import Updates window, click **BROWSE** and navigate to the **NetAppNasPlugin2.0.1.zip** file. Select the file and click **Open**.

Step 6. Repeat Step 5 to import the **ucs-tool-esxi_1.3.1-1OEM.zip** file.

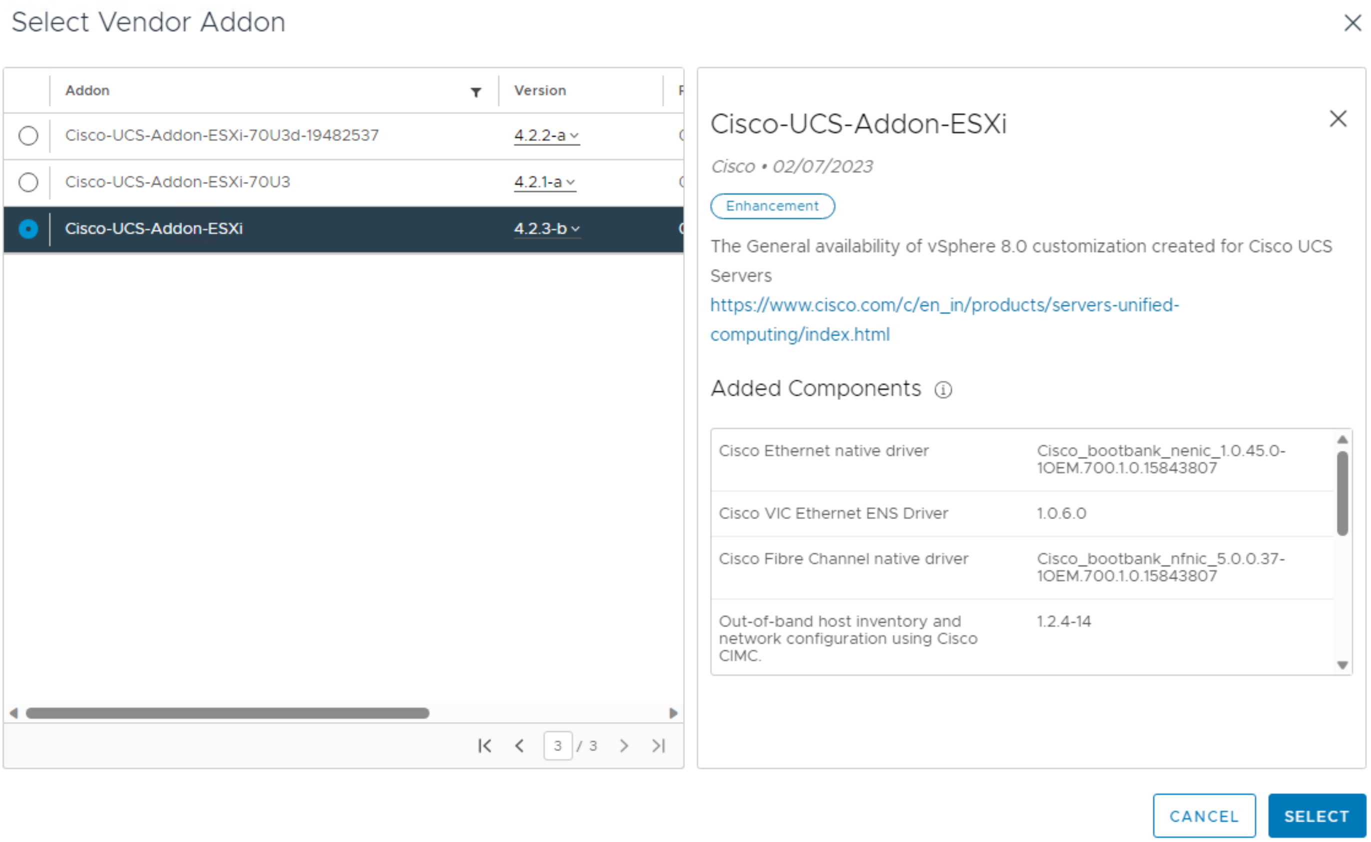
Step 7. Under Inventory, select the FlexPod-Management cluster and select the **Updates** tab to the right.

Step 8. On the right side of the page, select **MANAGE WITH A SINGLE IMAGE**.

Step 9. Click SETUP IMAGE.

Step 10. For the ESXi Version, select the latest ESXi 8.0 version (8.0c – 21493926) at the time this document was written.

Step 11. To the right of Vendor Addon, click **SELECT**. Navigate to **Cisco-UCS-Addon-ESXi** and select version **4.2.3-b** (4.3.1-a will initially be selected). Click **SELECT**.



Select Vendor Addon

	Addon	Version
○	Cisco-UCS-Addon-ESXi-70U3d-19482537	4.2.2-a
○	Cisco-UCS-Addon-ESXi-70U3	4.2.1-a
●	Cisco-UCS-Addon-ESXi	4.2.3-b

Cisco-UCS-Addon-ESXi

Cisco • 02/07/2023

Enhancement

The General availability of vSphere 8.0 customization created for Cisco UCS Servers

https://www.cisco.com/c/en_in/products/servers-unified-computing/index.html

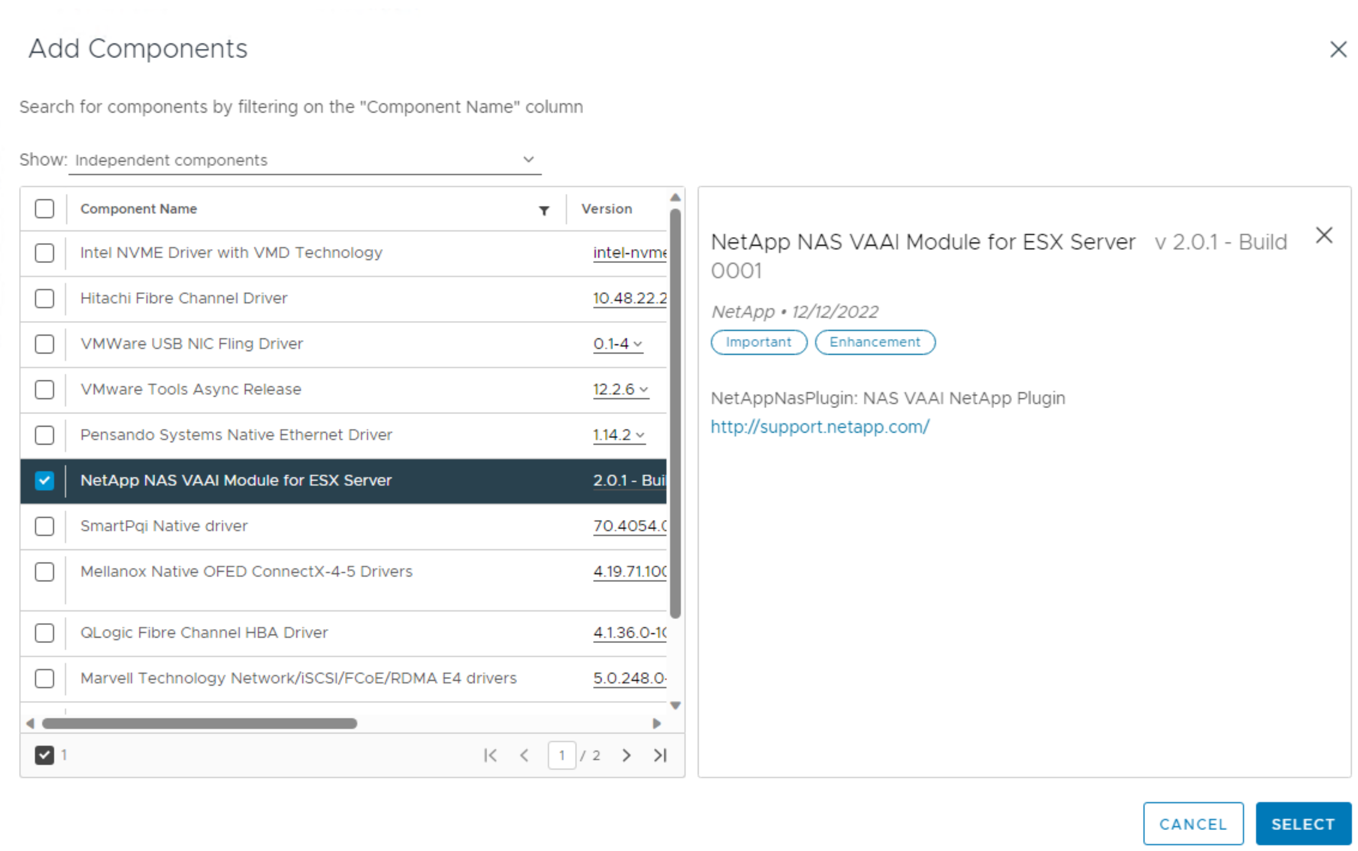
Added Components

Cisco Ethernet native driver	Cisco_bootbank_nenic_1.0.45.0-1OEM.700.1.0.15843807
Cisco VIC Ethernet ENS Driver	1.0.6.0
Cisco Fibre Channel native driver	Cisco_bootbank_nfnic_5.0.0.37-1OEM.700.1.0.15843807
Out-of-band host inventory and network configuration using Cisco CIMC.	1.2.4-14

Step 12. Do not select a Firmware and Drivers Addon.

Step 13. To the right of Components, click **Show details**. Click **ADD COMPONENTS**.

Step 14. In the Add Components window, click the checkbox to select the **NetApp NAS VAAI Module for ESX Server** and click **SELECT**.



Search for components by filtering on the "Component Name" column

Show: Independent components

☐	Component Name	Version
☐	Intel NVME Driver with VMD Technology	intel-nvme
☐	Hitachi Fibre Channel Driver	10.48.22.2
☐	VMWare USB NIC Fling Driver	0.1-4
☐	VMware Tools Async Release	12.2.6
☐	Pensando Systems Native Ethernet Driver	1.14.2
☑	NetApp NAS VAAI Module for ESX Server	2.0.1 - Bui
☐	SmartPqi Native driver	70.4054.
☐	Mellanox Native OFED ConnectX-4-5 Drivers	4.19.71.10
☐	QLogic Fibre Channel HBA Driver	4.1.36.0-1
☐	Marvell Technology Network/iSCSI/FCoE/RDMA E4 drivers	5.0.248.0-

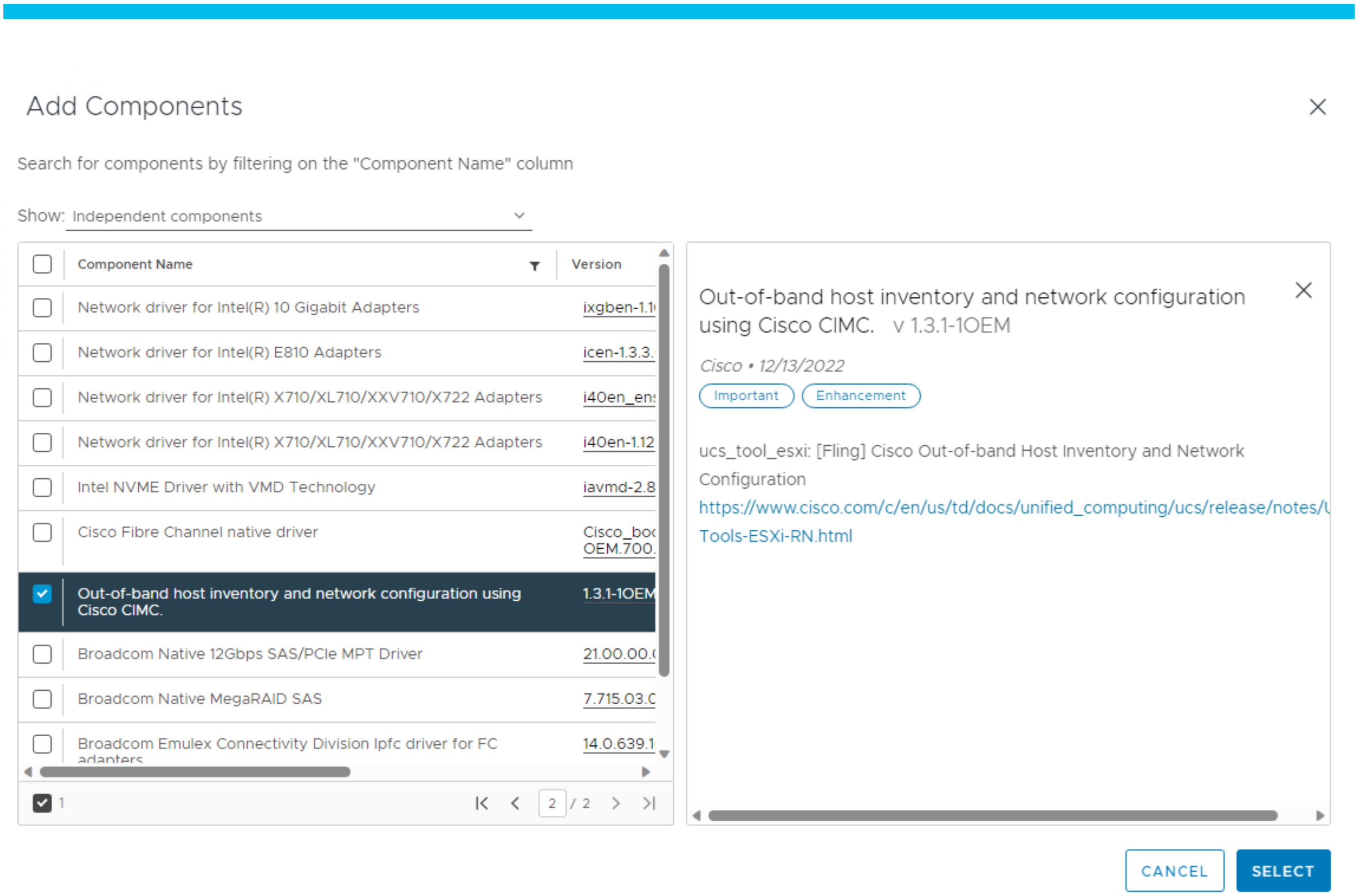
NetApp NAS VAAI Module for ESX Server v 2.0.1 - Build 0001

NetApp • 12/12/2022

NetAppNasPlugin: NAS VAAI NetApp Plugin

http://support.netapp.com/

Step 15. Click **ADD COMPONENTS**. Navigate to and use the checkbox to select Out-of-band host inventory and network configuration using Cisco CIMC. Click **SELECT**.



Add Components

Search for components by filtering on the "Component Name" column

Show: Independent components

	Component Name	Version
☐	Network driver for Intel(R) 10 Gigabit Adapters	ixgben-1.1
☐	Network driver for Intel(R) E810 Adapters	icen-1.3.3.
☐	Network driver for Intel(R) X710/XL710/XXV710/X722 Adapters	i40en_ens
☐	Network driver for Intel(R) X710/XL710/XXV710/X722 Adapters	i40en-1.12
☐	Intel NVME Driver with VMD Technology	iavmd-2.8
☐	Cisco Fibre Channel native driver	Cisco_boc OEM.700.
☑	Out-of-band host inventory and network configuration using Cisco CIMC.	1.3.1-1OEM
☐	Broadcom Native 12Gbps SAS/PCIe MPT Driver	21.00.00.
☐	Broadcom Native MegaRAID SAS	7.715.03.0
☐	Broadcom Emulex Connectivity Division lpfc driver for FC adapters	14.0.639.1

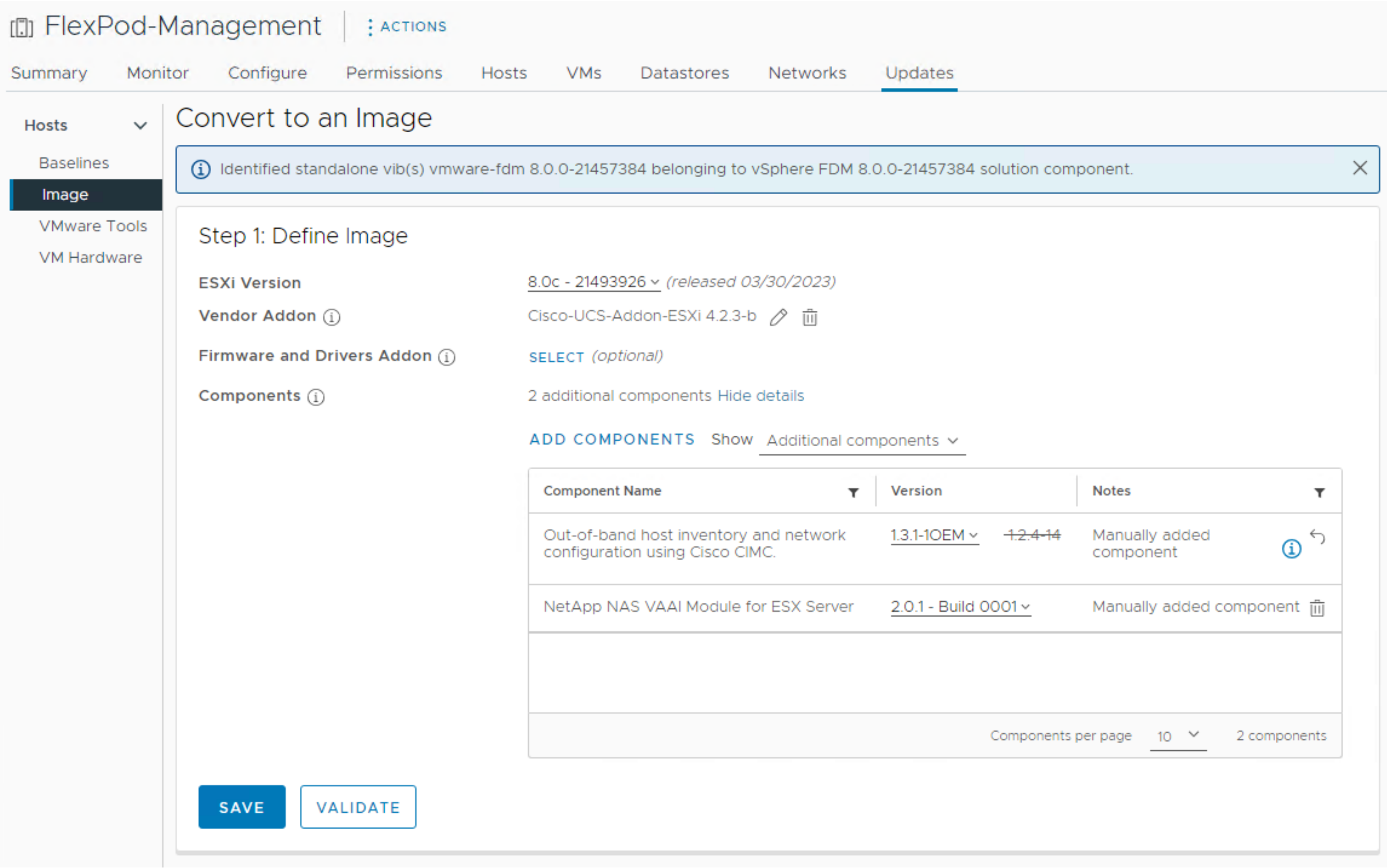
☑ 1 2 / 2

Out-of-band host inventory and network configuration using Cisco CIMC. v 1.3.1-1OEM

Cisco • 12/13/2022

ucs_tool_esxi: [Fling] Cisco Out-of-band Host Inventory and Network Configuration
https://www.cisco.com/c/en/us/td/docs/unified_computing/ucs/release/notes/U
Tools-ESXi-RN.html

Step 16. The image selection is now complete. Click **SAVE** to save the image.



Convert to an Image

Identified standalone vib(s) vmware-fdm 8.0.0-21457384 belonging to vSphere FDM 8.0.0-21457384 solution component.

Step 1: Define Image

ESXi Version: 8.0c - 21493926 *(released 03/30/2023)*

Vendor Addon: Cisco-UCS-Addon-ESXi 4.2.3-b

Firmware and Drivers Addon: SELECT *(optional)*

Components: 2 additional components Hide details

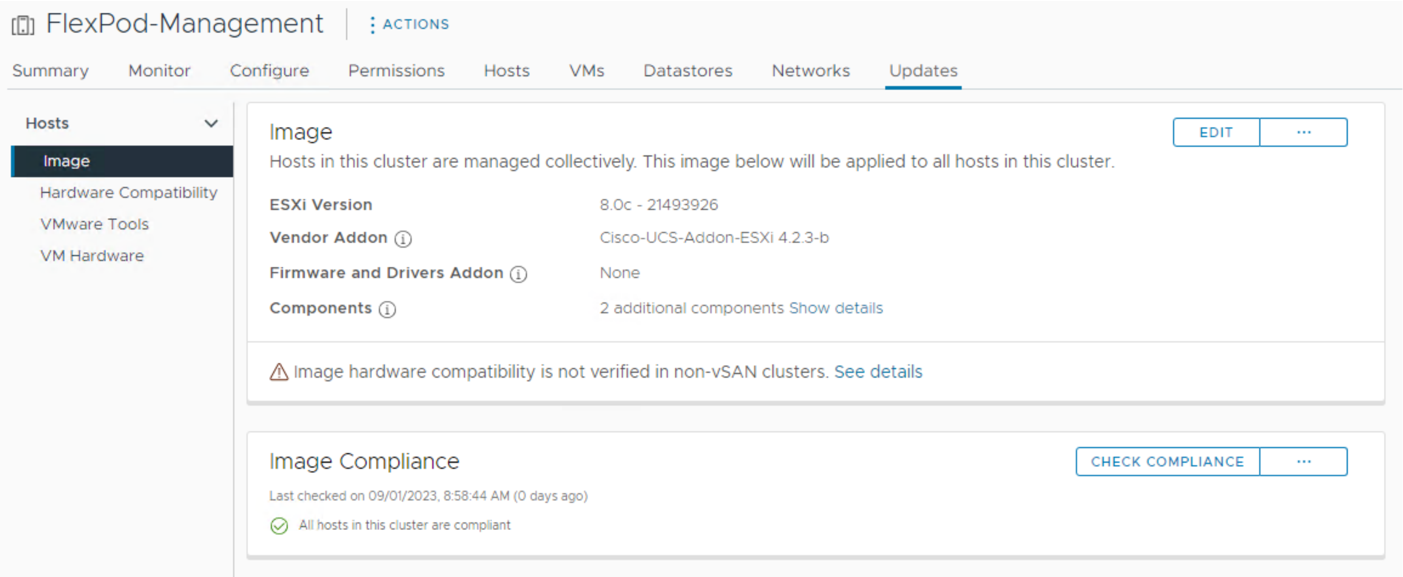
ADD COMPONENTS Show Additional components

Component Name	Version	Notes
Out-of-band host inventory and network configuration using Cisco CIMC.	1.3.1-1OEM ~~1.2.4-14~~	Manually added component
NetApp NAS VAAI Module for ESX Server	2.0.1 - Build 0001	Manually added component

Components per page 10 2 components

Step 17. Click **FINISH IMAGE SETUP** and then click **YES, FINISH IMAGE SETUP**.

Step 18. vCenter will complete an Image Compliance Check and all servers should be out of compliance because of the updated VMware ESXi version. You can click **REMEDIATE ALL** followed by **START REMEDIATION** and the servers will be put in Maintenance Mode, upgraded, and brought into compliance one at a time without affecting running VMs. This process will take time depending on the size of the cluster. Once all hosts have been remediated, they should all be compliant with the image.



Image

Hosts in this cluster are managed collectively. This image below will be applied to all hosts in this cluster.

ESXi Version: 8.0c - 21493926

Vendor Addon: Cisco-UCS-Addon-ESXi 4.2.3-b

Firmware and Drivers Addon: None

Components: 2 additional components Show details

⚠ Image hardware compatibility is not verified in non-vSAN clusters. See details

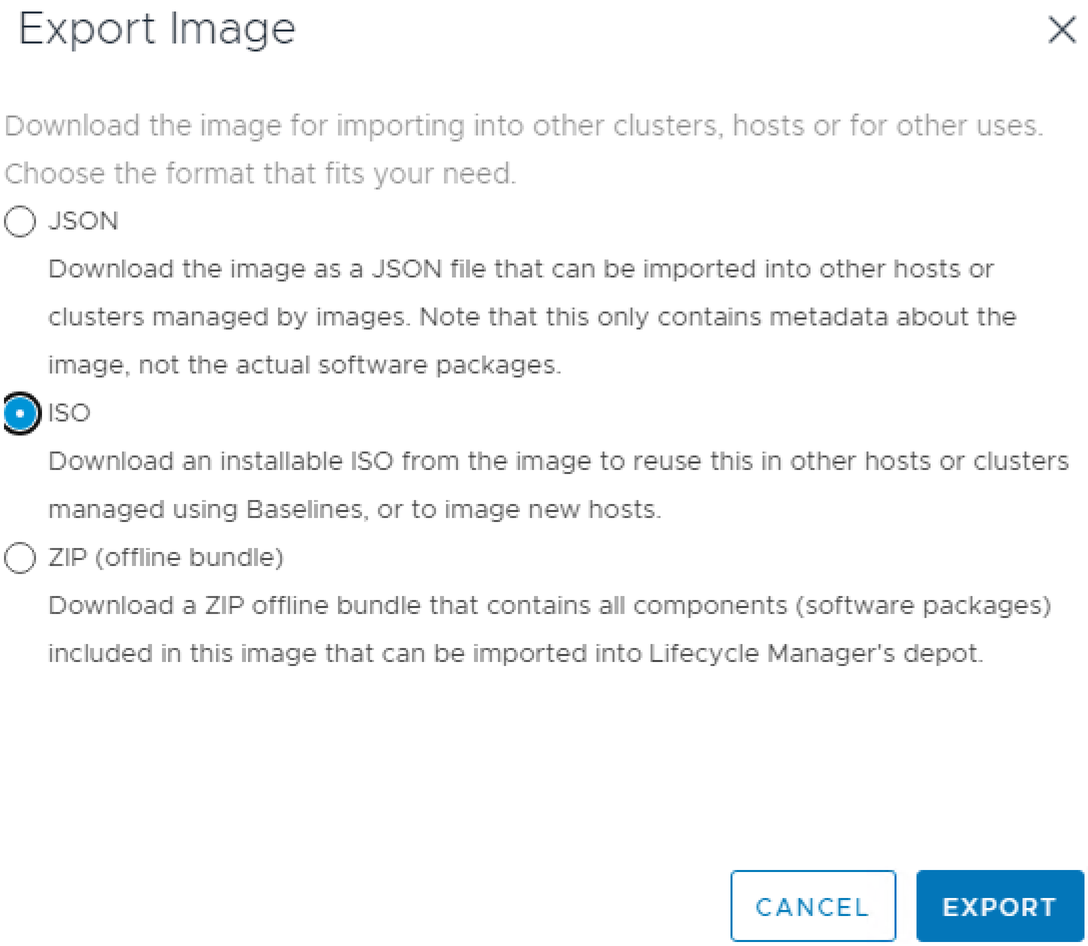
Image Compliance

Last checked on 09/01/2023, 8:58:44 AM (0 days ago)

✓ All hosts in this cluster are compliant

Step 19. The image built in this process can be exported both to a bootable ISO to install or upgrade additional ESXi hosts and to a JSON file to set up other ESXi clusters. To create a bootable ISO, under Inventory select the

FlexPod-Management cluster, select the **Updates** tab, and click **...** EDIT ... on the right. Select **Export**. In the Export Image window, select **ISO** and click **EXPORT**. The ISO will be downloaded to your downloads folder. You can rename the image to a more user-friendly name.



Export Image

Download the image for importing into other clusters, hosts or for other uses.

Choose the format that fits your need.

○ JSON

Download the image as a JSON file that can be imported into other hosts or clusters managed by images. Note that this only contains metadata about the image, not the actual software packages.

● ISO

Download an installable ISO from the image to reuse this in other hosts or clusters managed using Baselines, or to image new hosts.

○ ZIP (offline bundle)

Download a ZIP offline bundle that contains all components (software packages) included in this image that can be imported into Lifecycle Manager's depot.

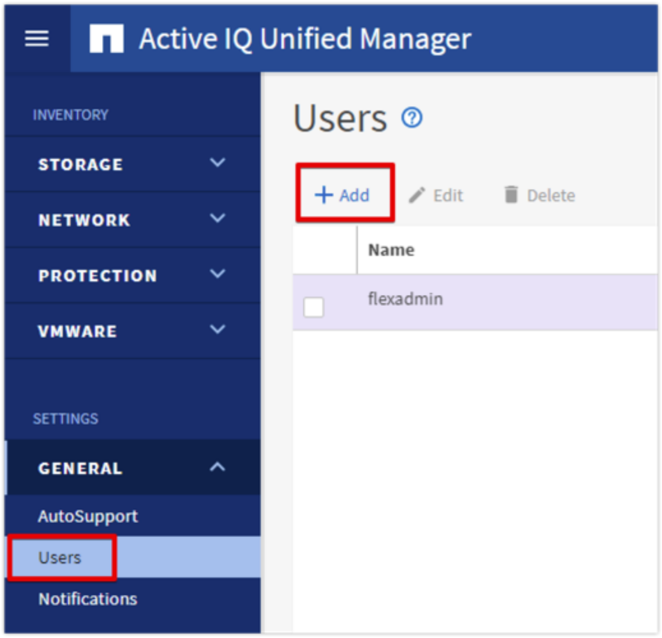
Step 20. To export a JSON file, in the Export Image window select **JSON** and click **EXPORT**. A JSON file will be downloaded to your Downloads folder. This file can be imported into another ESXi cluster to manage that cluster with this same ESXi image.

Step 21. The standalone Nexus Dashboard host can be upgraded by using the exported ISO. You will need to shutdown the Nexus Dashboard VM (by right-clicking the VM and selecting **Power > Shut Down Guest OS**) and then put the Nexus Dashboard ESXi host in Maintenance Mode once the Nexus Dashboard VM has shutdown. Go to **Cisco USC Manager** and launch a **KVM Console** for this host. Use the **Virtual Media** tab to map the downloaded ISO and the use the **Power** tab to **Reset System**. When the ESXi Installer has booted follow the prompts to upgrade the host. When the upgrade process is complete, **reboot** the host. When the host has reconnected to vCenter, **Exit Maintenance Mode**, and **Power On the Nexus Dashboard VM**.

Active IQ Unified Manager User Configuration

Procedure 1. Add Local Users to Active IQ Unified Manager

Step 1. Go to **Settings** > **General** section and click **Users.**



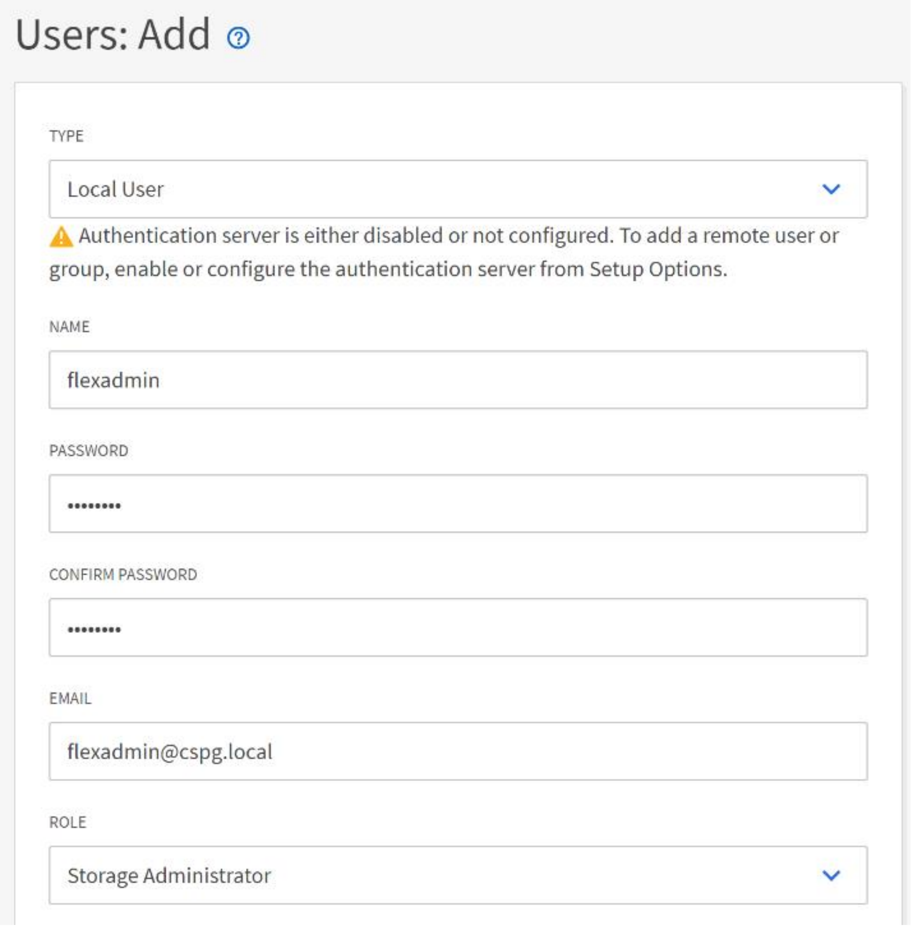
Step 2. Click **+ Add** and complete the requested information:

a. Select Local User for the Type.

b. Enter a username and password.

c. Add the user’s email address.

d. Select the appropriate role for the new user.



Users: Add

TYPE

Local User

⚠ Authentication server is either disabled or not configured. To add a remote user or group, enable or configure the authentication server from Setup Options.

NAME

flexadmin

PASSWORD

••••••••

CONFIRM PASSWORD

••••••••

EMAIL

flexadmin@cspg.local

ROLE

Storage Administrator

Step 3. Click **SAVE** to finish adding the new user.

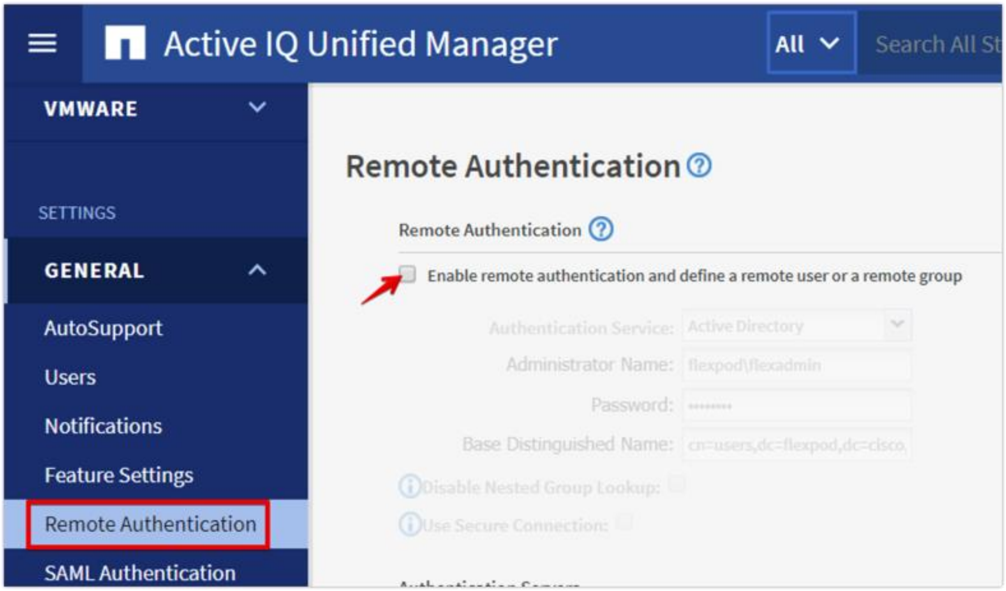
Procedure 2. Configure Remote Authentication

Simplify user management and authentication for Active IQ Unified Manager by integrating it with Microsoft Active Directory.

Note: You must be logged on as the maintenance user created during the installation or another user with Application Administrator privileges to configure remote authentication.

Step 1. Go to **General** and select **Remote Authentication**.

Step 2. Select the option to enable Remote Authentication and define a remote user or remote group.



Remote Authentication

Remote Authentication

□ Enable remote authentication and define a remote user or a remote group

Authentication Service: Active Directory

Administrator Name: flexpod\flexadmin

Password: ••••••••

Base Distinguished Name: cn=users,dc=flexpod,dc=cisco,

Disable Nested Group Lookup: □

Use Secure Connection: □

Step 3. Select **Active Directory** from the authentication service list.

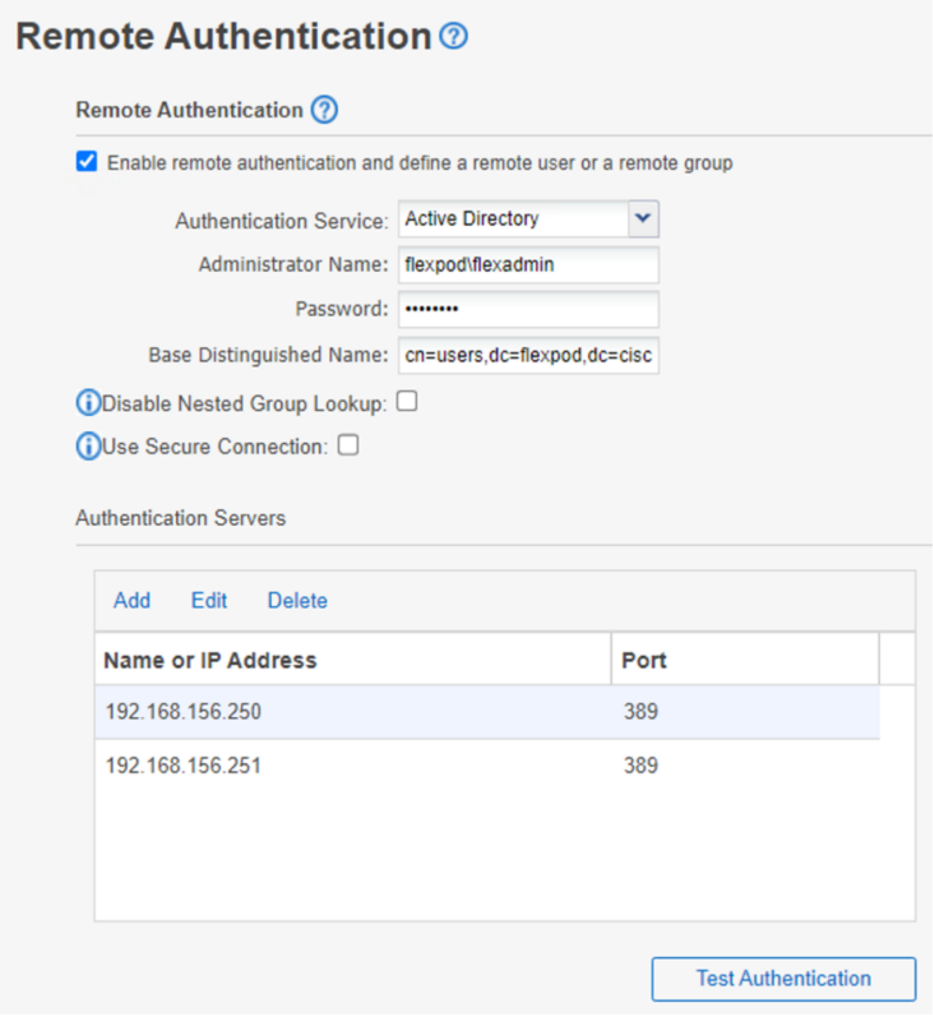
Step 4. Enter the Active Directory service account name and password. The account name can be in the format of domain\user or user@domain.

Step 5. Enter the base DN where your Active Directory users reside.

Step 6. If Active Directory LDAP communications are protected via SSL enable the **Use Secure Connection** option.

Step 7. Add one or more Active Directory domain controllers by clicking **Add** and entering the IP or FQDN of the domain controller.

Step 8. Click **Save** to enable the configuration.



Remote Authentication

Remote Authentication

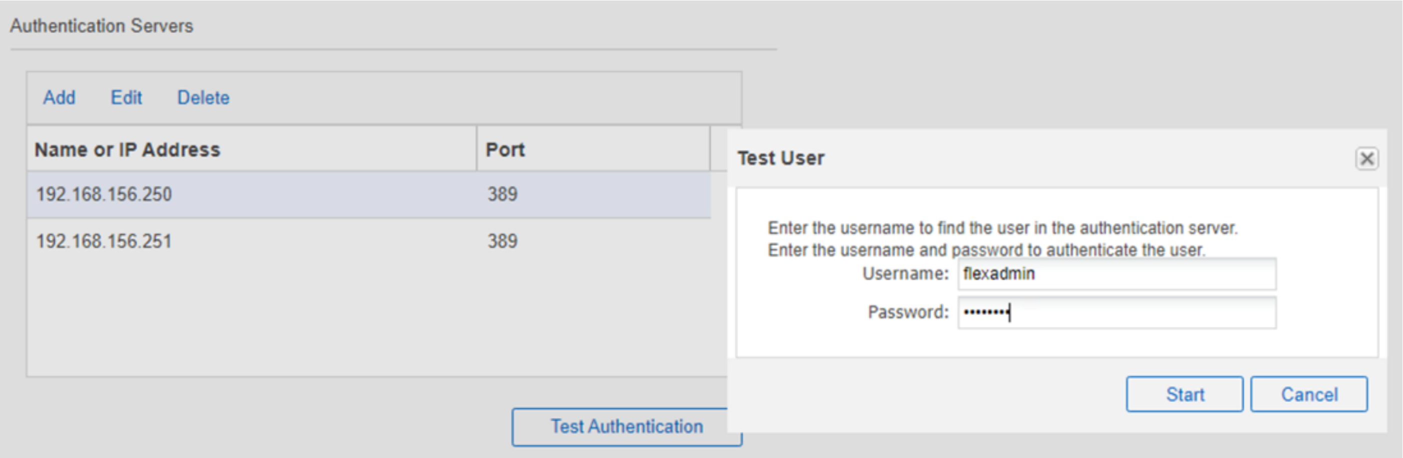
☑ Enable remote authentication and define a remote user or a remote group

Authentication Service:	Active Directory
Administrator Name:	flexpod\flexadmin
Password:	••••••••
Base Distinguished Name:	cn=users,dc=flexpod,dc=cisc
Disable Nested Group Lookup:	□
Use Secure Connection:	□

Authentication Servers

Name or IP Address	Port
192.168.156.250	389
192.168.156.251	389

Step 9. Click **Test Authentication** and enter an Active Directory username and password to test authentication with the Active Directory authentication servers. Click **Start.**



Authentication Servers

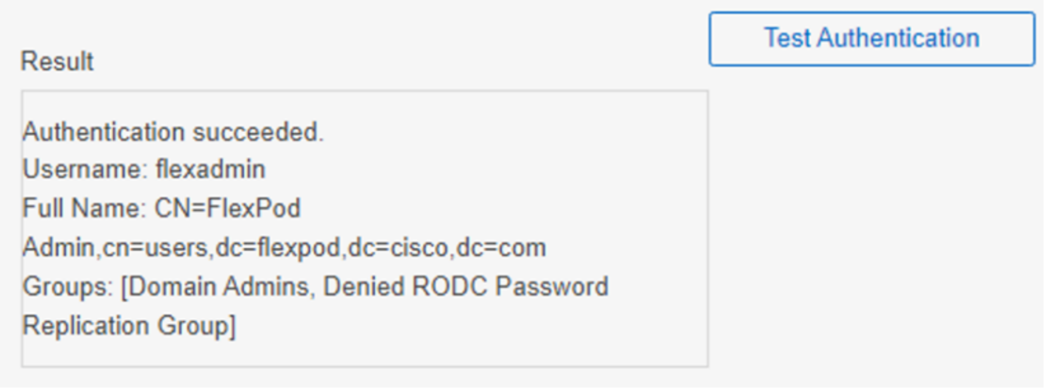
Name or IP Address	Port
192.168.156.250	389
192.168.156.251	389

Test User

Enter the username to find the user in the authentication server.
Enter the username and password to authenticate the user.

Username:	flexadmin
Password:	••••••••

A result message displays indicating authentication was successful:



Result

Authentication succeeded.
Username: flexadmin
Full Name: CN=FlexPod Admin,cn=users,dc=flexpod,dc=cisco,dc=com
Groups: [Domain Admins, Denied RODC Password Replication Group]

Procedure 3. Add a Remote User to Active IQ Unified Manager

Step 1. Navigate to the **General** section and select **Users.**

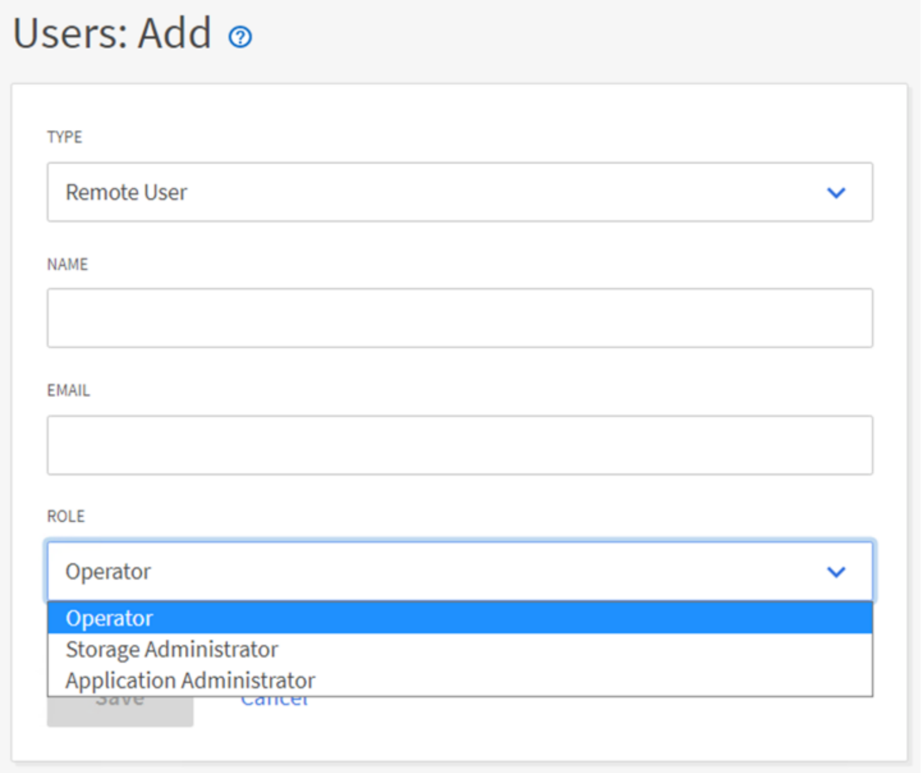
Step 2. Click **Add** and select **Remote User** from the Type drop-down list.

Step 3. Enter the following information into the form:

a. The username of the Active Directory user.

b. Email address of the user.

c. Select the appropriate role (Operator / Storage Administrator / Application Administrator) for the user.


Users: Add

TYPE: Remote User

NAME:

EMAIL:

ROLE: Operator

Step 4. Click **Save** to add the remote user to Active IQ Unified Manager.

Note: Please review the Active IQ Unified Manager documentation page for the definitions of the various user roles:

https://docs.netapp.com/us-en/active-iq-unified-manager/config/reference_definitions_of_user_roles.html

Active IQ Unified Manager vCenter Configuration

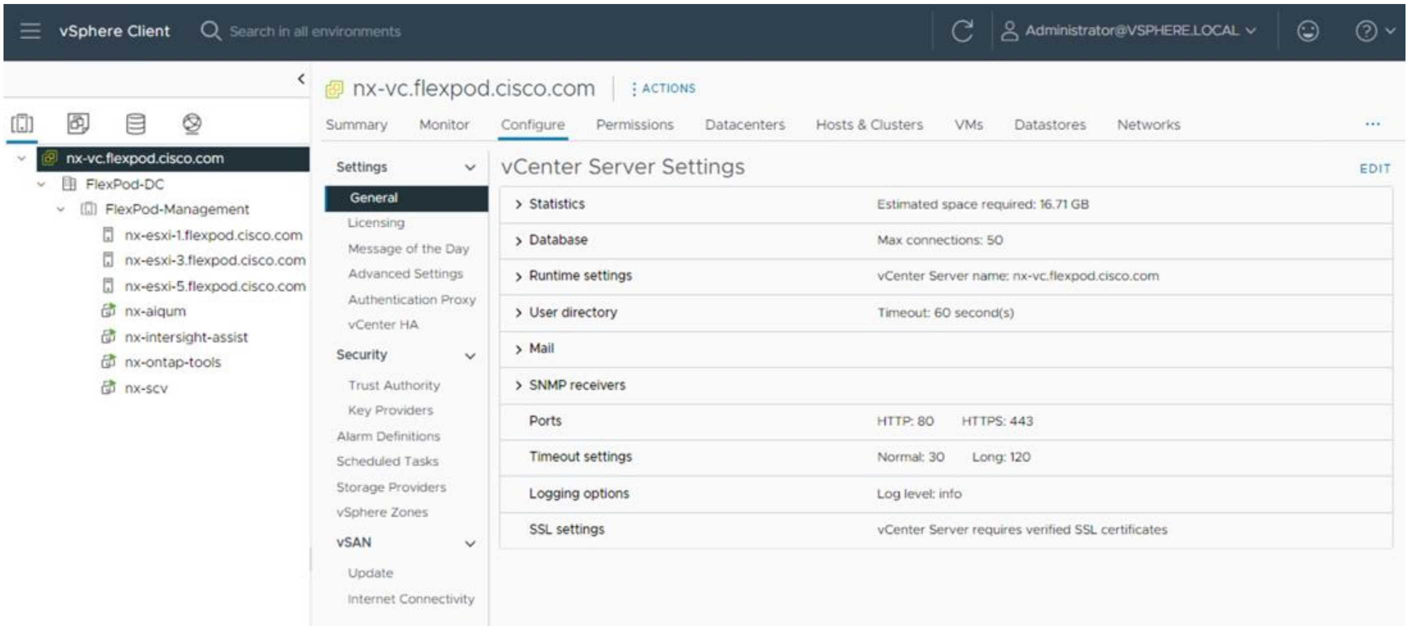
Active IQ Unified Manager provides visibility into vCenter and the virtual machines running inside the datastores backed by ONTAP storage. Virtual machines and storage are monitored to enable quick identification of performance issues within the various components of the virtual infrastructure stack.

Note: Before adding vCenter into Active IQ Unified Manager, the log level of the vCenter server must be changed.

Procedure 1. Configure Active IQ Unified Manager vCenter

Step 1. In the vSphere client go to **Menu** > **VMs and Templates** and select the vCenter instance from the top of the object tree.

Step 2. Click the **Configure** tab, expand **Settings**, and select **General**.

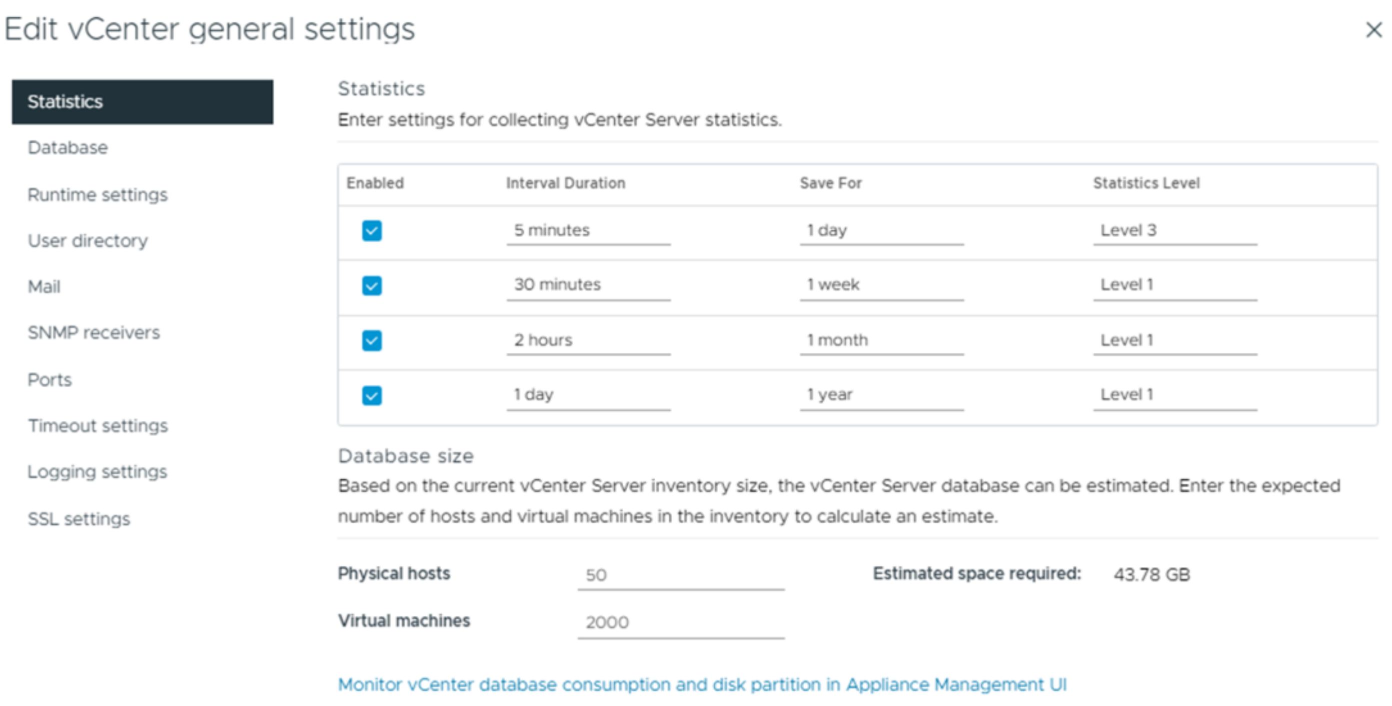


vCenter Server Settings

> Statistics	Estimated space required: 16.71 GB
> Database	Max connections: 50
> Runtime settings	vCenter Server name: nx-vc.flexpod.cisco.com
> User directory	Timeout: 60 second(s)
> Mail	
> SNMP receivers	
Ports	HTTP: 80 HTTPS: 443
Timeout settings	Normal: 30 Long: 120
Logging options	Log level: info
SSL settings	vCenter Server requires verified SSL certificates

Step 3. Click **EDIT**.

Step 4. In the pop-up window under Statistics, locate the 5 minutes Interval Duration row and change the setting to **Level 3** under the Statistics Level column.



Statistics

Enter settings for collecting vCenter Server statistics.

Enabled	Interval Duration	Save For	Statistics Level
☑	5 minutes	1 day	Level 3
☑	30 minutes	1 week	Level 1
☑	2 hours	1 month	Level 1
☑	1 day	1 year	Level 1

Database size

Based on the current vCenter Server inventory size, the vCenter Server database can be estimated. Enter the expected number of hosts and virtual machines in the inventory to calculate an estimate.

Physical hosts: 50

Virtual machines: 2000

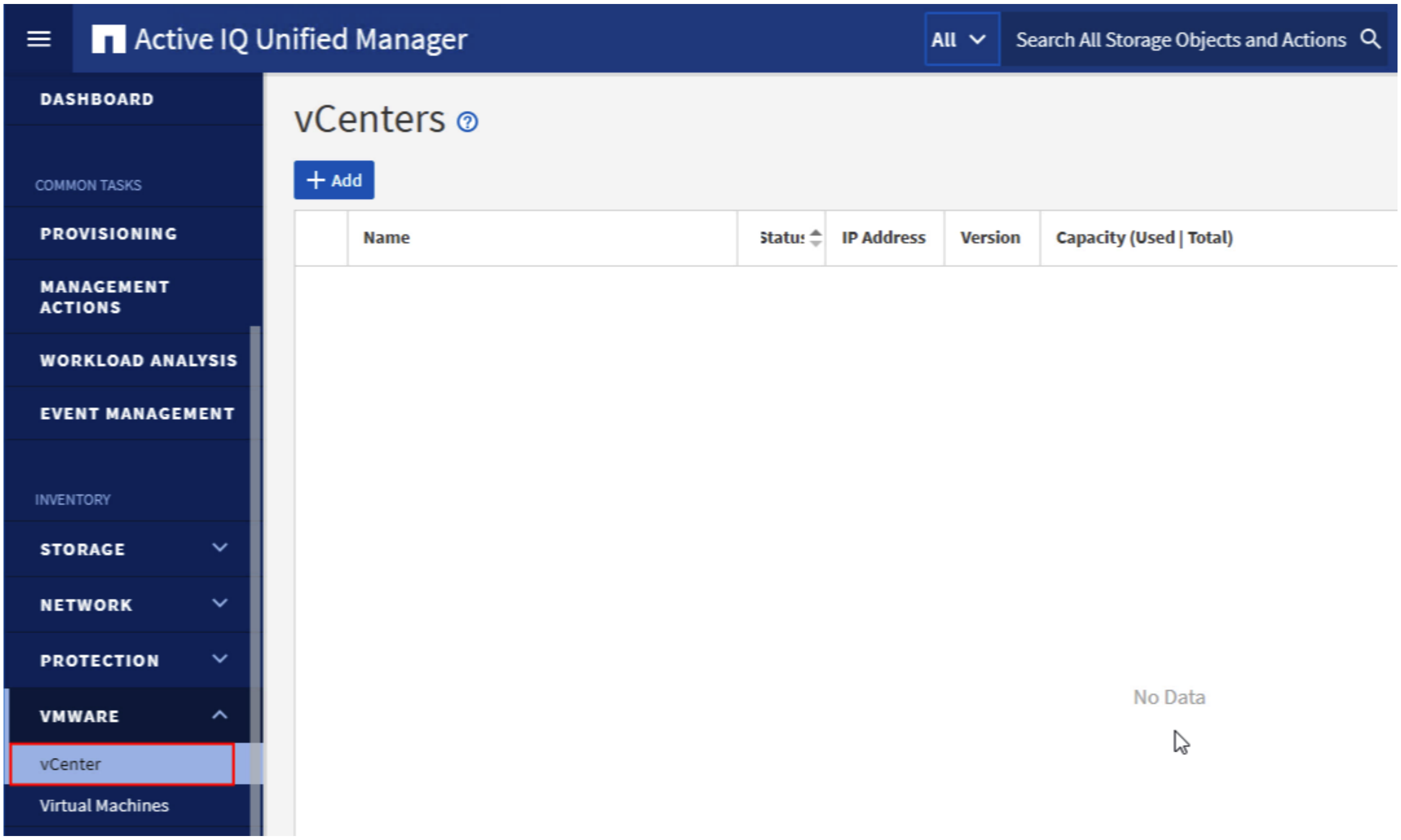
Estimated space required: 43.78 GB

Monitor vCenter database consumption and disk partition in Appliance Management UI

Step 5. Click **SAVE**.

Step 6. Switch to the Active IQ Unified Manager and navigate to the **VMware** section located under **Inventory**.

Step 7. Expand VMware and select **vCenter**.

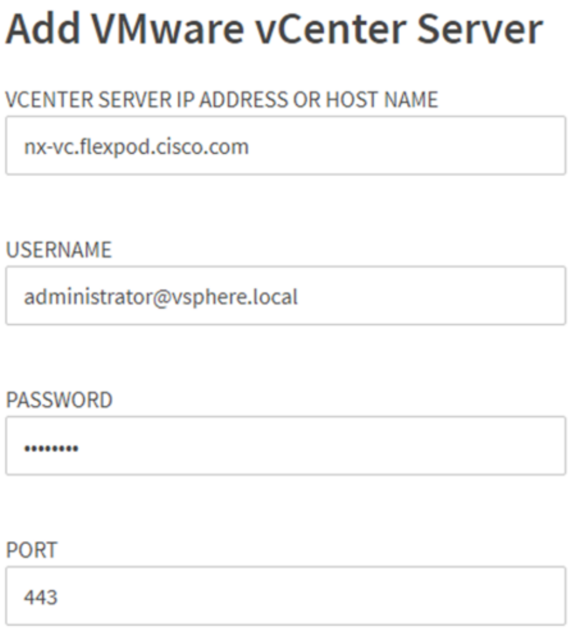


Name	Status	IP Address	Version	Capacity (Used | Total)

No Data

Step 8. Click **Add**.

Step 9. Enter the VMware vCenter server details and click **Save**.



Add VMware vCenter Server

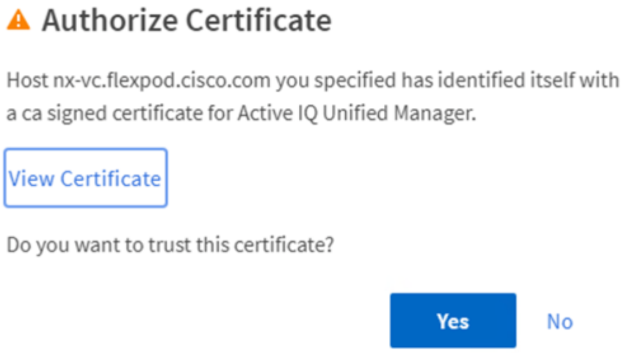
VCENTER SERVER IP ADDRESS OR HOST NAME: nx-vc.flexpod.cisco.com

USERNAME: administrator@vsphere.local

PASSWORD: ••••••••

PORT: 443

Step 10. A dialog box will appear asking to authorize the certificate. Click **Yes** to accept the certificate and add the vCenter server.



Authorize Certificate

Host nx-vc.flexpod.cisco.com you specified has identified itself with a ca signed certificate for Active IQ Unified Manager.

Do you want to trust this certificate?

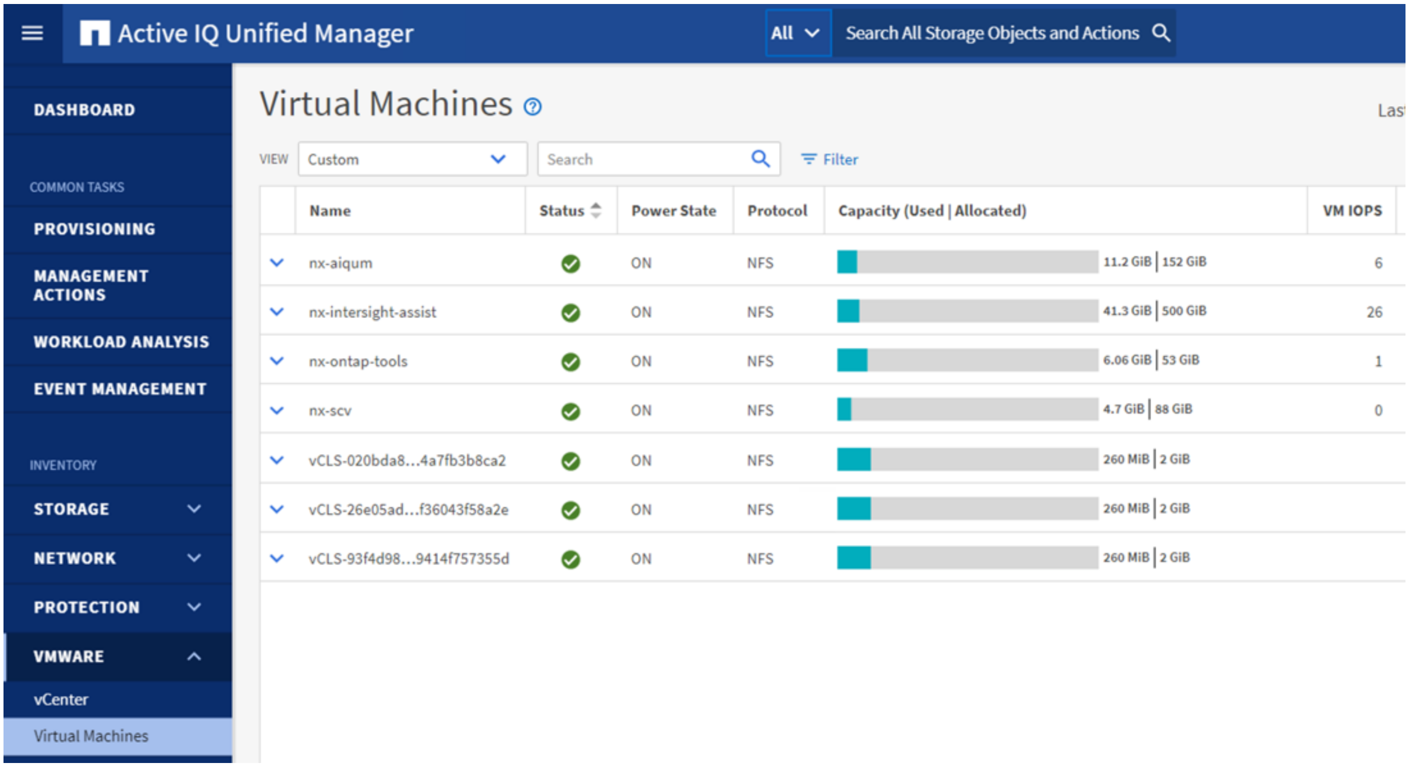
Note: It may take up to 15 minutes to discover vCenter. Performance data can take up to an hour to become available.

Procedure 2. View Virtual Machine Inventory

The virtual machine inventory is automatically added to Active IQ Unified Manager during discovery of the vCenter server. Virtual machines can be viewed in a hierarchical display detailing storage capacity, IOPS and latency for each component in the virtual infrastructure to troubleshoot the source of any performance related issues.

Step 1. Log into **NetApp Active IQ Unified Manager**.

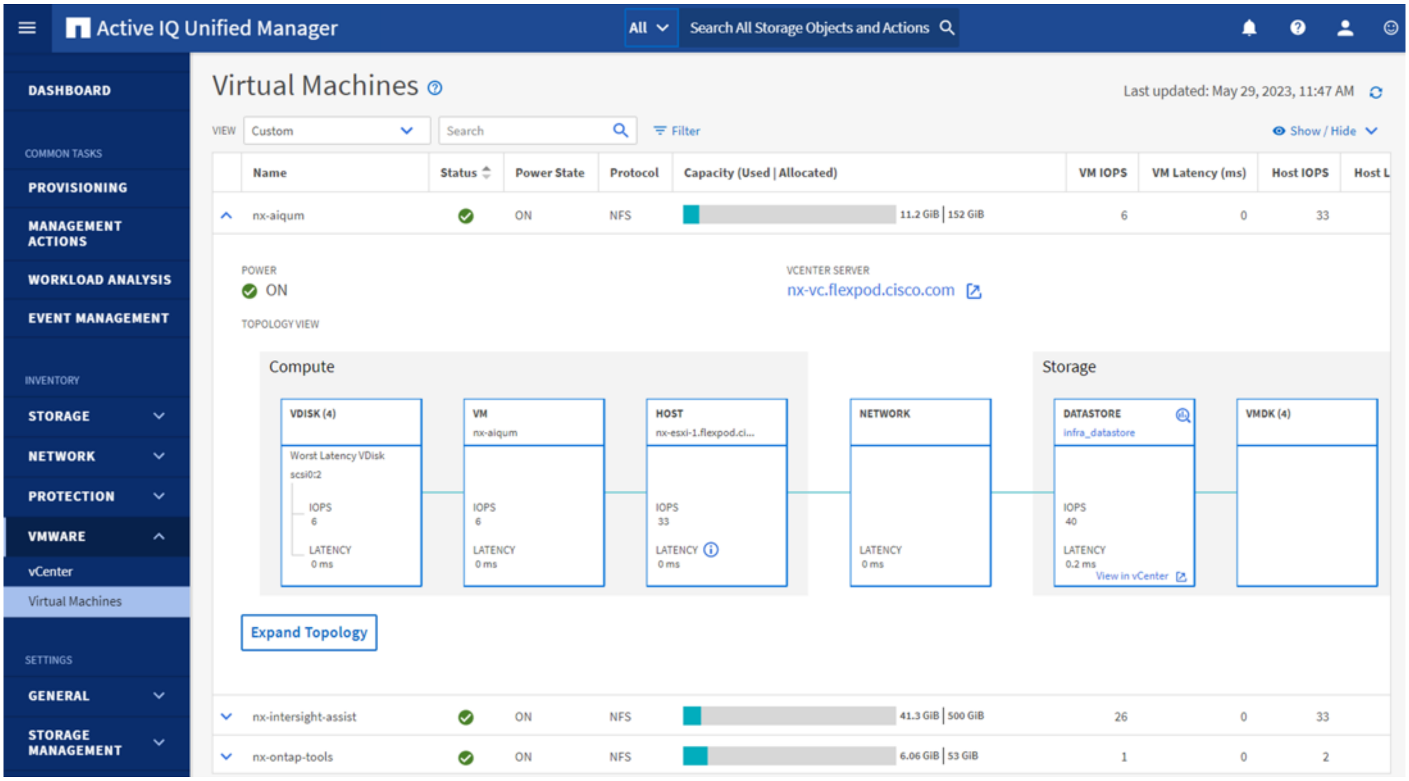
Step 2. Navigate to the VMware section located under Inventory, expand the section, and click **Virtual Machines**.



Virtual Machines

	Name	Status	Power State	Protocol	Capacity (Used | Allocated)	VM IOPS
⌄	nx-aiqum	✓	ON	NFS	11.2 GiB | 152 GiB	6
⌄	nx-intersight-assist	✓	ON	NFS	41.3 GiB | 500 GiB	26
⌄	nx-ontap-tools	✓	ON	NFS	6.06 GiB | 53 GiB	1
⌄	nx-scv	✓	ON	NFS	4.7 GiB | 88 GiB	0
⌄	vCLS-020bda8…4a7fb3b8ca2	✓	ON	NFS	260 MiB | 2 GiB	
⌄	vCLS-26e05ad…f36043f58a2e	✓	ON	NFS	260 MiB | 2 GiB	
⌄	vCLS-93f4d98…9414f757355d	✓	ON	NFS	260 MiB | 2 GiB	

Step 3. Select a VM and click the blue caret to expose the topology view. Review the compute, network, and storage components and their associated IOPS and latency statistics.



Virtual Machines

Last updated: May 29, 2023, 11:47 AM

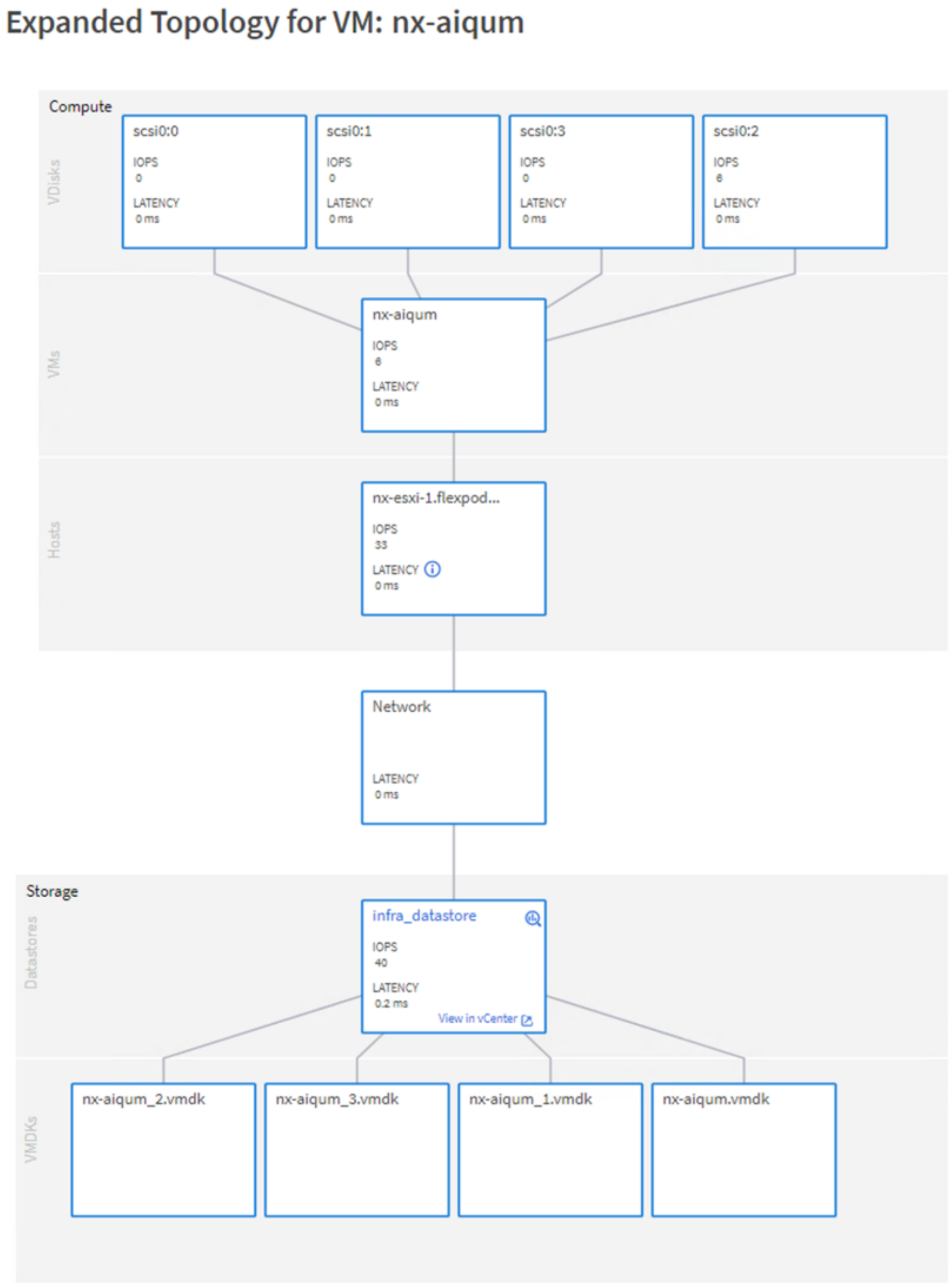
	Name	Status	Power State	Protocol	Capacity (Used | Allocated)	VM IOPS	VM Latency (ms)	Host IOPS	Host L
^	nx-aiqum	✓	ON	NFS	11.2 GiB | 152 GiB	6	0	33	
⌄	nx-intersight-assist	✓	ON	NFS	41.3 GiB | 500 GiB	26	0	33	
⌄	nx-ontap-tools	✓	ON	NFS	6.06 GiB | 53 GiB	1	0	2	

POWER
✓ ON

VCENTER SERVER
nx-vc.flexpod.cisco.com

TOPOLOGY VIEW

Step 4. Click **Expand Topology** to see the entire hierarchy of the virtual machine and its virtual disks as it is connected through the virtual infrastructure stack. The VM components are mapped from vSphere and compute through the network to the storage.



NetApp Active IQ

NetApp Active IQ is a data-driven service that leverages artificial intelligence and machine learning to provide analytics and actionable intelligence for ONTAP storage systems. Active IQ uses AutoSupport data to deliver proactive guidance and best practices recommendations to optimize storage performance and minimize risk. Additional Active IQ documentation is available on the Active IQ Documentation Resources web page.

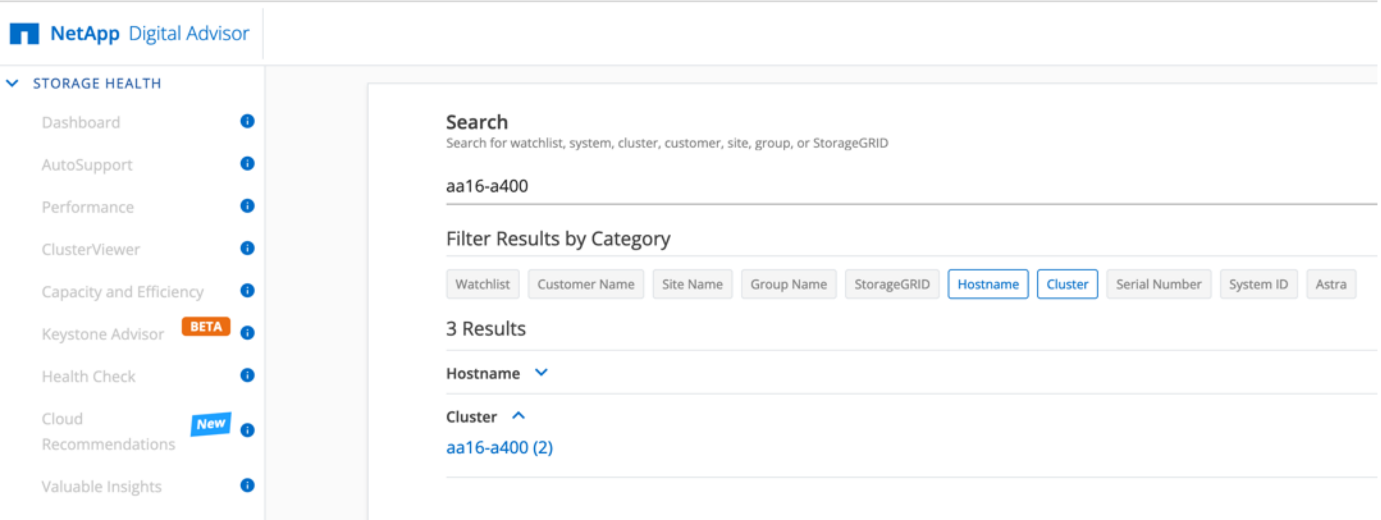
Note: Active IQ is automatically enabled when AutoSupport is configured on the NetApp ONTAP storage controllers.

Procedure 1. Configure NetApp Active IQ

Step 1. Navigate to the Active IQ portal at https://activeiq.netapp.com/.

Step 2. Login with NetApp support account ID.

Step 3. At the Welcome screen enter the cluster name or one of controller serial numbers in the search box. Active IQ will automatically begin searching for the cluster and display results below:



Search for watchlist, system, cluster, customer, site, group, or StorageGRID

aa16-a400

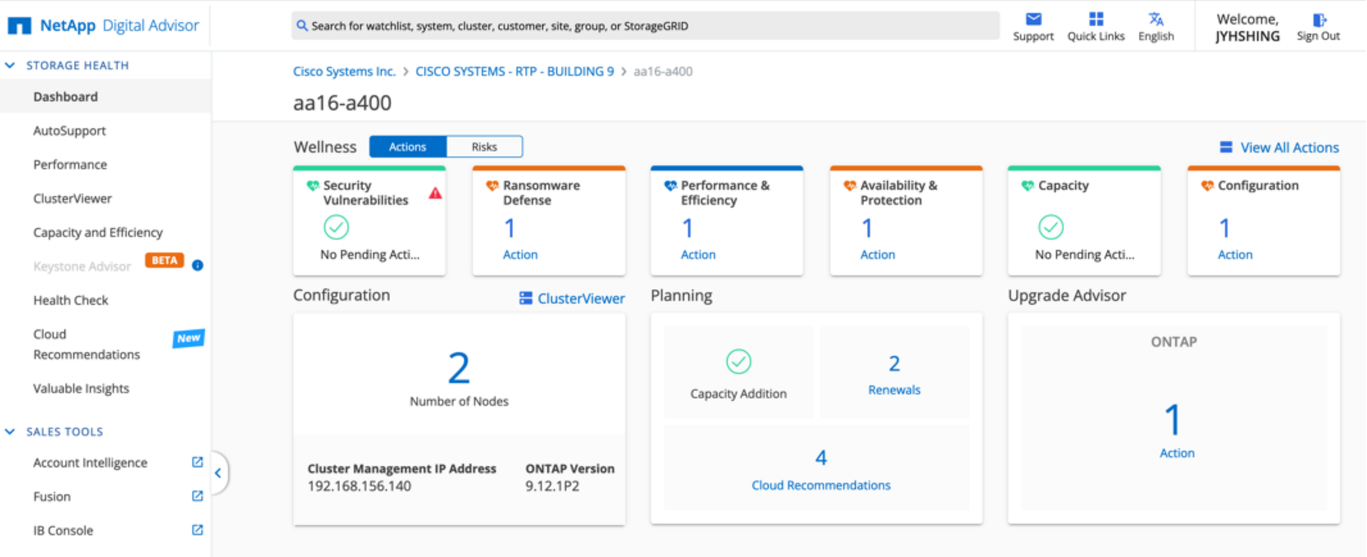
3 Results

Hostname

Cluster

aa16-a400 (2)

Step 4. Click the <**cluster name**> (for example, aa02-a800) to launch the dashboard for this cluster.



Cluster Management IP Address 192.168.156.140

ONTAP Version 9.12.1P2

Procedure 2. Add a Watchlist to the Digital Advisor Dashboard

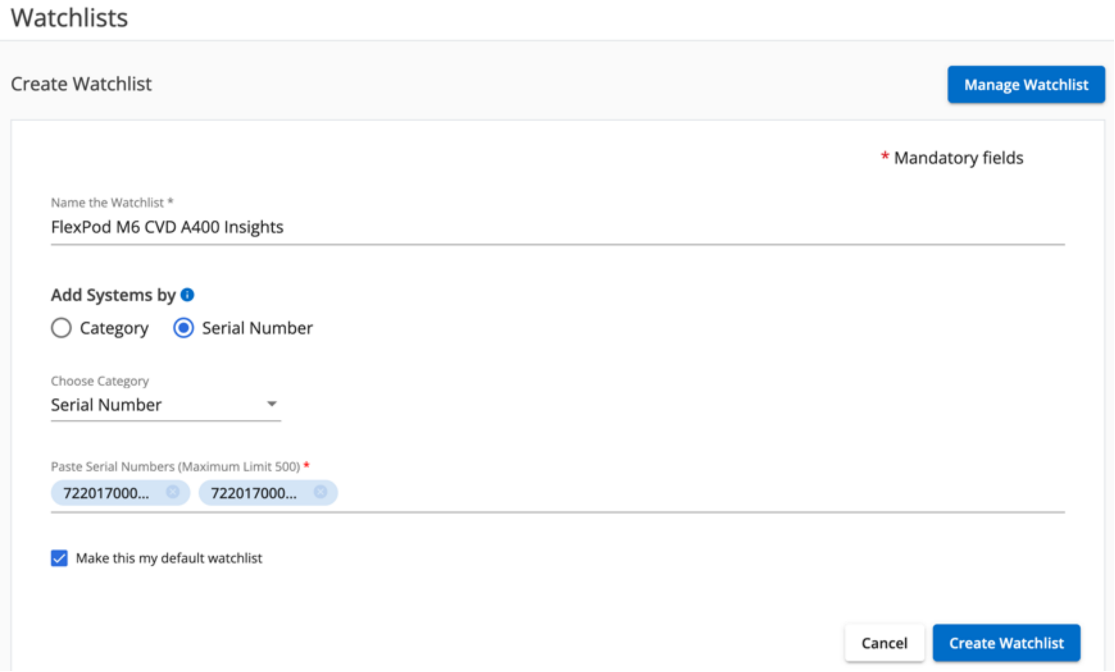
The Active IQ Digital advisor provides a summary dashboard and system wellness score based on the health and risks that Active IQ has identified. The dashboard provides a quick way to identify and get proactive recommendations on how to mitigate risks in the storage environment including links to technical reports and mitigation plans. This procedure details the steps to create a watchlist and launch Digital advisor dashboard for the watchlist.

Step 1. Click **GENERAL** > **Watchlists**.

Step 2. Enter a name for the watchlist.

Step 3. Select the radio button to add systems by serial number and enter the cluster serial numbers to the watchlist.

Step 4. Check the box for **Make this my default watchlist** if desired.



Watchlists

Create Watchlist

* Mandatory fields

Name the Watchlist *
FlexPod M6 CVD A400 Insights

Add Systems by
○ Category ● Serial Number

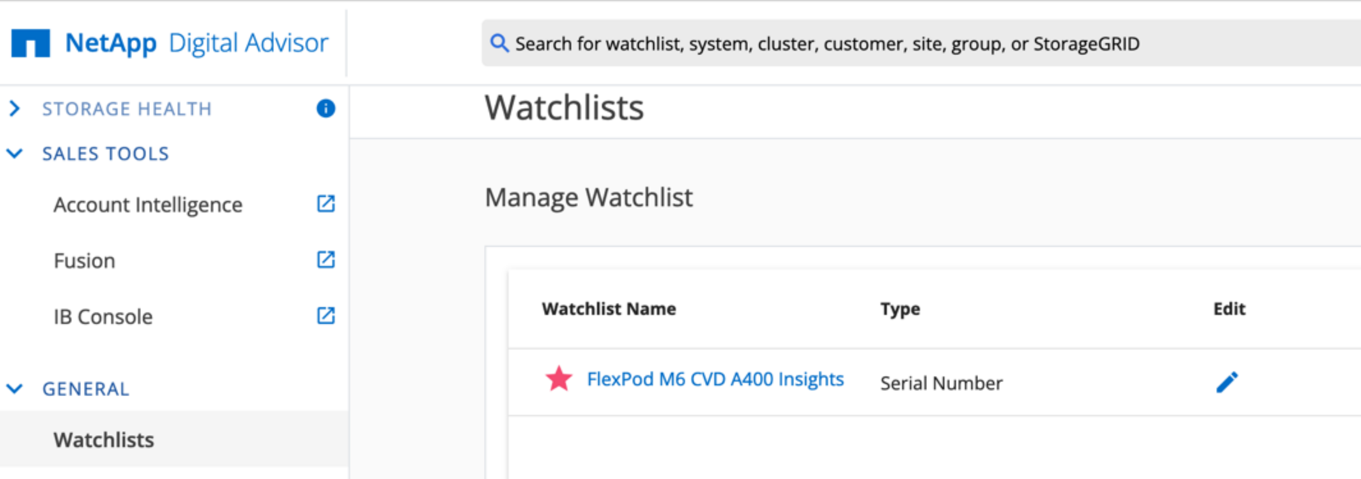
Choose Category
Serial Number

Paste Serial Numbers (Maximum Limit 500) *
722017000... 722017000...

☑ Make this my default watchlist

Step 5. Click **Create Watchlist**.

Step 6. Click **GENERAL** > **Watchlists** in the left menu bar again to list the watchlist created.



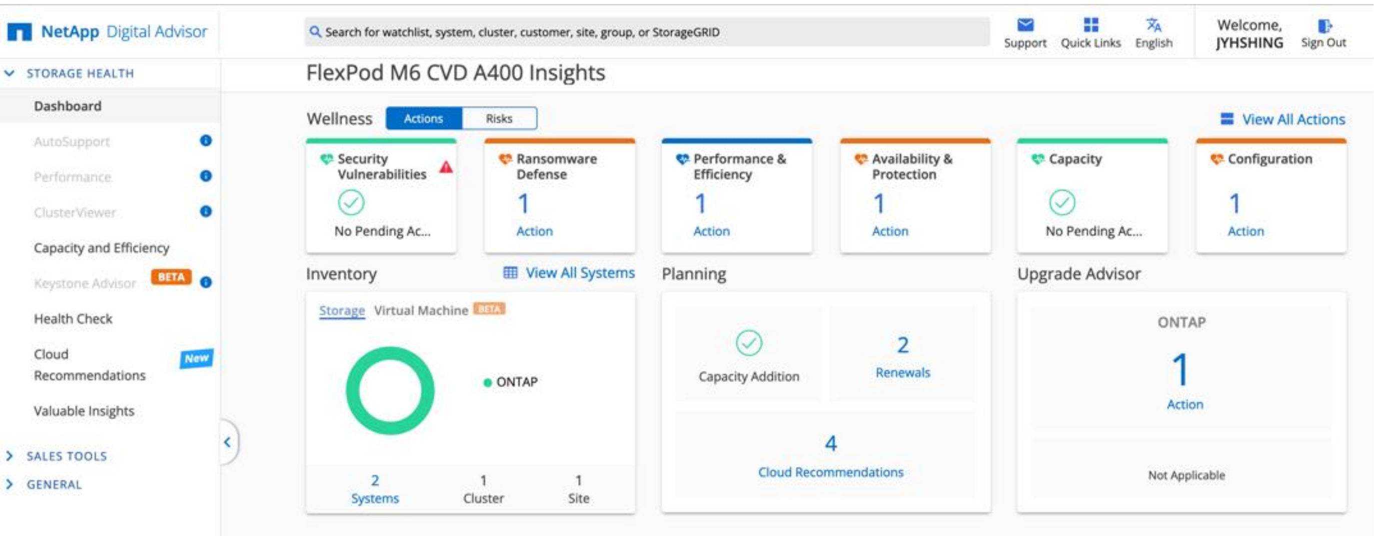
Watchlists

Manage Watchlist

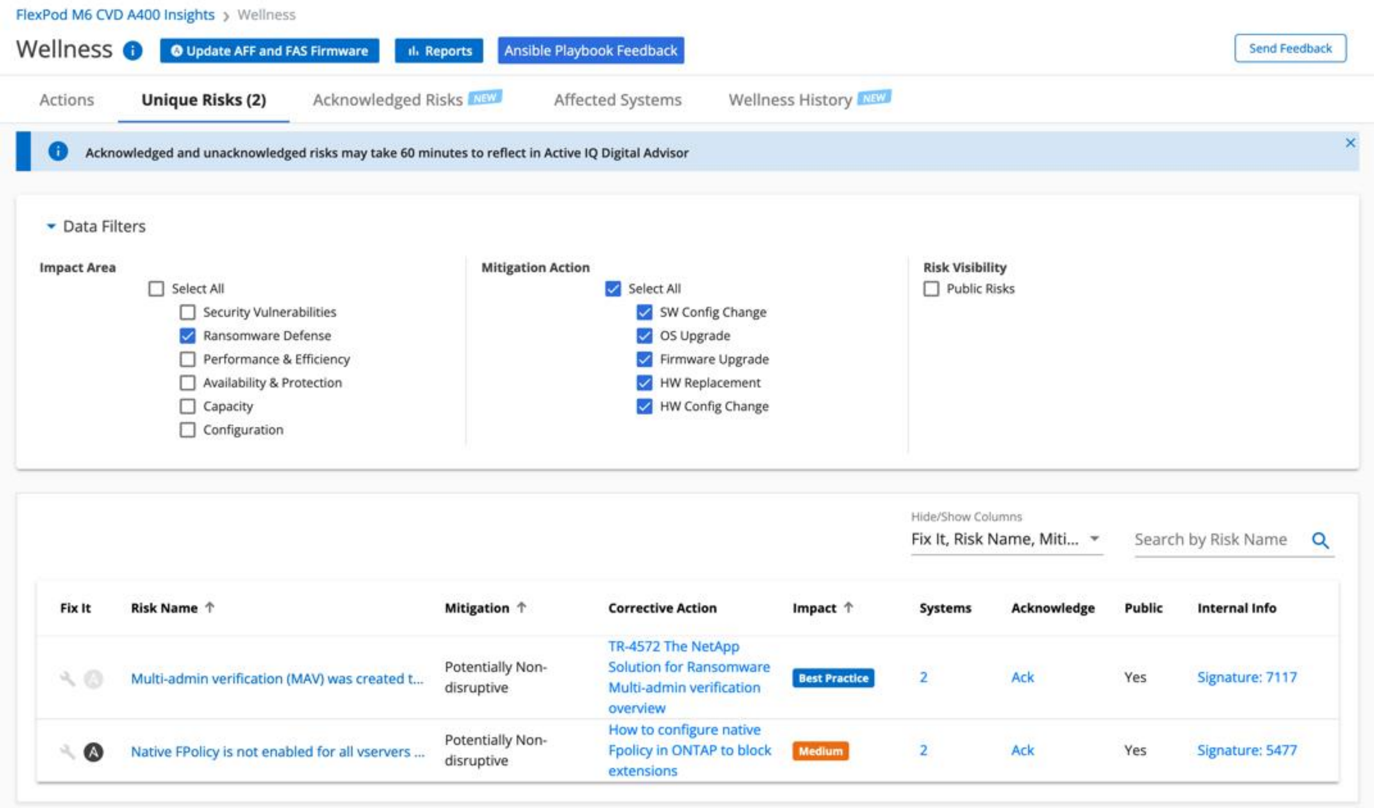
Watchlist Name	Type	Edit
★ FlexPod M6 CVD A400 Insights	Serial Number	✎

Step 7. Click the blue Watchlist Name to launch the specific watchlist in **Digital Advisor Dashboard**.

Step 8. Review the dashboard to learn more about any recommended actions or risks.



Step 9. Switch between the **Actions** and **Risks** tabs to view the risks by category or a list of all risks with their impact and links to corrective actions.



Acknowledged and unacknowledged risks may take 60 minutes to reflect in Active IQ Digital Advisor

Impact Area: □ Select All, □ Security Vulnerabilities, ☑ Ransomware Defense, □ Performance & Efficiency, □ Availability & Protection, □ Capacity, □ Configuration

Mitigation Action: ☑ Select All, ☑ SW Config Change, ☑ OS Upgrade, ☑ Firmware Upgrade, ☑ HW Replacement, ☑ HW Config Change

Risk Visibility: □ Public Risks

Fix It	Risk Name ↑	Mitigation ↑	Corrective Action	Impact ↑	Systems	Acknowledge	Public	Internal Info
	Multi-admin verification (MAV) was created t...	Potentially Non-disruptive	TR-4572 The NetApp Solution for Ransomware Multi-admin verification overview	Best Practice	2	Ack	Yes	Signature: 7117
A	Native FPolicy is not enabled for all vservers ...	Potentially Non-disruptive	How to configure native Fpolicy in ONTAP to block extensions	Medium	2	Ack	Yes	Signature: 5477

Step 10. Click the links in the Corrective Action column to read the best practice information or knowledge base article about how to remediate the risk.

Note: Additional tutorials and video walk-throughs of Active IQ features can be viewed here: https://docs.netapp.com/us-en/active-iq/

FlexPod Backups

Procedure 1. Cisco Nexus and MDS Backups

The configuration of the Cisco Nexus 9000 and Cisco MDS 9132T switches can be backed up manually at any time with the copy command, but automated backups can be enabled using the NX-OS feature scheduler.

An example of setting up automated configuration backups of one of the NX-OS switches is shown below:

```
config t
feature scheduler
scheduler logfile size 1024
scheduler job name backup-cfg
copy running-config tftp://<server-ip>/$(SWITCHNAME)-cfg.$(TIMESTAMP) vrf management
exit
scheduler schedule name daily
job name backup-cfg
time daily 2:00
end
```

Note: Using “vrf management” in the copy command is only needed when Mgmt0 interface is part of VRF management. “vrf management is not needed in Cisco MDS switches.

Step 1. Verify the scheduler job has been correctly setup using following command(s):

```
show scheduler job
Job Name: backup-cfg
--------------------
copy running-config tftp://10.1.156.150/$(SWITCHNAME)-cfg.$(TIMESTAMP) vrf management

==============================================================================


show scheduler schedule
Schedule Name       : daily
---------------------------
User Name           : admin
Schedule Type       : Run every day at 2 Hrs 0 Mins
Last Execution Time : Yet to be executed
-----------------------------------------------
     Job Name            Last Execution Status
-----------------------------------------------
backup-cfg                            -NA-
==============================================================================
```

The documentation for the feature scheduler can be found here: https://www.cisco.com/c/en/us/td/docs/dcn/nx-os/nexus9000/102x/configuration/system-management/cisco-nexus-9000-series-nx-os-system-management-configuration-guide-102x/m-configuring-the-scheduler-10x.html

Procedure 2. NetApp ONTAP Configuration Backup

The configuration backup files of the NetApp ONTAP cluster and nodes are automatically created according to the following schedules:

- Every 8 hours
- Daily
- Weekly

At each of these times, a node configuration backup file is created on each healthy node in the cluster. All of these node configuration backup files are then collected in a single cluster configuration backup file along with the replicated cluster configuration and saved on one or more nodes in the cluster.

An example of viewing the ONTAP cluster configuration backup files is shown below:

```
AA16-A400::> set advanced
```

```
Warning: These advanced commands are potentially dangerous; use them only when directed to do so by NetApp
personnel.
Do you want to continue? {y|n}: y
AA16-A400::*> row 0
  (rows)
AA16-A400::*> system configuration backup show
Node       Backup Name                               Time               Size
---------  ----------------------------------------- ------------------ -----
AA16-A400-01  AA16-A400.8hour.2023-08-31.18_15_00.7z 08/31 18:15:00     34.60MB
AA16-A400-01  AA16-A400.8hour.2023-09-01.02_15_00.7z 09/01 02:15:00     35.65MB
AA16-A400-01  AA16-A400.8hour.2023-09-01.10_15_00.7z 09/01 10:15:00     36.05MB
AA16-A400-01  AA16-A400.daily.2023-08-31.00_10_01.7z 08/31 00:10:01     34.87MB
AA16-A400-01  AA16-A400.daily.2023-09-01.00_10_01.7z 09/01 00:10:01     35.09MB
AA16-A400-01  AA16-A400.weekly.2023-08-27.00_15_00.7z 08/27 00:15:00    23.50MB
AA16-A400-02  AA16-A400.8hour.2023-09-01.02_15_00.7z 09/01 02:15:00     35.65MB
AA16-A400-02  AA16-A400.8hour.2023-09-01.10_15_00.7z 09/01 10:15:00     36.05MB
AA16-A400-02  AA16-A400.daily.2023-08-30.00_10_00.7z 08/30 00:10:00     32.69MB
AA16-A400-02  AA16-A400.daily.2023-08-31.00_10_01.7z 08/31 00:10:01     34.87MB
AA16-A400-02  AA16-A400.daily.2023-09-01.00_10_01.7z 09/01 00:10:01     35.09MB
AA16-A400-02  AA16-A400.weekly.2023-08-27.00_15_00.7z 08/27 00:15:00    23.50MB
12 entries were displayed.
AA16-A400::*> set admin
AA16-A400::>
```

You can use the `system configuration backup settings` commands to manage configuration backup schedules and specify a remote URL (HTTP, HTTPS, FTP, FTPS, or TFTP) where the configuration backup files will be uploaded in addition to the default locations in the cluster.

An example of setting up an automated ONTAP cluster configuration backup upload destination using TFTP is shown below:

```
AA16-A400::> set advanced
Warning: These advanced commands are potentially dangerous; use them only when directed to do so by NetApp
personnel.
Do you want to continue? {y|n}: y
AA16-A400::*> system configuration backup setting modify -destination tftp://10.1.156.150/ONTAP
AA16-A400::*> system configuration backup setting show
Backup Destination URL                             Username
-------------------------------------------------- -------------
tftp://10.1.156.150/ONTAP

AA16-A400::*> set admin
AA16-A400::>
```

Procedure 3. VMware VCSA Backup

Note: Basic scheduled backup for the vCenter Server Appliance is available within the native capabilities of the VCSA.

Step 1. Connect to the VCSA Console at **https://<VCSA IP>:5480**.

Step 2. Log in as **root**.

Step 3. Click **Backup** in the list to open the Backup Schedule Dialogue.

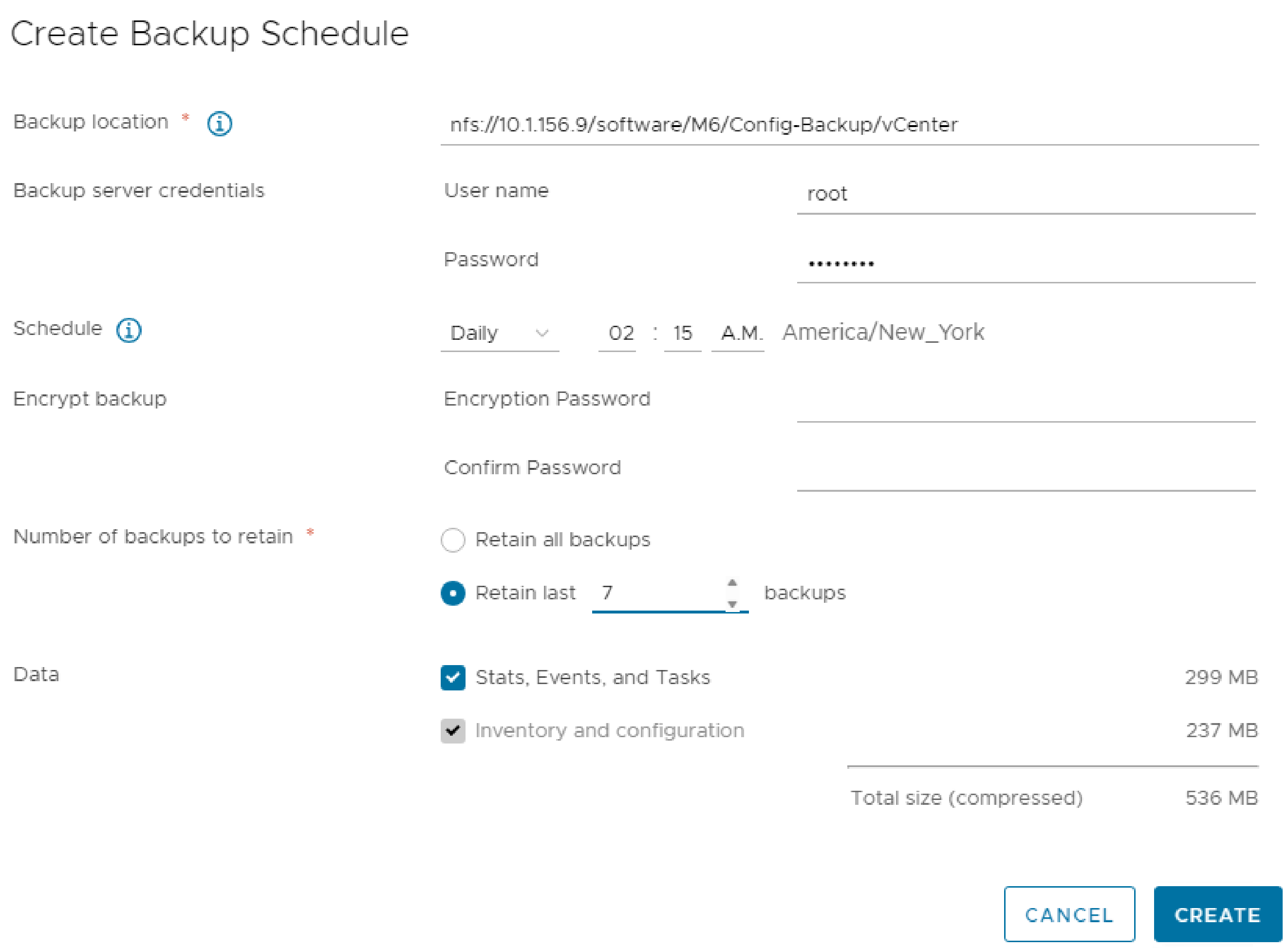
Step 4. To the right of Backup Schedule, click **CONFIGURE**.

Step 5. Specify the following:

a. The Backup location with the protocol to use (FTPS,HTTPS,SFTP,FTP,NFS,SMB, and HTTP)

b. The Username and Password. For the NFS (NFS3) example captured below, the username is root and use a random password because NFSv3 sys security was configured.

c. The Number of backups to retain.



Create Backup Schedule

Backup location * nfs://10.1.156.9/software/M6/Config-Backup/vCenter

Backup server credentials: User name root; Password ••••••••

Schedule: Daily 02 : 15 A.M. America/New_York

Encrypt backup: Encryption Password; Confirm Password

Number of backups to retain *

○ Retain all backups

● Retain last 7 backups

Data

☑ Stats, Events, and Tasks 299 MB

☑ Inventory and configuration 237 MB

Total size (compressed) 536 MB

Step 6. Click **CREATE.**

The Backup Schedule Status should now show **Activated.**

Step 7. To test the backup setup, select **BACKUP NOW** and select "**Use backup location and user name from backup schedule**" to test the backup location. Fill in the password, add an optional Description and click **START**.

Step 8. Restoration can be initiated with the backed-up files using the Restore function of the VCSA 8.0 Installer.

Glossary of Acronyms

AAA–Authentication, Authorization, and Accounting

ACP–Access-Control Policy

ACI–Cisco Application Centric Infrastructure

ACK–Acknowledge or Acknowledgement

ACL–Access-Control List

AD–Microsoft Active Directory

AFI–Address Family Identifier

AMP–Cisco Advanced Malware Protection

AP–Access Point

API–Application Programming Interface

APIC– Cisco Application Policy Infrastructure Controller (ACI)

ASA–Cisco Adaptative Security Appliance

ASM–Any-Source Multicast (PIM)

ASR–Aggregation Services Router

Auto-RP–Cisco Automatic Rendezvous Point protocol (multicast)

AVC–Application Visibility and Control

BFD–Bidirectional Forwarding Detection

BGP–Border Gateway Protocol

BMS–Building Management System

BSR–Bootstrap Router (multicast)

BYOD–Bring Your Own Device

CAPWAP–Control and Provisioning of Wireless Access Points Protocol

CDP–Cisco Discovery Protocol

CEF–Cisco Express Forwarding

CMD–Cisco Meta Data

CPU–Central Processing Unit

CSR–Cloud Services Routers

CTA–Cognitive Threat Analytics

CUWN–Cisco Unified Wireless Network

CVD–Cisco Validated Design

CYOD–Choose Your Own Device

DC–Data Center

DHCP–Dynamic Host Configuration Protocol

DM–Dense-Mode (multicast)

DMVPN–Dynamic Multipoint Virtual Private Network

DMZ–Demilitarized Zone (firewall/networking construct)

DNA–Cisco Digital Network Architecture

DNS–Domain Name System

DORA–Discover, Offer, Request, ACK (DHCP Process)

DWDM–Dense Wavelength Division Multiplexing

ECMP–Equal Cost Multi Path

EID–Endpoint Identifier

EIGRP–Enhanced Interior Gateway Routing Protocol

EMI–Electromagnetic Interference

ETR–Egress Tunnel Router (LISP)

EVPN–Ethernet Virtual Private Network (BGP EVPN with VXLAN data plane)

FHR–First-Hop Router (multicast)

FHRP–First-Hop Redundancy Protocol

FMC–Cisco Firepower Management Center

FTD–Cisco Firepower Threat Defense

GBAC–Group-Based Access Control

GbE–Gigabit Ethernet

Gbit/s–Gigabits Per Second (interface/port speed reference)

GRE–Generic Routing Encapsulation

GRT–Global Routing Table

HA–High-Availability

HQ–Headquarters

HSRP–Cisco Hot-Standby Routing Protocol

HTDB–Host-tracking Database (SD-Access control plane node construct)

IBNS–Identity-Based Networking Services (IBNS 2.0 is the current version)

ICMP– Internet Control Message Protocol

IDF–Intermediate Distribution Frame; essentially a wiring closet.

IEEE–Institute of Electrical and Electronics Engineers

IETF–Internet Engineering Task Force

IGP–Interior Gateway Protocol

IID–Instance-ID (LISP)

IOE–Internet of Everything

IoT–Internet of Things

IP–Internet Protocol

IPAM–IP Address Management

IPS–Intrusion Prevention System

IPSec—Internet Protocol Security

ISE—Cisco Identity Services Engine

ISR—Integrated Services Router

IS-IS—Intermediate System to Intermediate System routing protocol

ITR—Ingress Tunnel Router (LISP)

LACP—Link Aggregation Control Protocol

LAG—Link Aggregation Group

LAN—Local Area Network

L2 VNI—Layer 2 Virtual Network Identifier; as used in SD-Access Fabric, a VLAN.

L3 VNI— Layer 3 Virtual Network Identifier; as used in SD-Access Fabric, a VRF.

LHR—Last-Hop Router (multicast)

LISP—Location Identifier Separation Protocol

MAC—Media Access Control Address (OSI Layer 2 Address)

MAN—Metro Area Network

MEC—Multichassis EtherChannel, sometimes referenced as ***MCEC***

MDF—Main Distribution Frame; essentially the central wiring point of the network.

MnT—Monitoring and Troubleshooting Node (Cisco ISE persona)

MOH—Music on Hold

MPLS—Multiprotocol Label Switching

MR—Map-resolver (LISP)

MS—Map-server (LISP)

MSDP—Multicast Source Discovery Protocol (multicast)

MTU—Maximum Transmission Unit

NAC—Network Access Control

NAD—Network Access Device

NAT—Network Address Translation

NBAR—Cisco Network-Based Application Recognition (NBAR2 is the current version).

NFV—Network Functions Virtualization

NSF—Non-Stop Forwarding

OSI—Open Systems Interconnection model

OSPF—Open Shortest Path First routing protocol

OT—Operational Technology

PAgP—Port Aggregation Protocol

PAN—Primary Administration Node (Cisco ISE persona)

PCI DSS—Payment Card Industry Data Security Standard

PD—Powered Devices (PoE)

PETR—Proxy-Egress Tunnel Router (LISP)

PIM—Protocol-Independent Multicast

PITR—Proxy-Ingress Tunnel Router (LISP)

PnP—Plug-n-Play

PoE—Power over Ethernet (Generic term, may also refer to IEEE 802.3af, 15.4W at PSE)

PoE+—Power over Ethernet Plus (IEEE 802.3at, 30W at PSE)

PSE—Power Sourcing Equipment (PoE)

PSN—Policy Service Node (Cisco ISE persona)

pxGrid—Platform Exchange Grid (Cisco ISE persona and publisher/subscriber service)

PxTR—Proxy-Tunnel Router (LISP - device operating as both a PETR and PITR)

QoS—Quality of Service

RADIUS—Remote Authentication Dial-In User Service

REST—Representational State Transfer

RFC—Request for Comments Document (IETF)

RIB—Routing Information Base

RLOC—Routing Locator (LISP)

RP—Rendezvous Point (multicast)

RP—Redundancy Port (WLC)

RP—Route Processer

RPF—Reverse Path Forwarding

RR—Route Reflector (BGP)

RTT—Round-Trip Time

SA—Source Active (multicast)

SAFI—Subsequent Address Family Identifiers (BGP)

SD—Software-Defined

SDA—Cisco Software Defined-Access

SDN—Software-Defined Networking

SFP—Small Form-Factor Pluggable (1 GbE transceiver)

SFP+– Small Form-Factor Pluggable (10 GbE transceiver)

SGACL–Security-Group ACL

SGT–Scalable Group Tag, sometimes reference as Security Group Tag

SM–Spare-mode (multicast)

SNMP–Simple Network Management Protocol

SSID–Service Set Identifier (wireless)

SSM–Source-Specific Multicast (PIM)

SSO–Stateful Switchover

STP–Spanning-tree protocol

SVI–Switched Virtual Interface

SVL–Cisco StackWise Virtual

SWIM–Software Image Management

SXP–Scalable Group Tag Exchange Protocol

Syslog–System Logging Protocol

TACACS+–Terminal Access Controller Access-Control System Plus

TCP–Transmission Control Protocol (OSI Layer 4)

UCS– Cisco Unified Computing System

UDP–User Datagram Protocol (OSI Layer 4)

UPoE–Cisco Universal Power Over Ethernet (60W at PSE)

UPoE+– Cisco Universal Power Over Ethernet Plus (90W at PSE)

URL–Uniform Resource Locator

VLAN–Virtual Local Area Network

VM—Virtual Machine

VN–Virtual Network, analogous to a VRF in SD-Access

VNI–Virtual Network Identifier (VXLAN)

vPC–virtual Port Channel (Cisco Nexus)

VPLS–Virtual Private LAN Service

VPN–Virtual Private Network

VPNv4–BGP address family that consists of a Route-Distinguisher (RD) prepended to an IPv4 prefix

VPWS–Virtual Private Wire Service

VRF–Virtual Routing and Forwarding

VSL–Virtual Switch Link (Cisco VSS component)

VSS–Cisco Virtual Switching System

VXLAN–Virtual Extensible LAN

WAN–Wide-Area Network

WLAN–Wireless Local Area Network (generally synonymous with IEEE 802.11-based networks)

WoL–Wake-on-LAN

xTR–Tunnel Router (LISP - device operating as both an ETR and ITR)

Glossary of Terms

This glossary addresses some terms used in this document, for the purposes of aiding understanding. This is not a complete list of all multicloud terminology. Some Cisco product links are supplied here also, where considered useful for the purposes of clarity, but this is by no means intended to be a complete list of all applicable Cisco products.

aaS/XaaS **(IT capability provided as a Service)**	Some IT capability, X, provided as a service (XaaS). Some benefits are: • The provider manages the design, implementation, deployment, upgrades, resiliency, scalability, and overall delivery of the service and the infrastructure that supports it. • There are very low barriers to entry, so that services can be quickly adopted and dropped in response to business demand, without the penalty of inefficiently utilized CapEx. • The service charge is an IT OpEx cost (pay-as-you-go), whereas the CapEx and the service infrastructure is the responsibility of the provider. • Costs are commensurate to usage and hence more easily controlled with respect to business demand and outcomes. Such services are typically implemented as “microservices,” which are accessed via REST APIs. This architectural style supports composition of service components into systems. Access to and management of aaS assets is via a web GUI and/or APIs, such that Infrastructure-as-code (IaC) techniques can be used for automation, for example, Ansible and Terraform. The provider can be any entity capable of implementing an aaS “cloud-native” architecture. The cloud-native architecture concept is well-documented and supported by open-source software and a rich ecosystem of services such as training and consultancy. The provider can be an internal IT department or any of many third-party companies using and supporting the same open-source platforms. Service access control, integrated with corporate IAM, can be mapped to specific users and business activities, enabling consistent policy controls across services, wherever they are delivered from.
Ansible	An infrastructure automation tool, used to implement processes for instantiating and configuring IT service components, such as VMs on an IaaS platform. Supports the consistent execution of processes defined in YAML “playbooks” at scale, across multiple targets. Because the Ansible artefacts (playbooks) are text-based, they can be stored in a Source Code Management (SCM) system, such as GitHub. This allows for software development like processes to be applied to infrastructure automation, such as, Infrastructure-as-code (see IaC below). https://www.ansible.com
AWS **(Amazon Web Services)**	Provider of IaaS and PaaS. https://aws.amazon.com
Azure	Microsoft IaaS and PaaS.

	https://azure.microsoft.com/en-gb/
Co-located data center	“A colocation center (CoLo)...is a type of data center where equipment, space, and bandwidth are available for rental to retail customers. Colocation facilities provide space, power, cooling, and physical security for the server, storage, and networking equipment of other firms and also connect them to a variety of telecommunications and network service providers with a minimum of cost and complexity.” https://en.wikipedia.org/wiki/Colocation_centre

Containers **(Docker)**	A (Docker) container is a means to create a package of code for an application and its dependencies, such that the application can run on different platforms which support the Docker environment. In the context of aaS, microservices are typically packaged within Linux containers orchestrated by Kubernetes (K8s). https://www.docker.com https://www.cisco.com/c/en/us/products/cloud-systems-management/containerplatform/index.html
DevOps	The underlying principle of DevOps is that the application development and operations teams should work closely together, ideally within the context of a toolchain that automates the stages of development, test, deployment, monitoring, and issue handling. DevOps is closely aligned with IaC, continuous integration and deployment (CI/CD), and Agile software development practices. https://en.wikipedia.org/wiki/DevOps https://en.wikipedia.org/wiki/CI/CD
Edge compute	Edge compute is the idea that it can be more efficient to process data at the edge of a network, close to the endpoints that originate that data, or to provide virtualized access services, such as at the network edge. This could be for reasons related to low latency response, reduction of the amount of unprocessed data being transported, efficiency of resource utilization, and so on. The generic label for this is Multi-access Edge Computing (MEC), or Mobile Edge Computing for mobile networks specifically. From an application experience perspective, it is important to be able to utilize, at the edge, the same operations model, processes, and tools used for any other compute node in the system. https://en.wikipedia.org/wiki/Mobile_edge_computing
IaaS **(Infrastructure as-a-Service)**	Infrastructure components provided aaS, located in data centers operated by a provider, typically accessed over the public Internet. IaaS provides a base platform for the deployment of workloads, typically with containers and Kubernetes (K8s).
IaC **(Infrastructure as-Code)**	Given the ability to automate aaS via APIs, the implementation of the automation is typically via Python code, Ansible playbooks, and similar. These automation artefacts are programming code that define how the services are consumed. As such, they can be subject to the same code management and software development regimes as any other body of code. This means that infrastructure automation can be subject to all of the quality and consistency benefits, CI/CD, traceability, automated testing, compliance checking, and so on, that could be applied to any coding project. https://en.wikipedia.org/wiki/Infrastructure_as_code
IAM **(Identity and Access Management)**	IAM is the means to control access to IT resources so that only those explicitly authorized to access given resources can do so. IAM is an essential foundation to a secure multicloud environment. https://en.wikipedia.org/wiki/Identity_management
IBM **(Cloud)**	IBM IaaS and PaaS. https://www.ibm.com/cloud
Intersight	Cisco Intersight™ is a Software-as-a-Service (SaaS) infrastructure lifecycle management platform that delivers simplified configuration, deployment, maintenance, and support. https://www.cisco.com/c/en/us/products/servers-unified-computing/intersight/index.html

GCP **(Google Cloud Platform)**	Google IaaS and PaaS. https://cloud.google.com/gcp
Kubernetes **(K8s)**	Kubernetes is an open-source system for automating deployment, scaling, and management of containerized applications. https://kubernetes.io
Microservices	A microservices architecture is characterized by processes implementing fine-grained services, typically exposed via REST APIs and which can be composed into systems. The processes are often container-based, and the instantiation of the services often managed with Kubernetes. Microservices managed in this way are intrinsically well suited for deployment into IaaS environments, and as such, are the basis of a cloud native architecture. https://en.wikipedia.org/wiki/Microservices
PaaS **(Platform-as-a-Service)**	PaaS is a layer of value-add services, typically for application development, deployment, monitoring, and general lifecycle management. The use of IaC with IaaS and PaaS is very closely associated with DevOps practices.
Private on-premises data center	A data center infrastructure housed within an environment owned by a given enterprise is distinguished from other forms of data center, with the implication that the private data center is more secure, given that access is restricted to those authorized by the enterprise. Thus, circumstances can arise where very sensitive IT assets are only deployed in a private data center, in contrast to using public IaaS. For many intents and purposes, the underlying technology can be identical, allowing for hybrid deployments where some IT assets are privately deployed but also accessible to other assets in public IaaS. IAM, VPNs, firewalls, and similar are key technologies needed to underpin the security of such an arrangement.
REST API	Representational State Transfer (REST) APIs is a generic term for APIs accessed over HTTP(S), typically transporting data encoded in JSON or XML. REST APIs have the advantage that they support distributed systems, communicating over HTTP, which is a well-understood protocol from a security management perspective. REST APIs are another element of a cloud-native applications architecture, alongside microservices. https://en.wikipedia.org/wiki/Representational_state_transfer
SaaS **(Software-as-a-Service)**	End-user applications provided "aaS" over the public Internet, with the underlying software systems and infrastructure owned and managed by the provider.
SAML **(Security Assertion Markup Language)**	Used in the context of Single-Sign-On (SSO) for exchanging authentication and authorization data between an identity provider, typically an IAM system, and a service provider (some form of SaaS). The SAML protocol exchanges XML documents that contain security assertions used by the aaS for access control decisions. https://en.wikipedia.org/wiki/Security_Assertion_Markup_Language
Terraform	An open-source IaC software tool for cloud services, based on declarative configuration files. https://www.terraform.io

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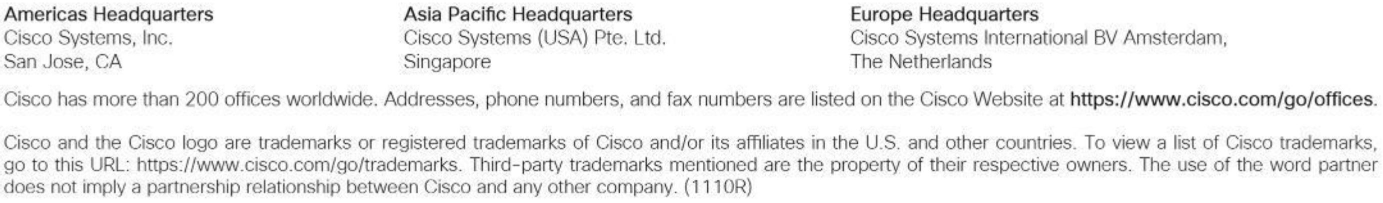

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