Pluribus UNUM™ Management Platform

High Capacity Appliance

Getting Started Guide

Version 6.3.1

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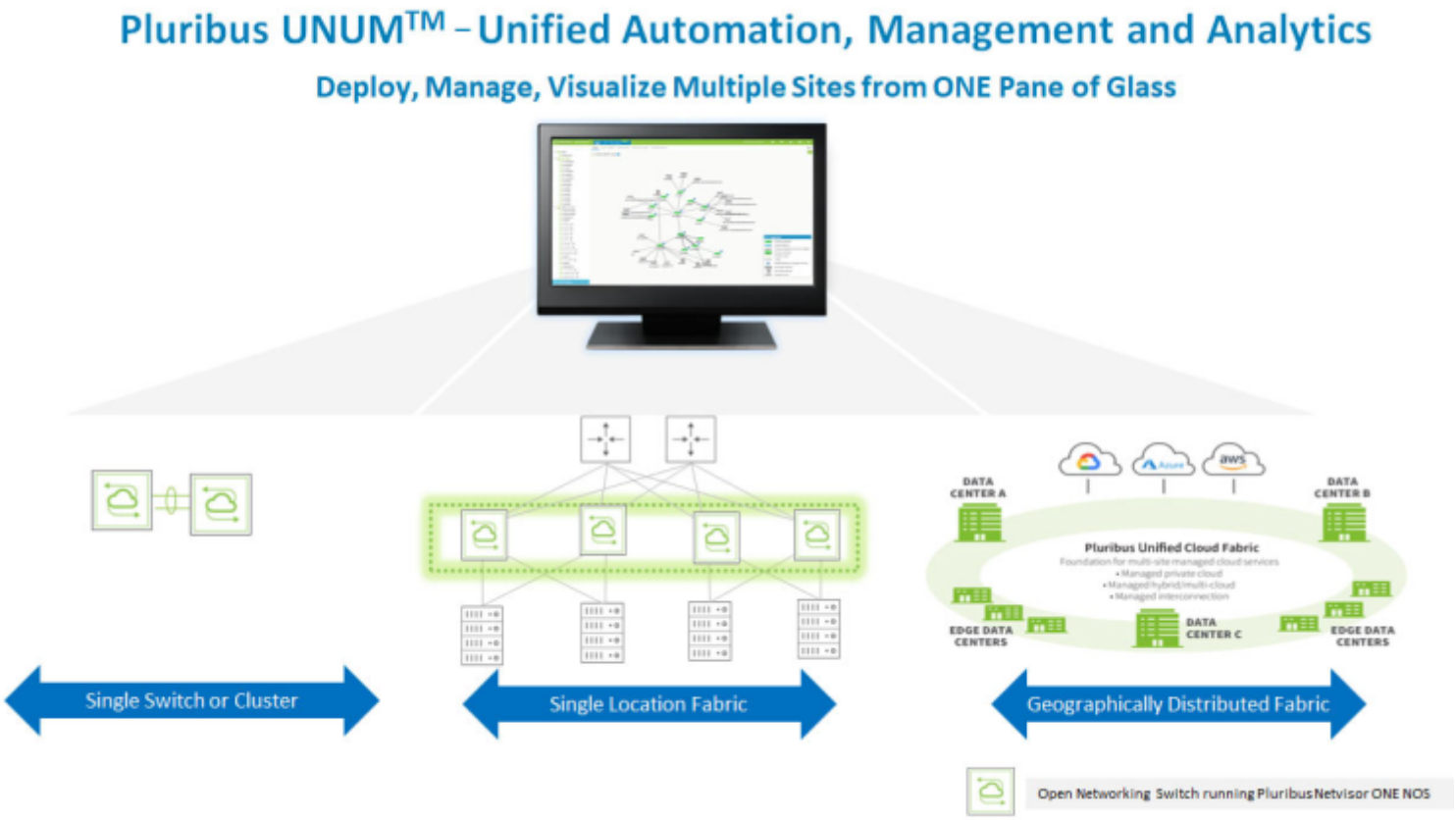
Introduction

Pluribus UNUM™ Unified Management, Automation, and Analytics Platform Software is an application portal developed by Pluribus Networks.

Pluribus UNUM is an agile, multi-functional web management portal that enhances the intrinsic automation of the Unified Cloud Fabric architecture. It combines an elastic big data database and intelligent analytics engine with an intuitive and consistent user interface that allows seamless navigation across fully integrated management and analysis modules.

Pluribus UNUM liberates network operators from the complexity of provisioning and operating a complex network, or groups of networks, by automating the complete network life cycle from implementation to operation and optimization, enabling intent-based network operations with vastly reduced deployment times.



Pluribus UNUM Management Platform

Introduction (cont'd)

UNUM enables the network administrator to extract analytical value from the telemetry data reported by the network switches powered by the Pluribus Networks Netvisor® ONE network operating system.

Once data is collected, UNUM relies upon a modern search engine database infrastructure to store, aggregate, filter, correlate and visualize vast amounts of data in real-time as well as with a powerful time machine functionality.

The Pluribus UNUM portal provides a collection of feature-rich applications that manages and orchestrates the gathering and presentation of network analytics using various types of collectors and reporting software.

The UNUM applications rely primarily on features of the Netvisor ONE, such as vFLOWs, mirrors, and connections statistics, and can also provide analytics in a non-Pluribus environment.

At a high-level, UNUM supports the following deployment scenarios:

- Netvisor ONE as a mirror switch; an out-of-band Pluribus switch is configured as a mirror in either an existing Pluribus-switched network or a non-Pluribus-switched network.
- Netvisor ONE as an inband switch; stats are pulled directly from configured switches such as connections, vports, ports, tunnels and, vflow-stats.
- Collectors gather network analytics and feed data into the UNUM analytics store(s):
    - The Collector uses the vREST API to gather the analytics data from Netvisor.

UNUM manages the following applications:

- **Common Infrastructure** – a centralized portal launches other applications, provides authentication to the corporate directory (using LDAP), and provides configuration of standard settings.
- **Insight Analytics** – this application provides reporting and Search capabilities on data collected from UNUM collectors.
- **Switch Analytics** – Switch Analytics contains a feature-rich set of management tools providing Traffic Monitoring and Notification services with exceptional drill-down capabilities.
- **Fabric Manager** – Fabric Manager contains a feature-rich set of management tools providing configuration tools for Layer 1, Layer 2, and Layer 3 services as well as Security, Monitoring, Analytical, and Service features.

Glossary of UNUM and Netvisor ONE® Terms

To review the Glossary of UNUM and Netvisor ONE® Terms, please refer to to the HTML document.

Specifications

Specifications UNUM High Capacity Appliance

Customers without an ESXi infrastructure or limited compute resources can purchase a Pluribus Networks tested and validated, turnkey appliance with UNUM pre-installed. Simply rack, stack, and power on. UNUM is ready to go.

	UNUM High Capacity Appliance[1]
CPU	32 vCPU (16-core) per server
Memory	256 GB per server
Local SSD	1920 GBper server
Shared NFS SSD	960 GB required for HA
VMWare ESXi Hypervisor	6.7, 7.0
Client Requirements	Google Chrome (Version 44+) Mozilla Firefox (Version 39+)
NIC	Dual 10G Base-T NIC
High Availability (HA)	Yes
Rack Dimensions	1ru Base/Medium, 2ru High Capacity

[1]The High Capacity appliance is four dedicated nodes of the listed specifications.

UNUM High Capacity Appliance Specifications

Software Requirements & Specifications

Specifications provided are operational requirements to use UNUM virtual machines. Values do not include ESXi resource requirements.

	vCPU (cores)	RAM	Storage
UNUM Base Capacity VM [4]	8vCPU (4-core)	64 GB	480 GB SSD
UNUM Base Capacity VM — Archive Viewer [1,3,4]	8vCPU (4-core)	64 GB	480 GB SSD
UNUM Medium Capacity VM[4]	8vCPU (4-core)	64 GB	960 GB SSD
UNUM Medium Capacity VM — Archive Viewer [1,3,4]	8vCPU (4-core)	64 GB	960 GB SSD
UNUM High Capacity VM Cluster [2,4]	Special	Special	Special
UNUM High Capacity VM — Archive Viewer [1,3,4]	Special	Special	Special

[1] UNUM Archiver requires the Archiver license and a shared NFS SSD storage to store daily analytics snapshots.
[2] The High Capacity VM cluster runs on four servers. Direct software download for existing servers is not supported, dedicated hardware needs to be purchased. See the Hardware Requirements and Specifications table.
[3] Customers wishing to use UNUM Archiver will require resources for a second VM (provided with the license).
[4] All UNUM virtual machines require ESXi 6.7.

UNUM Virtual Machines - Software Requirement & Specifications

Specifications (cont'd)

UNUM Fabric Manager Scalability Matrix

	UNUM Base Capacity VM/Appliance	UNUM Medium Capacity VM/Appliance	UNUM High Capacity VM Cluster/Appliance
Maximum Netvisor One Switches	55	55	140
Maximum Adaptive Cloud Fabrics [5]	10	10	10
Maximum Netvisor ONE Switches per Fabric [4]	32	32	128 leafs per super fabric[5]
Syslog Records [1]	Up to 7 Days	Up to 30 Days	Up to 60 Days
Port Stats [2,6]	512	768	1536
Tunnel Stats [2,6,7]	256	384	768
vFlows Stats [2,3,6]	2560	3520	7040

[1] Records storage is a rolling first-in first-out window of both flow (nvFlow) and switch analytics records.
[2] Numbers provided are aggregate values of active stats captured. To get a per switch value of active stats captured, divide the value provided by the total number of switches being managed by UNUM. For example, if the UNUM Base Capacity VM is managing 24 switches total, then 512 / 24 = 21 port stats per switch (rounding down).
[3] Local(switch) vFlows. Divide by number of switches to get fabric level vFlows, for example in an 8-node fabric, 2560 divided by 8 would be 320 fabric wide vFlows.
[4] Maximum fabric size of 32 switches is a Netvisor ONE limitation but is listed here for convenience. UNUM supports a number of fabrics and switches, up to the maximum amount of either switches or fabrics. For example, one fabric of 32 nodes, two fabrics of 24 and 26 nodes, three fabrics of 12, 18, and 20 nodes or five fabrics of 11 nodes each for the UNUM Base Capacity virtual machine.
[5] Super Fabric can manage up to four pods, up to 128 leafs and up to 12 spines. Without super fabric any combination of leafs and spines are supported up to 140 total, 32 nodes maximum per fabric.
[6] Number of simultaneous stats collected every ten seconds.
[7] A Tunnel is a virtual connection between two fabric end points.

UNUM Fabric Manager Scalability

UNUM Insight Analytics Scalability Matrix

	UNUM Base Capacity VM/Appliance	UNUM Medium Capacity VM/Appliance	UNUM High Capacity VM Cluster/Appliance
IA Maximum Records Stored [1,2,3]	100 million	500 million	2 billion
IA Analytics Records, Maximum days [1,3]	Up to 30 Days	Up to 30 Days	Up to 30 Days [4]
IA Peak Ingestion Rate [3]	1000 flows/sec	1000 flows /sec	10,000 flows/sec

[1] Records storage is a rolling first-in first-out window of both flow (nvFlow) and switch analytics records.
[2] Long-term retention of records, up to the value stated (100M, 500M, 2B). Variations based on network traffic can occur.
[3] Ingestion rate will affect the number of days of records are stored. This can vary based on fabric size and traffic patterns.
[4] Busy environments generating more than 1000 flows per second impact the number of days records are stored. If sustained 10,000 flows per second occur, the maximum days of records stored will be reduced to approximately one week. This environment can be mitigated using the UNUM Archiver license and external SSD storage.

Note: All UNUM fabrics are required to have a minimum of one switch with 16 GB of RAM to act as a communication node. Two 16 GB switches will be required if seed switch redundancy is implemented.

UNUM Insight Analytics Scalability

Specifications (cont'd)

UNUM 6.3.0 Licensing

Ordering Information

Pluribus UNUM software is available in three flavors: a BASE virtual machine, a medium capacity virtual machine, and a high-capacity option which can be ordered on an appliance or installed on four Dell RX740 servers. Refer to the Hardware Requirements and Scalability tables for more information on the different UNUM options. See the ordering information below for Pluribus UNUM, Insight Analytics, server appliances, and add-on reports/alerts. Support is ordered separately, and subscription options are available.

Pluribus UNUM Software is available in three options.

- UNUM-LIC — Pluribus UNUM BASE license.
- UNUM-MC-LIC — Pluribus medium-capacity license.
- UNUM-HC-LIC — Pluribus high-capacity license. Requires either the appliance option below or four Dell RX740 servers ordered directly from Dell, as well as professional services for deployment.

Insight Analytics Module License is optionally licensed in addition to the Pluribus UNUM software.

- IA-MOD-LIC — Pluribus Insight Analytics module BASE license. Supports up to 100 million flows.
- IA-MC-MOD-LIC — Pluribus Insight Analytics Medium-Capacity (MC) module license. Supports up to 500 million flows.
- IA-HC-MOD-LIC — Pluribus Insight Analytics High-Capacity (HC) module license. Supports up to 2 billion flows. Cannot be deployed on existing customer hardware – HC server appliance or four Dell RX740 are required.
- IA-SC-MOD-LIC — Introductory, low-cost license for Insight Analytics that will enable the storage of 1 million flows.

UNUM Appliance Hardware

- AP-HC-HW — UNUM high capacity hardware server appliance. Hardware only (software licenses are required) – add to order when a high-capacity appliance is needed. Requires professional services deployment.

Other Optional, add-on UNUM Licenses

- UNUM-RPRT-LIC — Pluribus UNUM add-on reporting license.
- UNUM-ALRT-LIC — Pluribus UNUM add-on e-mail alert license.
- UNUM-ARCHIVER-LIC — Archive daily snapshots capturing Insight & Switch Analytics meta data to an NFS repository (network folder) for long term storage. Includes a second UNUM "viewer" virtual machine so that archived data can be loaded and analyzed.

UNUM Licensing Information

For more information about the Hardware and Specifications and Scalability please refer to the Pluribus UNUM Platform Data Sheet.

Physical Installation

Please refer to “**Server Installation**” section in the Users Manual (MNL-1662). Follow the “Manuals” link at the following location:

https://www.supermicro.com/products/system/2U/2028/SYS-2028TP-HTTR.cfm

Please review and follow all Warnings! outlined in the above documentation.

High Capacity Appliance Hardware Overview

The 2RU Pluribus UNUM High Capacity Appliance is a unique server system. With four system boards incorporated into a single chassis acting as four separate server nodes.

Server Nodes

Each of the four server boards act as a separate server node in the system.

As independent server nodes, each may be powered off and on without affecting the others.

In addition, each server node is a hot-swappable unit that may be removed from the rear of the chassis.

The server nodes are connected to the server back-plane by means of an adapter card.

Note: A guide pin is located between the upper and lower server nodes on the inner chassis wall. This guide pin also acts as a "stop" when a server node is fully installed. If too much force is used when inserting a server node this pin may break off. Take care to slowly slide a server node in until you hear the "click" of the locking tab seating itself.

Each Server node consists of:

Processors

Dual Intel® Xeon® E5-26x series processors.

Memory

Sixteen DIMM slots supporting 256 GB of ECC RDIMM (Registered DIMM) memory.

Serial ATA

A Serial ATA controller is integrated to provide dual 1.2 TB SSD Drives.

Warning: The SATA drives are physically hot-swappable units, however doing so during regular operation results in loss of data in the Pluribus UNUM High Capacity Appliance.

Recommended Procedure: Under normal operation, power down the server node and data redistribute across the nodes, and then the SATA drives can be safely removed without data loss.

Onboard Controllers/Ports

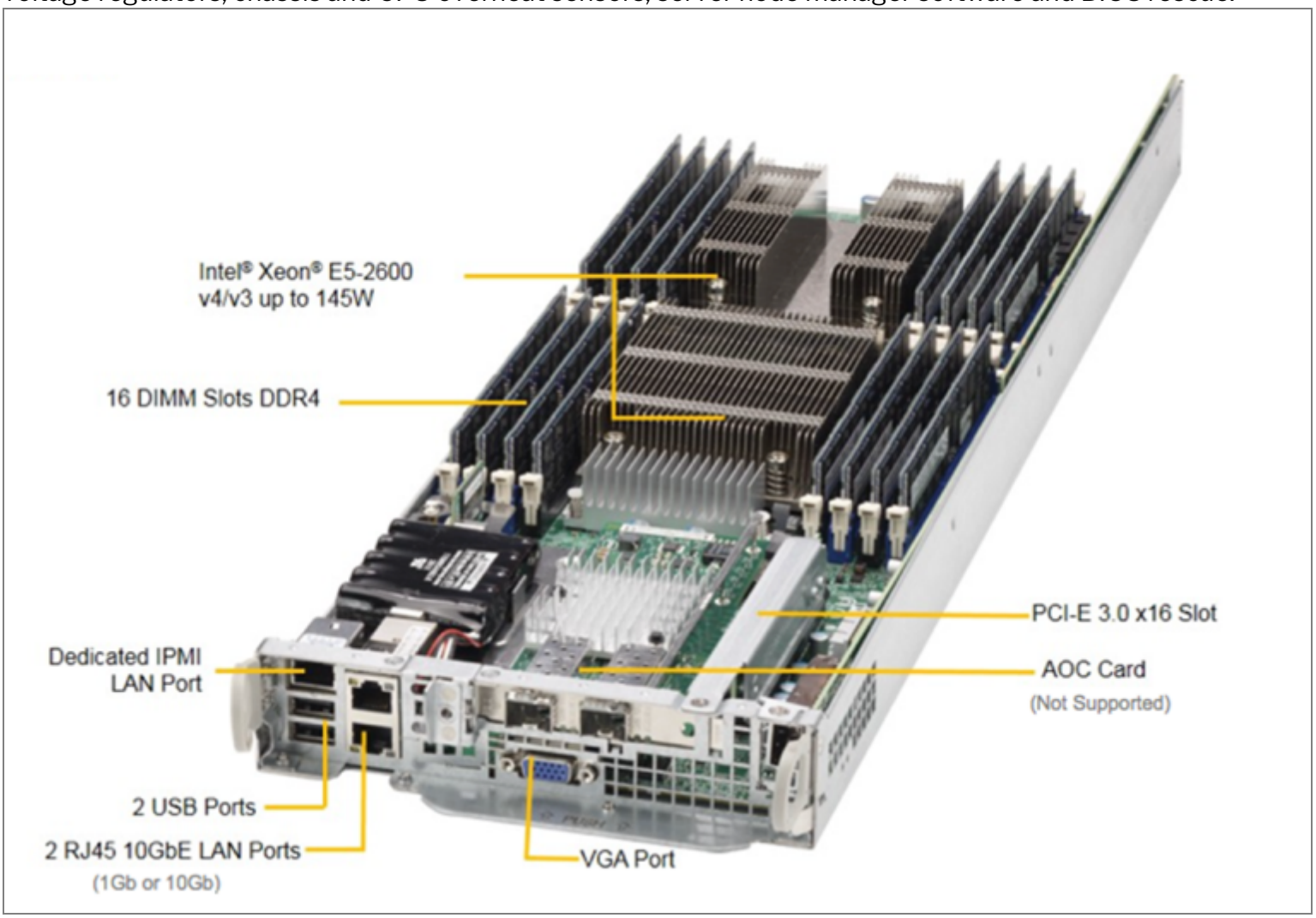
An Intel Gigabit (100/1000/10000 Mb/s) Ethernet dual-channel controller is included. Using an AOC Card not a supported configuration.

I/O ports include a VGA (monitor) port, two USB 3.0 ports, an IPMI dedicated LAN port and two Ethernet ports, Eth0 and Eth1. Eth0 is used for Management, Eth1 is used for internal server node to server node communications.

Eth1 must be isolated from the public network.

Other Features

Other onboard features that promote system health include onboard voltage monitors, auto-switching voltage regulators, chassis and CPU overheat sensors, server node manager software and BIOS rescue.



Server Nodes

Server Chassis Features

The following is a general outline of the main features of the appliance chassis.

System Power

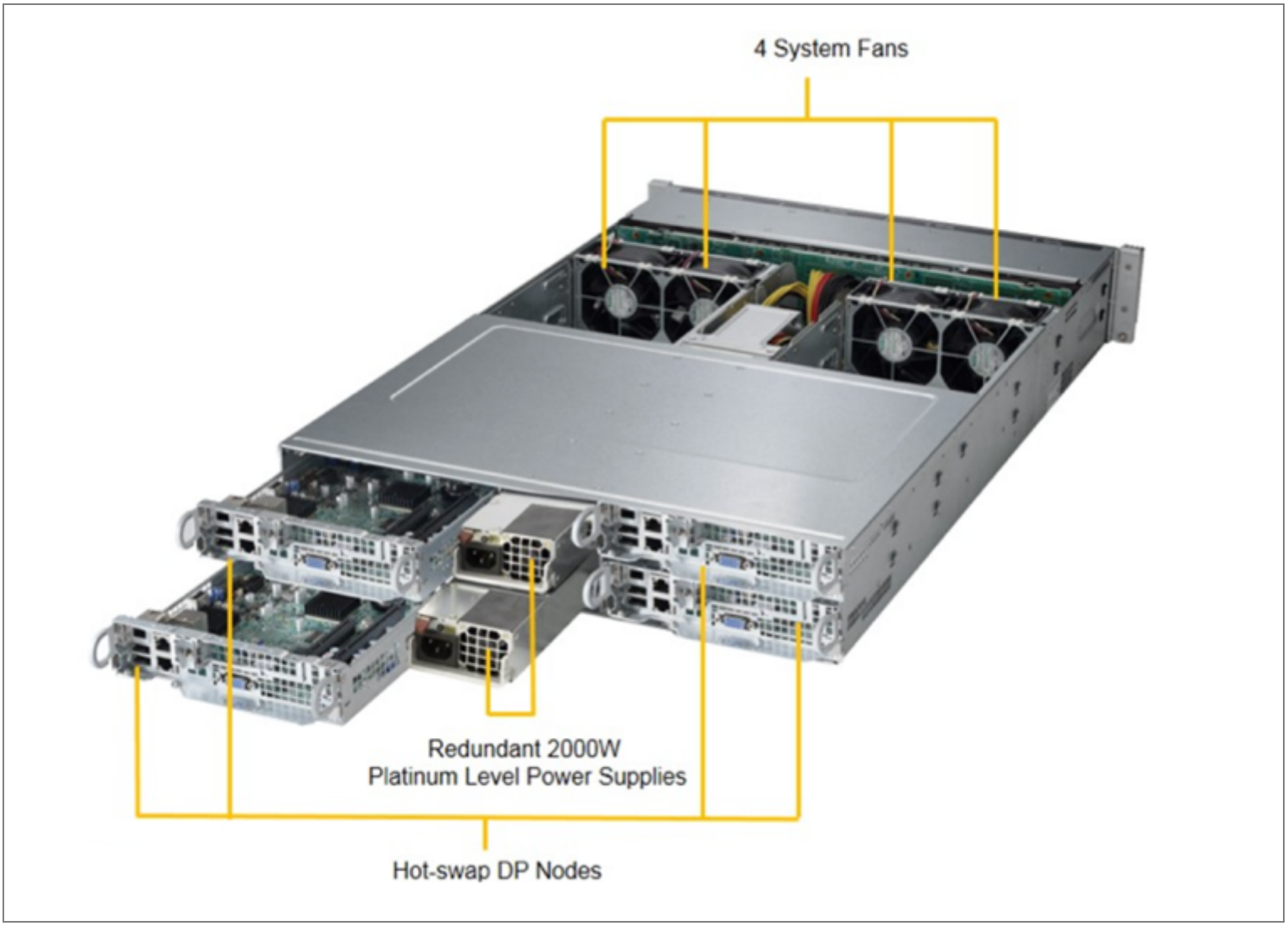
Each chassis model includes redundant, hot-plug high-efficiency 80-plus Platinum certified power supplies, rated at 2000 Watts. In the unlikely event your power supply fails, replacement is simple and can be accomplished without tools. An amber light will be illuminated on the power supply when the power is off. An illuminated green light indicates that the power supply is operating.

Cooling System

The chassis contains four system fans, which are powered from the back-plane.

Mounting Rails

The Pluribus UNUM High Capacity Appliance includes a set of quick-release rails, and can be placed in a rack for secure storage and use. To setup your rack, follow the step-by-step instructions included in the SMCI manual.

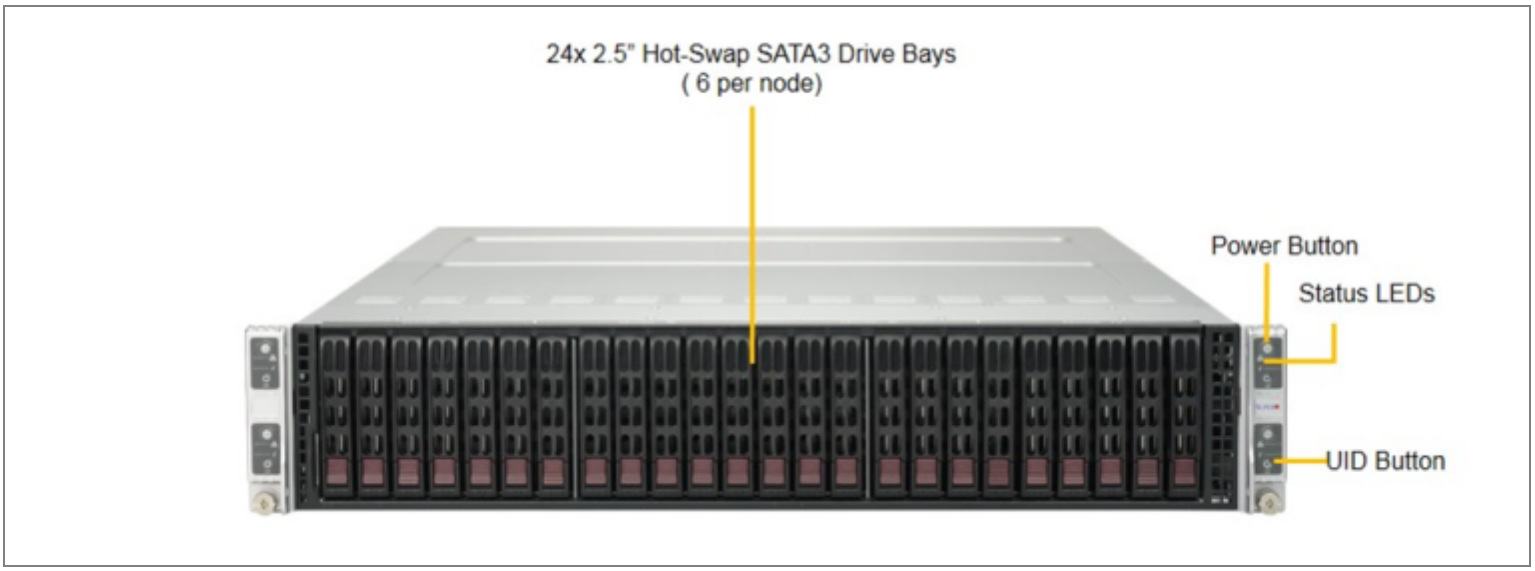


Server Chassis Features

High Capacity Appliance Interface

There are several LEDs on the control panel and on the drive carriers to keep you constantly informed of the overall status of the system.

This chapter explains the meanings of all LED indicators and the appropriate response you may need to take.



LED Indicators

Control Panel Button

Power

The main power button on each of the four control panels is used to apply or remove power from the power supply to each of the four server nodes in the chassis.

The power button has a built-in LED which will turn green when the power is on.

Each of the four server nodes are powered on and off individually.

Powering off one server node does not affect the power of the other server nodes.

Turning power off with this button does not remove power from the chassis, hence caution must be used when servicing.

UID

The UID button is used to turn on or off the blue light function of the LED.
Once the blue light is activated, the unit can be easily located in very large racks and server banks.

Control Panel LEDs

The four control panels are located on the front handle of the chassis.

Each control panel has two additional LEDs.

These LEDs provide you with critical information related to different parts of the system.

This section explains what each LED indicates when illuminated and any corrective action you may need to take.

Alert

This LED is illuminated when an alert condition occurs:

- A solid red light indicates an overheat condition in the system
- A flashing red light which flashes in one second intervals indicates a fan failure
- A flashing red light which flashes in four second intervals indicates a power failure

When notified of an alert, check the routing of the cables and make sure all fans are present and operating normally.

You should also check to make sure that the chassis covers, and air shrouds are installed.

This LED will remain flashing or on as long as the temperature is too high, or a fan does not function properly.

NIC

Indicates network activity on either LAN1 or LAN2 when flashing.

Drive Carrier LEDs

SATA Drives

Each drive carrier has two LEDs.

- Blue: When illuminated, this blue LED (on the front of the drive carrier) indicates drive activity. A connection to the back-plane enables this LED to blink on and off when that drive is being accessed
- Red: The red LED to indicate a hard drive failure.

High Capacity Appliance Network Interface

After installation of the Pluribus UNUM High Capacity Appliance, network activity must be setup as follows (please refer to the figure below for proper connections):

1. For proper operation the Pluribus UNUM High Capacity Appliance requires a separate 1G or 10G switch for connectivity between eth1 on all Server nodes.

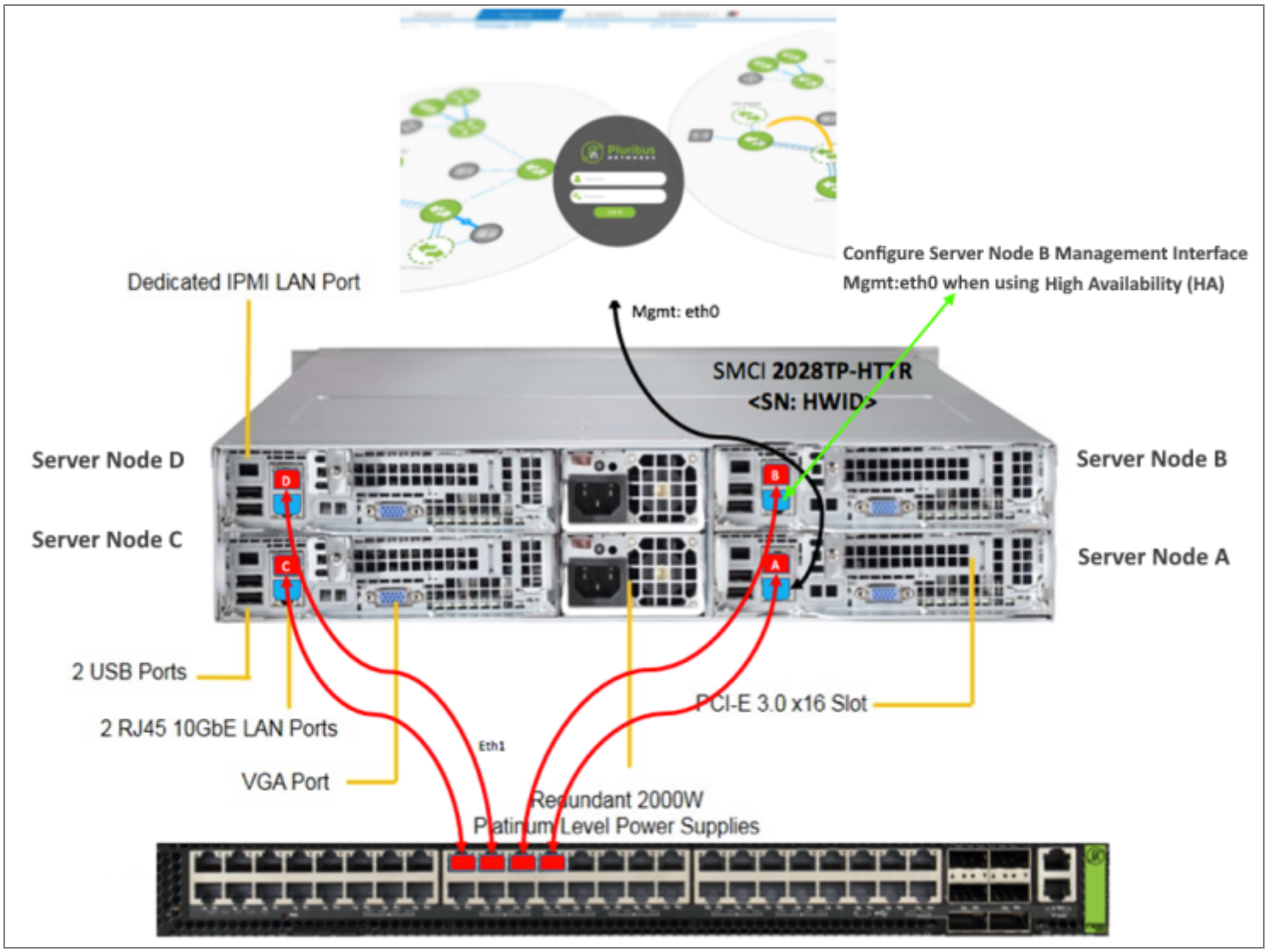
2. Connect your Management Network to Eth0 (1G or 10G) on Server node A. By default, Server node A (Host) is configured for DHCP. To set a static IP, see Appendix A.

3. It is required to connect Eth1 into an isolated 1G or 10G switch. Server nodes will communicate via Eth1, with the following IP Addresses:

    a. `172.16.250.150 - 172.16.250.162`

4. Plug in redundant power connections with the provided cables ONLY and power up.

High Capacity Appliance Network Interface (cont'd)



Network Connections

High Capacity Appliance Network Interface (cont'd)

NOTE: Eth1 connections are not configured on a VLAN, please contact Pluribus Technical support if one of the following must occur:

- More than one Pluribus UNUM High Capacity Appliance plugged into the same switch (by default, all appliances come with the same pre-configured Eth1 IP addresses), and each Appliance isolated in a separate and dedicated VLAN.
- You want to change the default Eth1 IP Addresses of: `172.16.250.150 - 172.16.250.162`.

5. Connect VGA console and IPMI as desired. IPMI default configuration is DHCP.
6. USB connections are not advised.
7. The Pluribus UNUM High Capacity Appliance, comes with the Pluribus UNUM software pre-installed.
8. Upon boot up, by default Pluribus UNUM will use DHCP to obtain a Management / eth0 IP address. If a Static IP is desired, see Appendix B.
9. It is highly recommended that the default root password of your Server nodes be changed from test123.

NOTE: It is required that all Server nodes have the same root password.

To change the root password of your Server nodes, you can do the following:

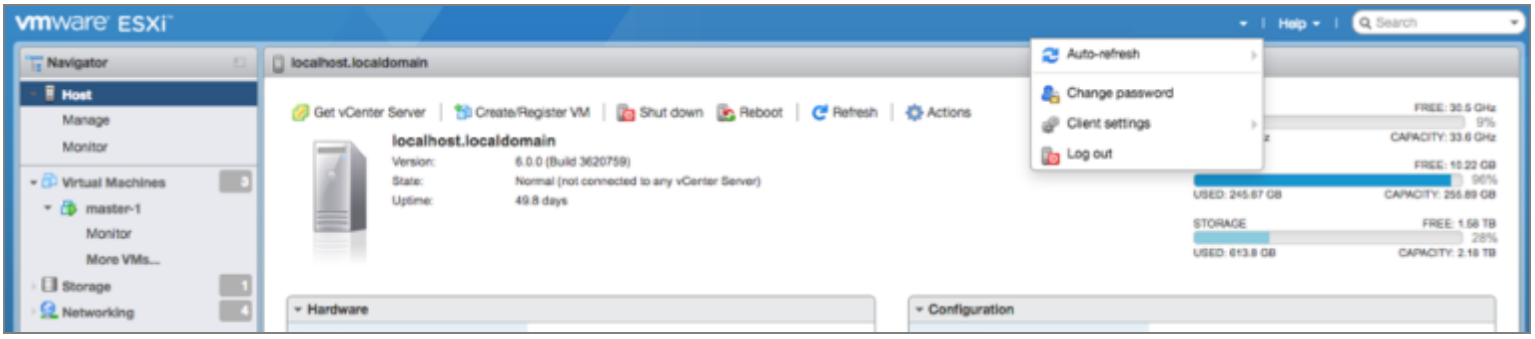
Network Connections (cont'd)

Log onto each Server node as root using the ESXi web client (or vSphere client if you have access):

VMware Welcome Screen

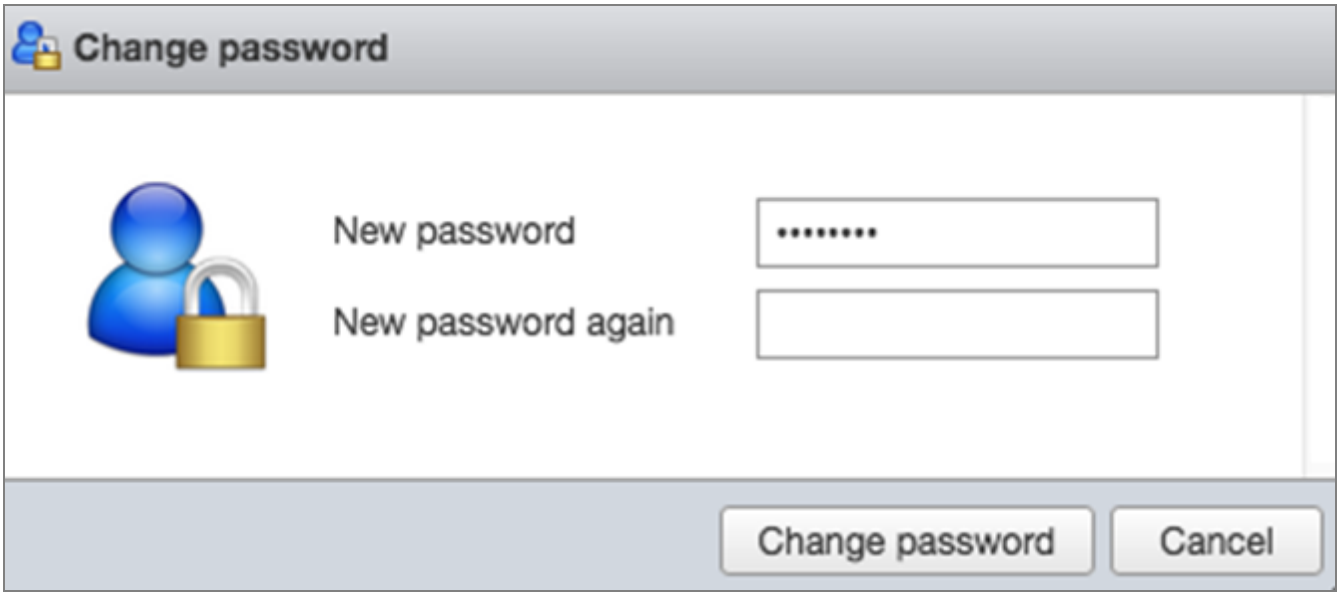
Network Connections (cont'd)

Select “Change Password”



VMware Change Password Dashboard

Enter New Password:



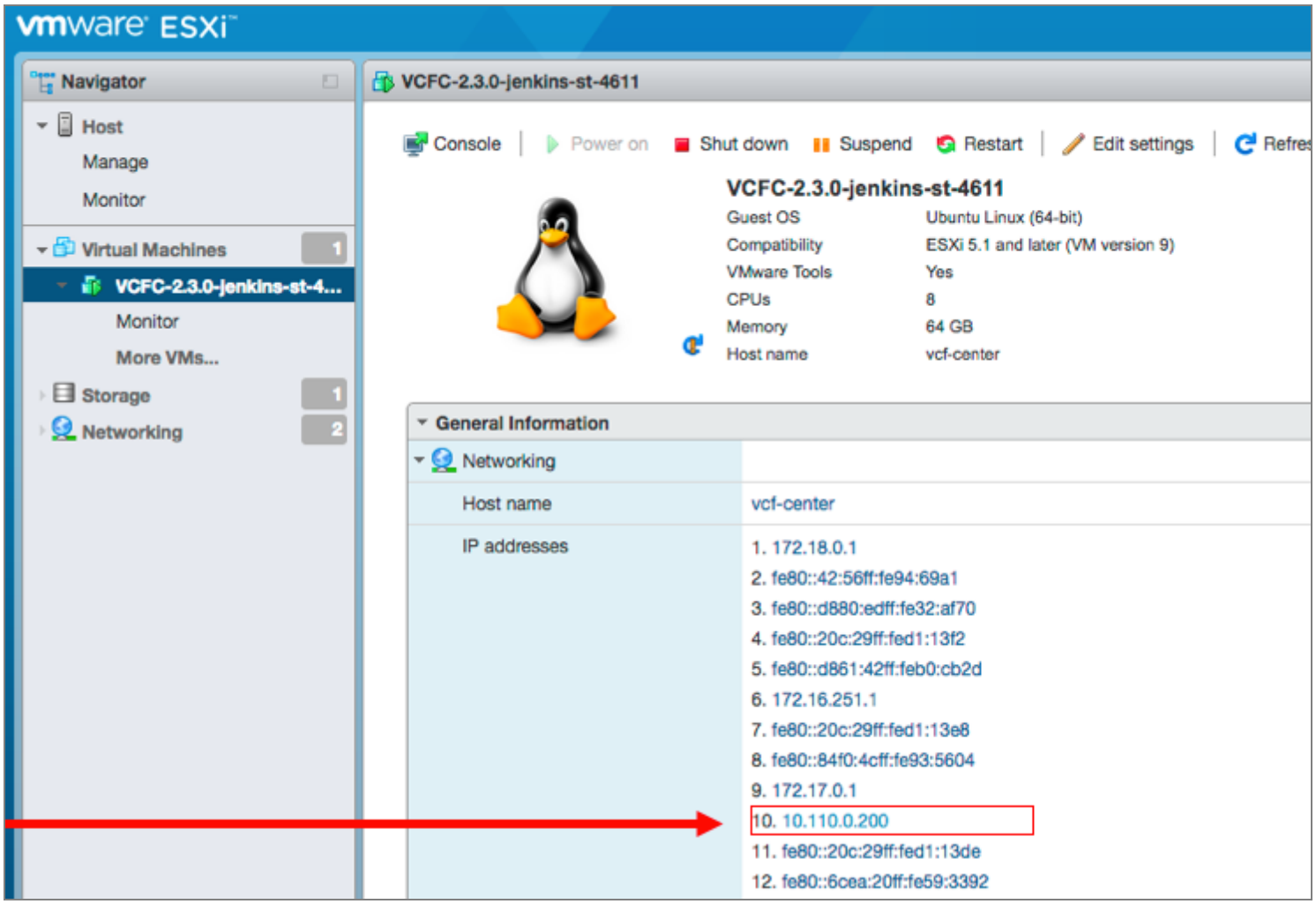
VMware Change Password

Network Connections (cont'd)

IMPORTANT: Repeat for each Server node, root passwords must be the same on each.

10. The Primary Server Node A, runs the Pluribus UNUM Web Interface.

    You can find the IP of your Pluribus UNUM Primary VM via the ESXi web client (or vSphere client if you have access), log in with the your newly set root password:



Pluribus UNUM Primary VM

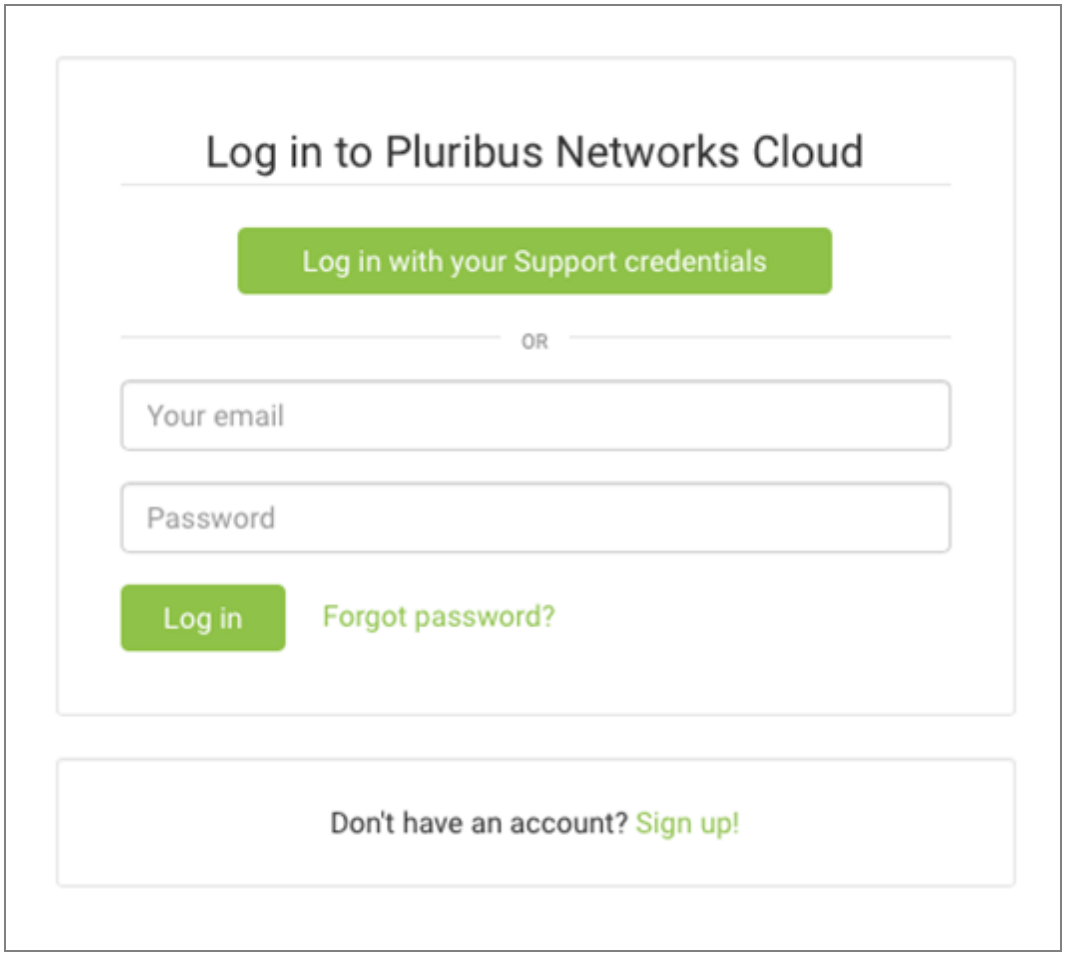
    In the above example, you will see the IP from your DHCP server, in this case it is “10.x.x.x”, but the actual IP will depend on your DHCP configurations.

11. Once you obtain the IP of your Pluribus UNUM, use a Chrome browser to connect for the best experience.

Network Connections (cont'd)

12. Please refer to the Pluribus UNUM Installation & User's Guide for SW configuration and current Release Notes for configuration and operating instructions:

    a. These documents can be found at: https://www.pluribusnetworks.com/get-started/unum



Pluribus Networks Cloud Login Screen

> **NOTE:** All content of the Installation & User's Guide is applicable to both the Pluribus UNUM Standalone VM as well as the Pluribus UNUM High Capacity Appliance unless otherwise noted. There is no need to download the OVA software as it comes pre-installed on the High-Capacity Appliance.

The software upgrade procedure is the same for both the Standalone VM/Appliance and the High Capacity Appliance.

If supported between two compatible versions, upgrade software can also be obtained from: https://www.pluribusnetworks.com/get-started/unum

Configuring UNUM to use VMware vSphere High Availability (HA)

> **Note:** Appropriate VMware licensing required when using vSphere HA. VMware vSphere Enterprise licensing recommended.

To fully utilize high availability for your UNUM instance, the general configuration process is as follows:

- Create a DataCenter on the VMware vCenter, if a datacenter does not currently exist.
- Create a VMWare Cluster.
- Create a shared Datastore.
- Migrate the primary UNUM instance.
- Configure HA on the cluster.
- Validate the configuration in VMware and UNUM Database Health.

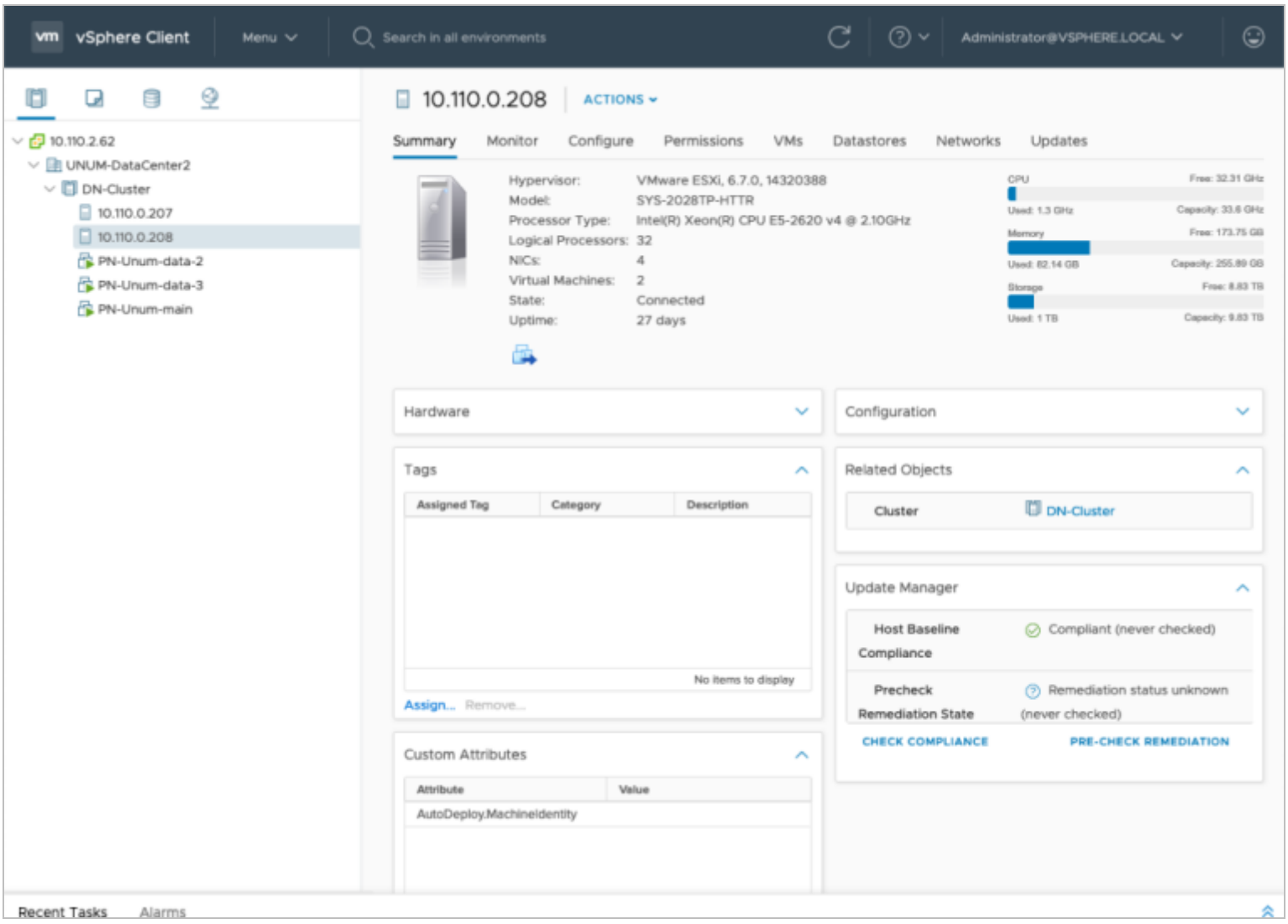
More detailed instructions are listed below in the Configure High Availability section.

The following series of illustrations are examples of a fully configured UNUM HA instance and using UNUM to monitor cluster health.

High Availability (cont'd)

Summary

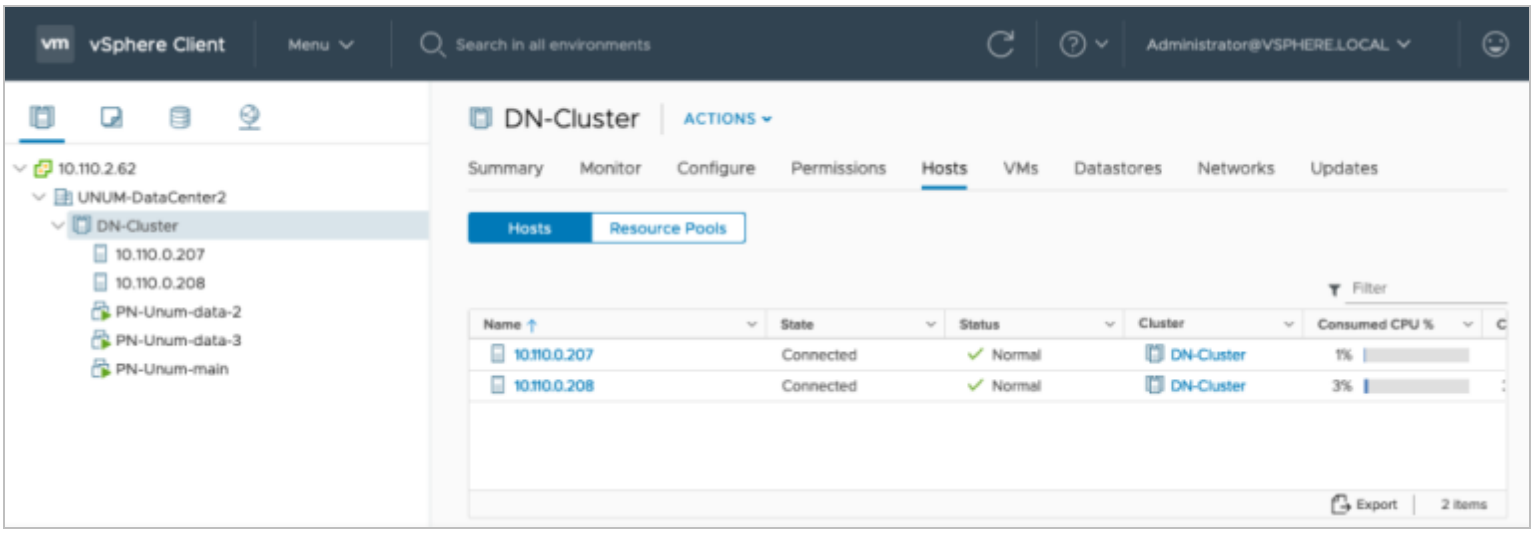
- **ESXi Server Node A** - configured on IP address 10.110.0.207.
- **ESXi Server Node B** - configured on IP Address 10.110.0.208.
- **PN-Unum-main** - UNUM application instance running on Node A and fails over to Node B as necessary.
- **PN-Unum-data-2** - UNUM datanode residing on local datastore on Node A.
- **PN-Unum-data-3** - UNUM datastore residing on local datastore on Node B.



Fully Configured High Availability UNUM Instance

DN Cluster ESXi Hosts

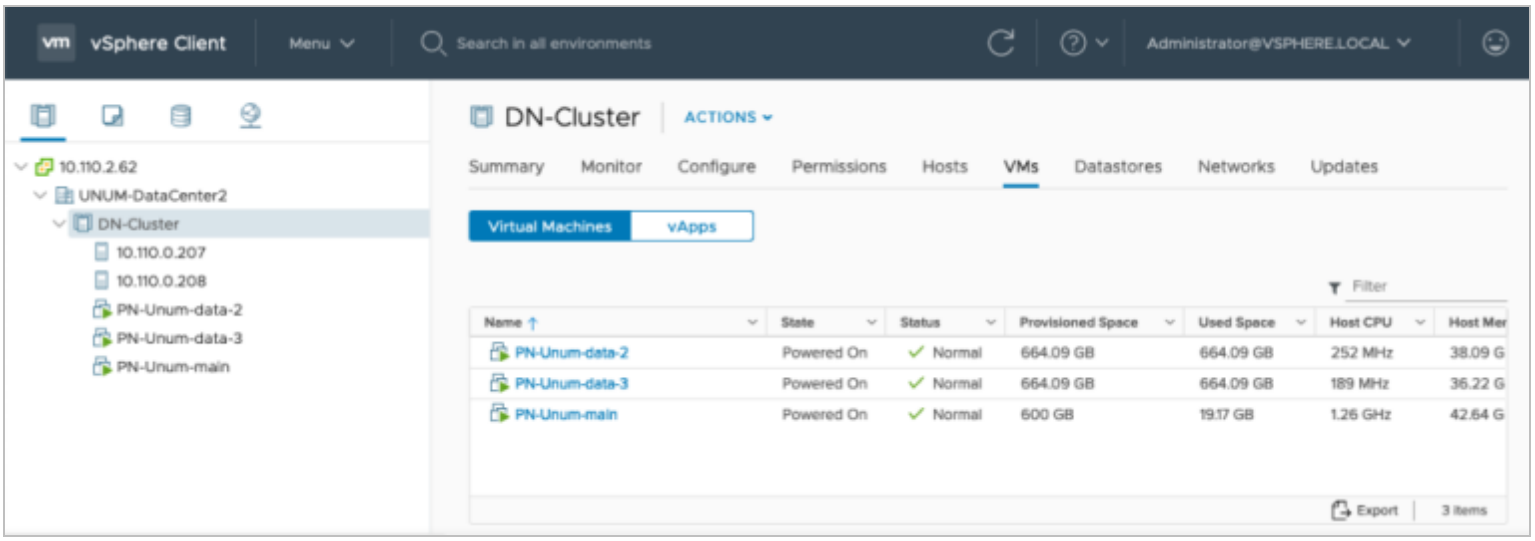
- **ESXi Server Node A** - configured on IP address 10.110.0.207
- **ESXi Server Node B** - configured on IP Address 10.110.0.208



Fully Configured High Availability UNUM Instance - Hosts

DN Cluster Virtual Machines

- **PN-Unum-main** - UNUM application instance running on Node A and fails over to Node B as necessary.
- **PN-Unum-data-2** - UNUM datanode residing on local datastore on Node A.
- **PN-Unum-data-3** - UNUM datastore residing on local datastore on Node B.



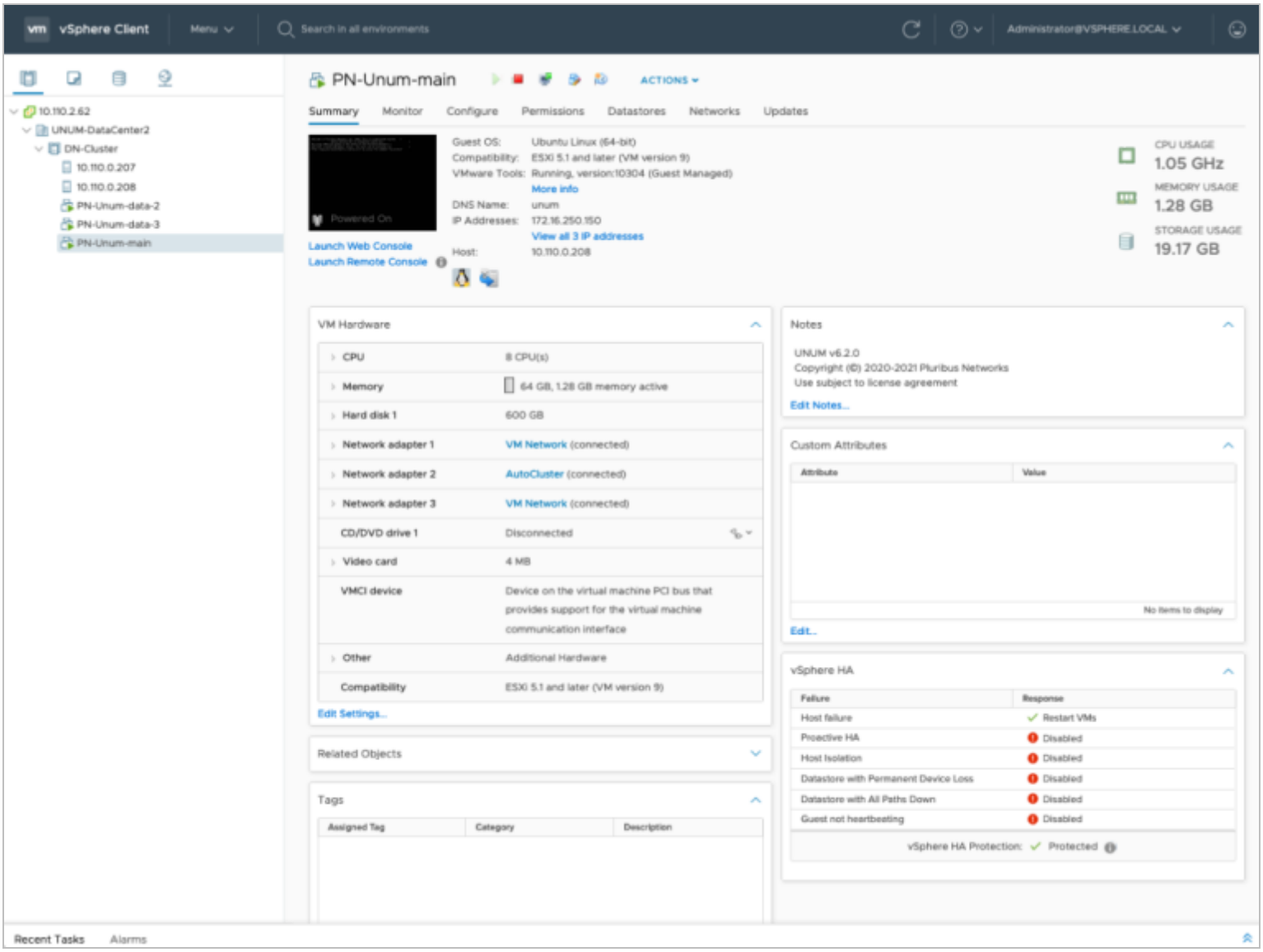
Fully Configured High Availability UNUM Instance - Virtual Machines

High Availability (cont'd)

UNUM Instance

The PN-Unum-main shown currently running on ESXi instance 10.110.0.208 and in vSphere HA protection mode (High Availability).

Should this instance go down or offline the UNUM application switches over to run on ESXi instance 10.110.0.207.

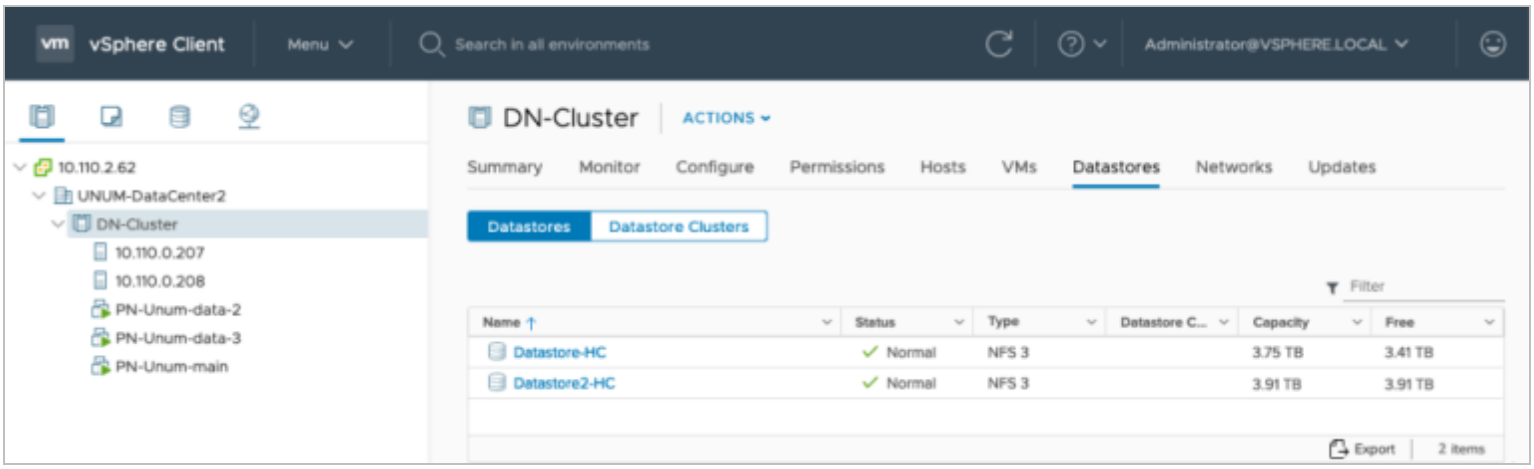


Fully Configured High Availability UNUM Instance - vSphere HA Protection Mode

High Availability (cont'd)

Datastores

- **Datastore-HC** - shared instance used by UNUM HA and VMware Heartbeat.
- **Datastore2-HC** - shared instance used for VMware Heartbeat.



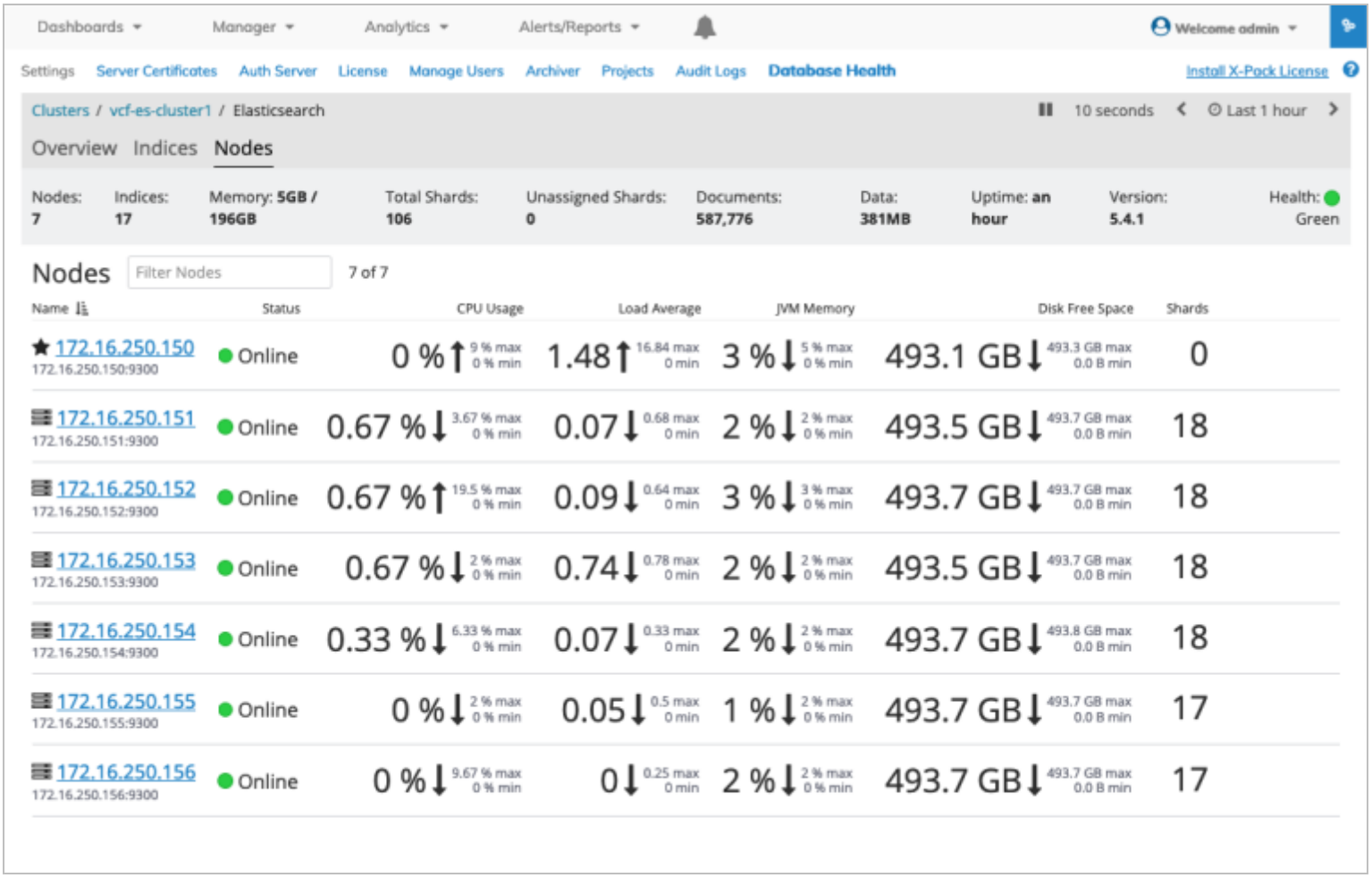
Fully Configured High Availability UNUM Instance - Redundant Datastores

High Availability (cont'd)

UNUM Database Health

In UNUM, **Settings** → **Database** → **Health**.

- **172.16.250.150** represents the health of the UNUM primary instance.
- **172.16.250.151 - .156** represent the health of the UNUM datanodes. The datanodes for **Nodes A & B** appear in the vCenter dashboard and all datanodes appear in the UNUM Database Health.



Fully Configured High Availability UNUM Instance - Database Health

Configure High Availability (HA)

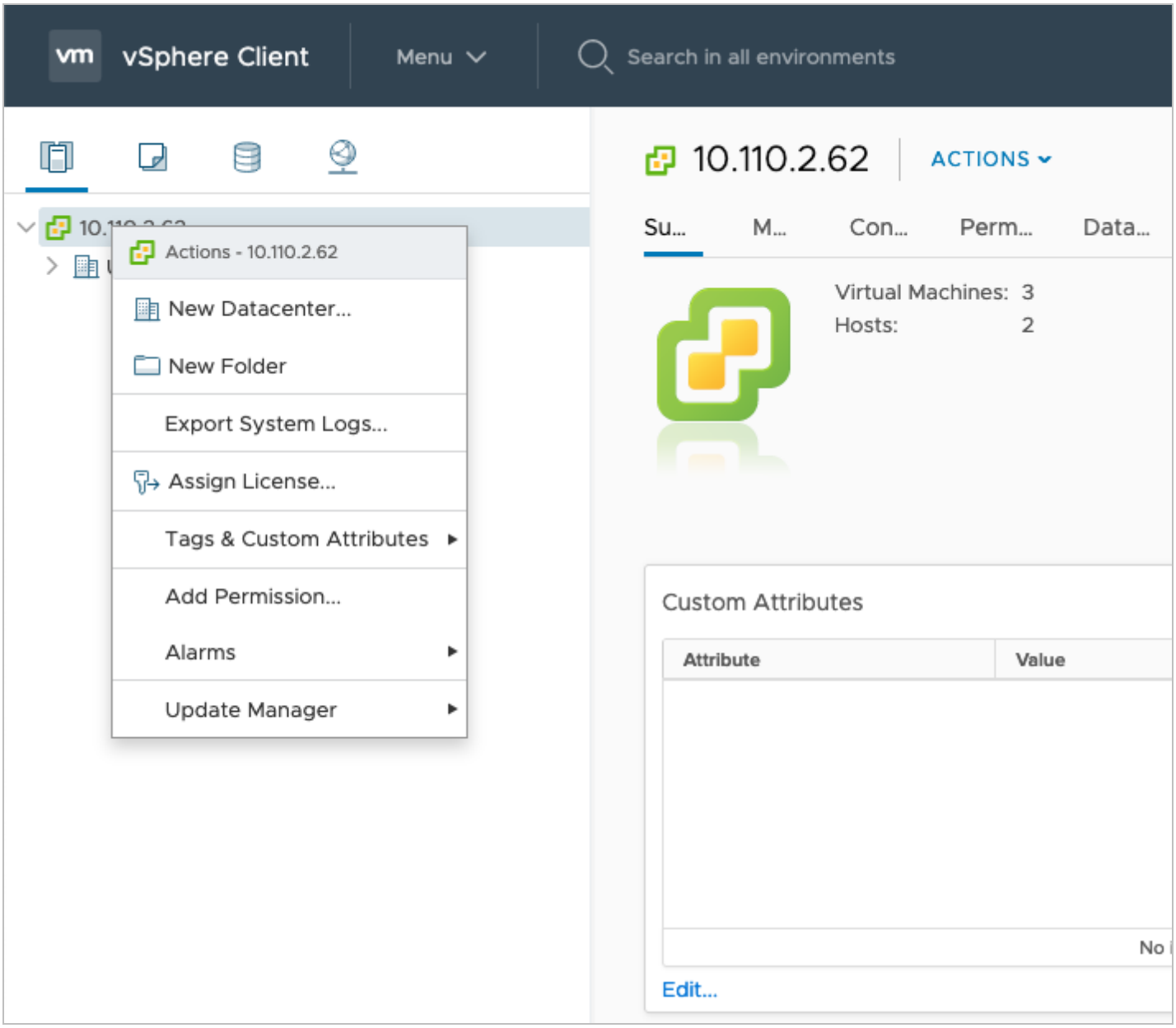
To configure HA refer to the following steps. The general process involves:

1. Creating a DataCenter on the VMware vCenter, if a datacenter does not currently exit.
2. Creating a VMWare Cluster.
3. Creating an NFS datastore.
4. Migrating the primary UNUM instance.
5. Configuring HA on the cluster.
6. Validating the configuration and Database Health.

Create Data Center on vCenter

If a datacenter does not exit you must create a new datacenter.

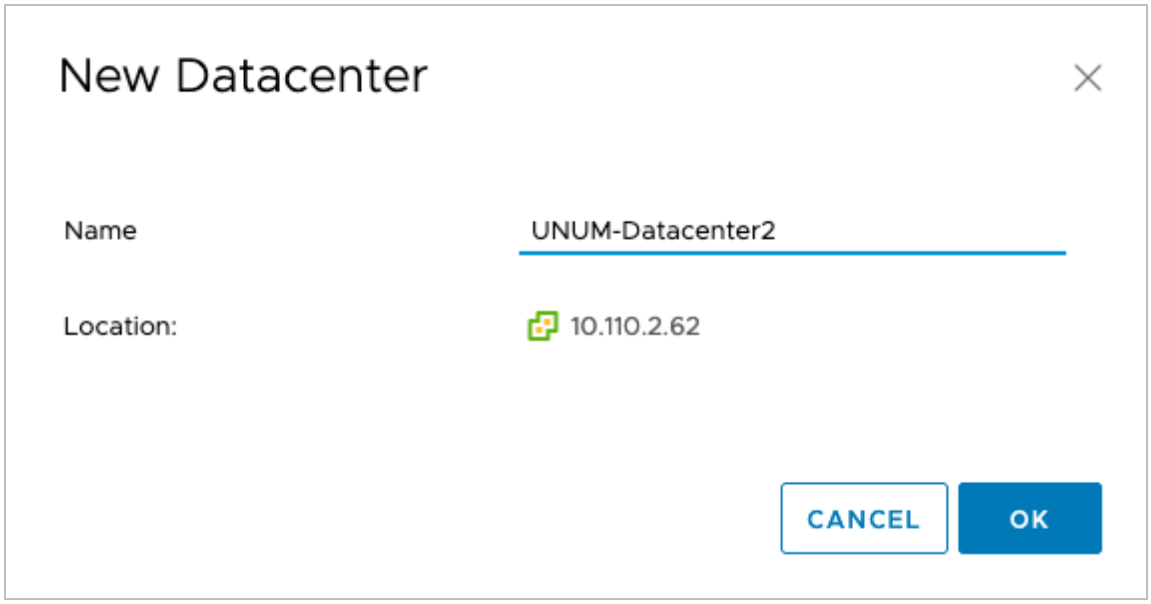
Right-click on the vSphere instance and select **New Datacenter**.



UNUM HA - Add New Datacenter

High Availability (cont'd)

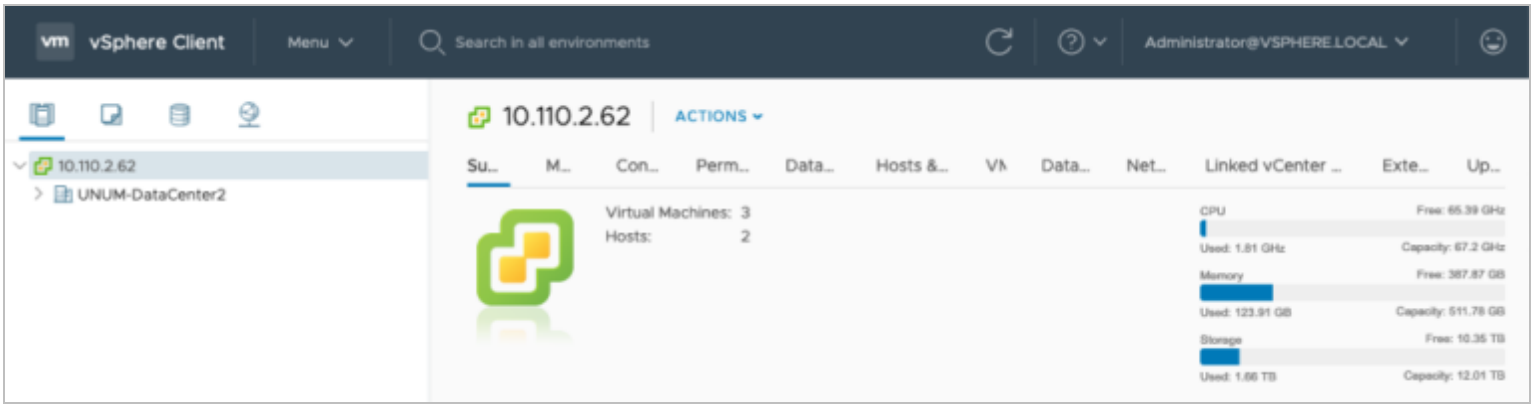
Enter the name for the new datacenter.



UNUM HA - Add New Name

Click **OK** to continue.

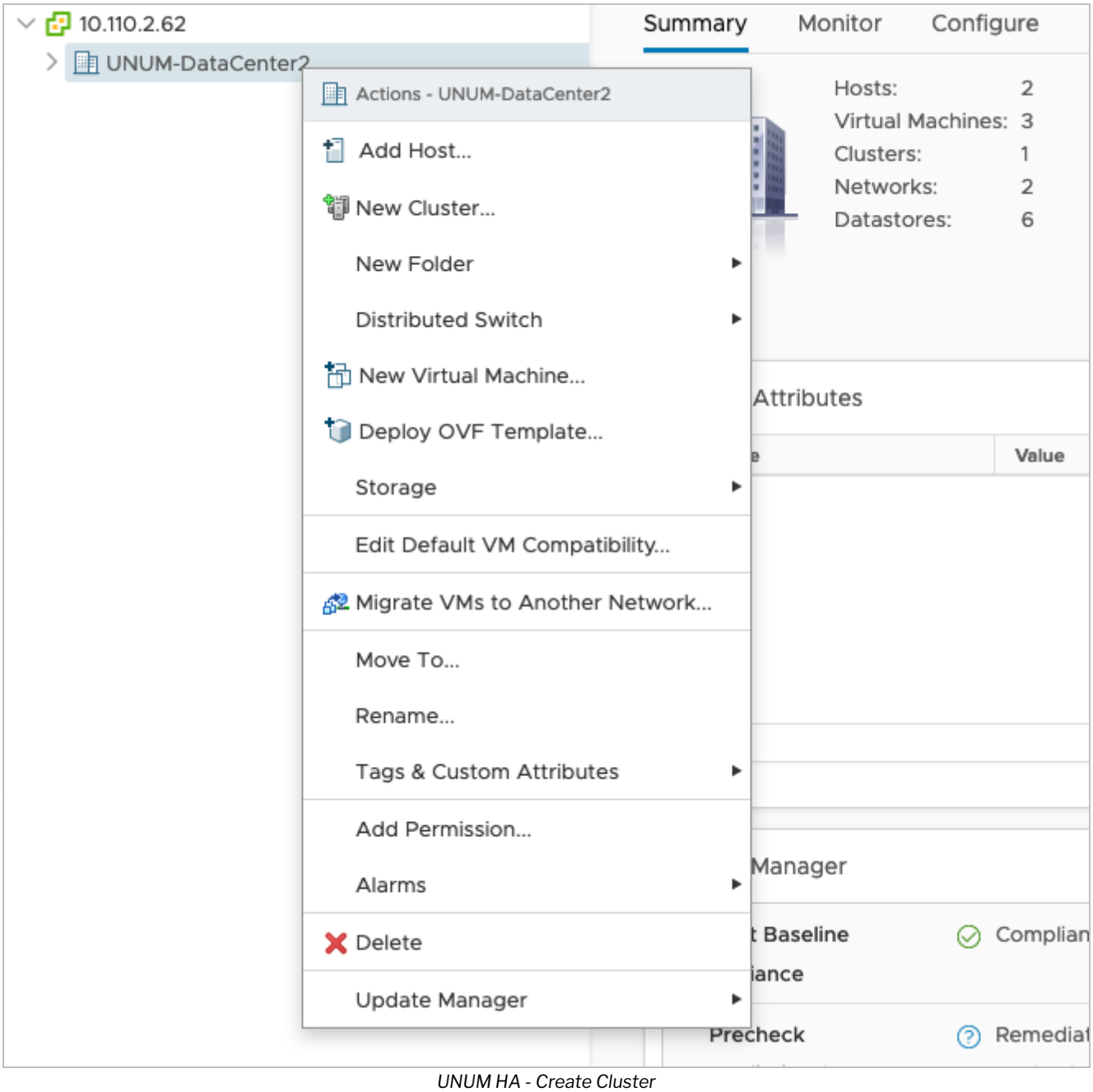
The new datacenter appears in the dashboard.



UNUM HA - New Datacenter Dashboard

Create VMware Cluster

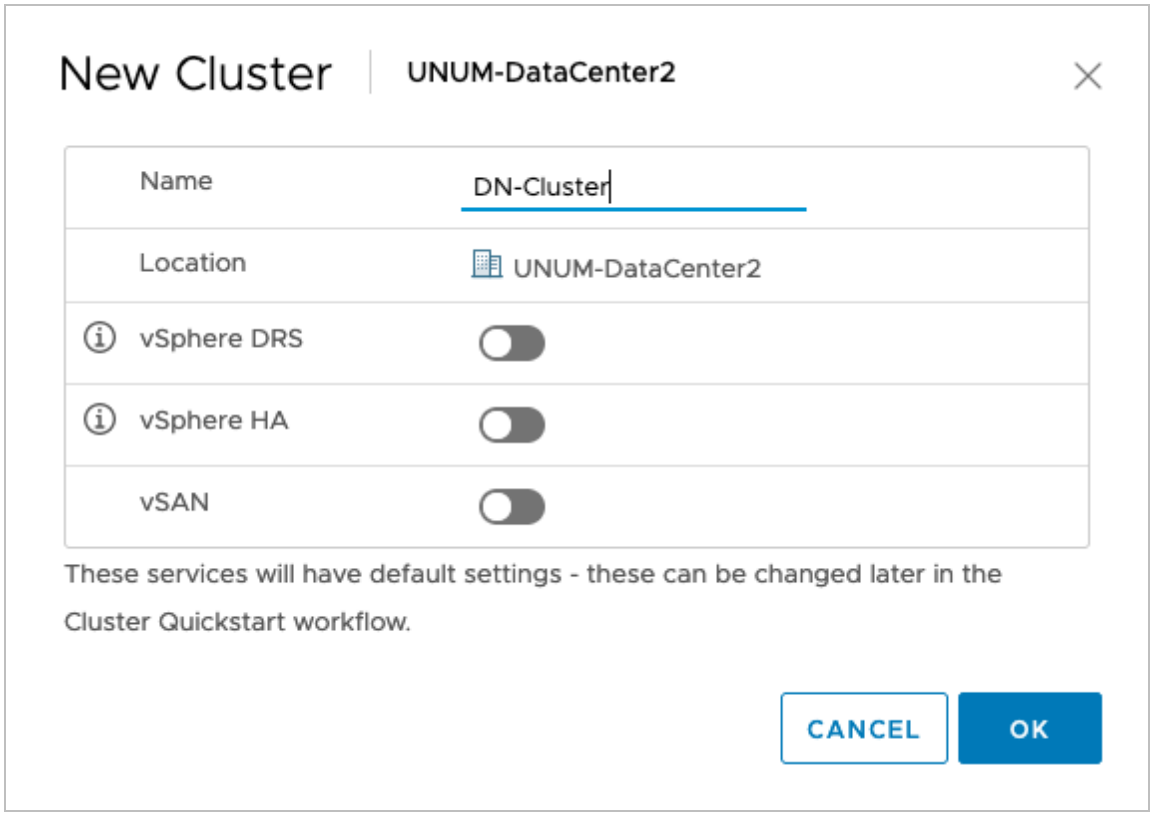
Create a VMware cluster under the new datacenter by selecting the datacenter. Right-click and select **New Cluster**.



UNUM HA - Create Cluster

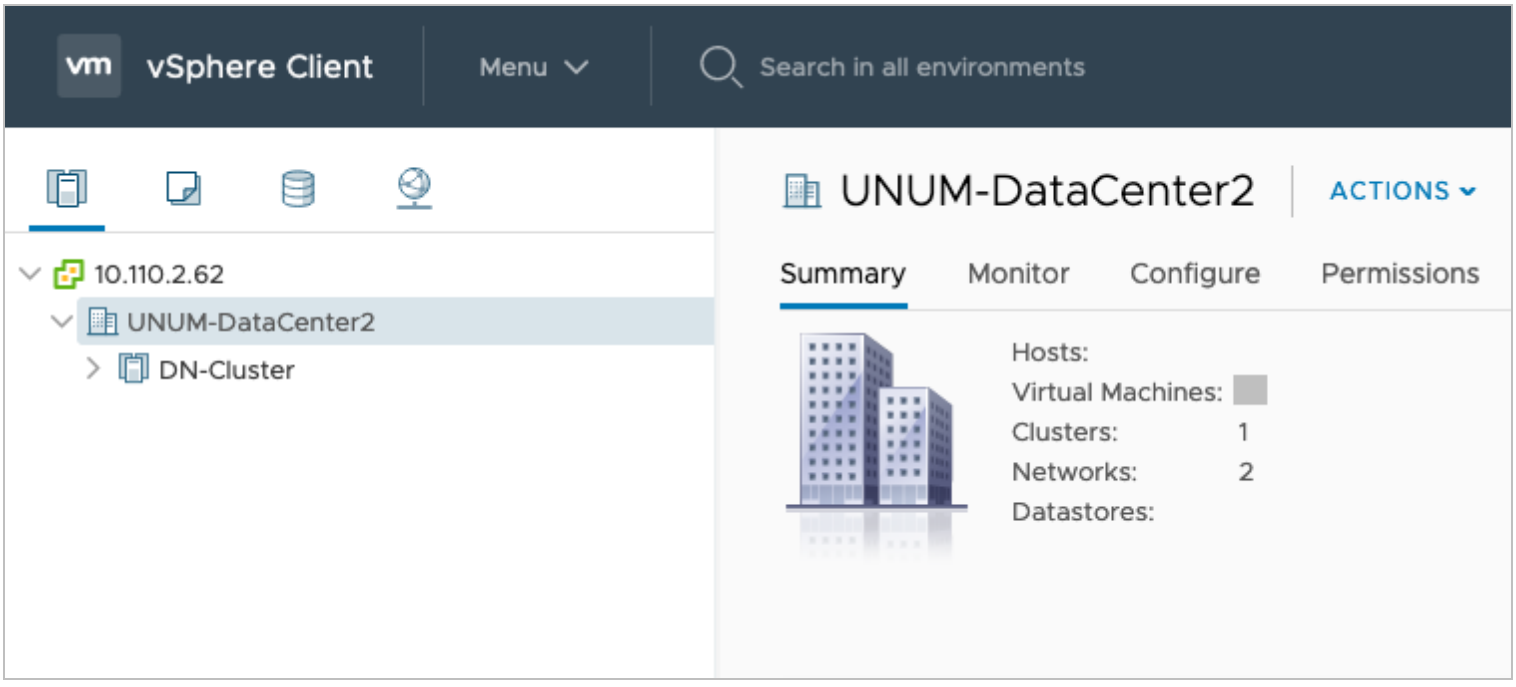
High Availability (cont'd)

Enter a **name** for the new cluster.



UNUM HA - New Cluster Name

Click **OK** to continue. The new cluster appears in the dashboard.

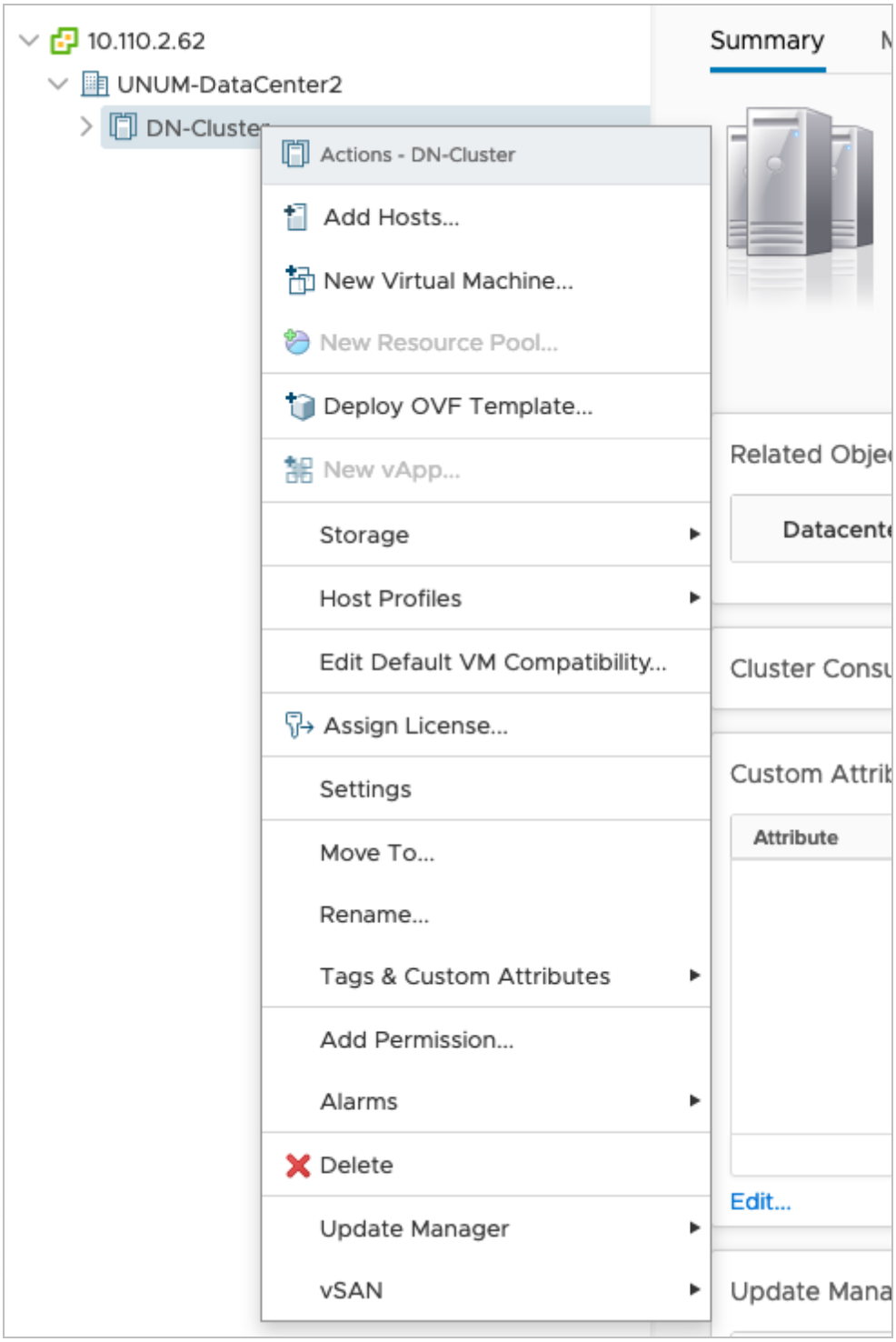


UNUM HA - New Cluster in Dashboard

Add Primary Hosts

Power off the deployed VMs before processing.

Highlight the new cluster and right-click and select **Add Hosts**.

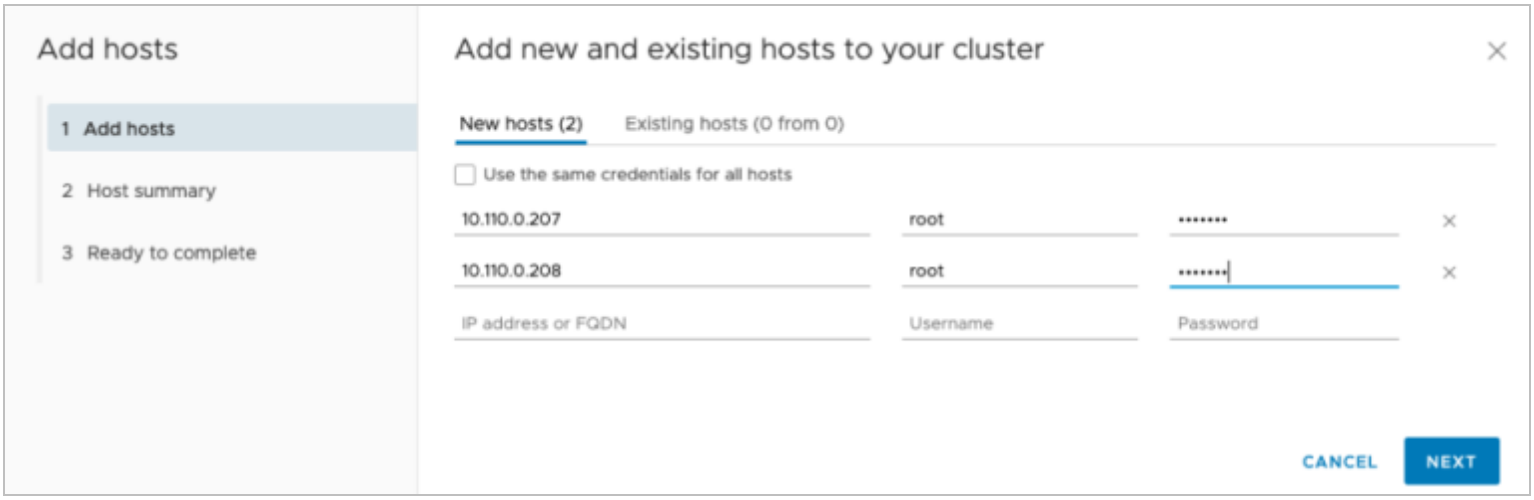


UNUM HA - Add Hosts

High Availability (cont'd)

Add Primary Hosts (ESXi servers) only, ESXi servers A & B.

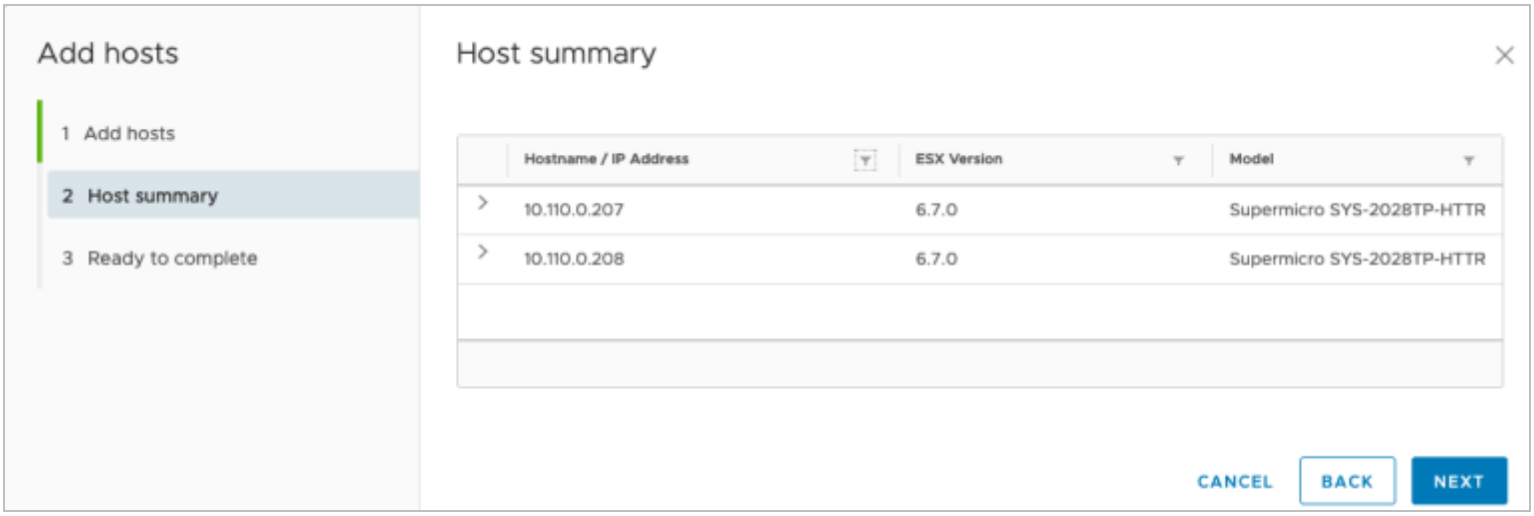
Enter the **IP Address**, **username** and **password** for each node.



UNUM HA - Add Hosts Details

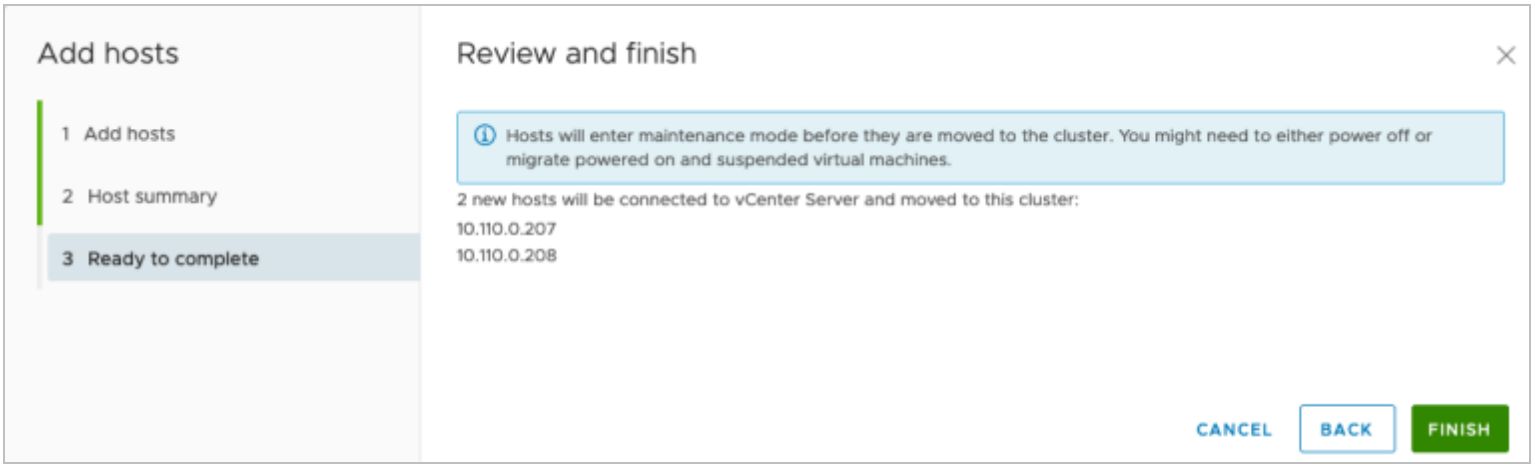
Click **Next** to continue.

Review the **Host Summary.**



Click **Next** to continue and review the entries.

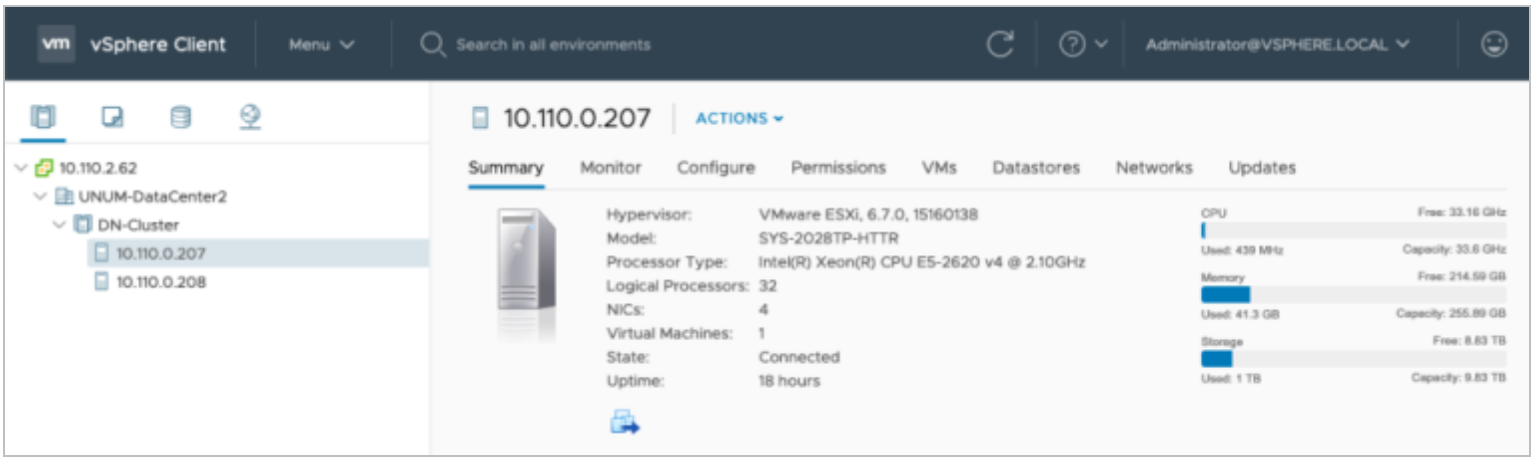
High Availability (cont'd)



UNUM HA - Add Hosts Finish

Click **Finish** to add the new hosts.

The hosts appear in the dashboard.



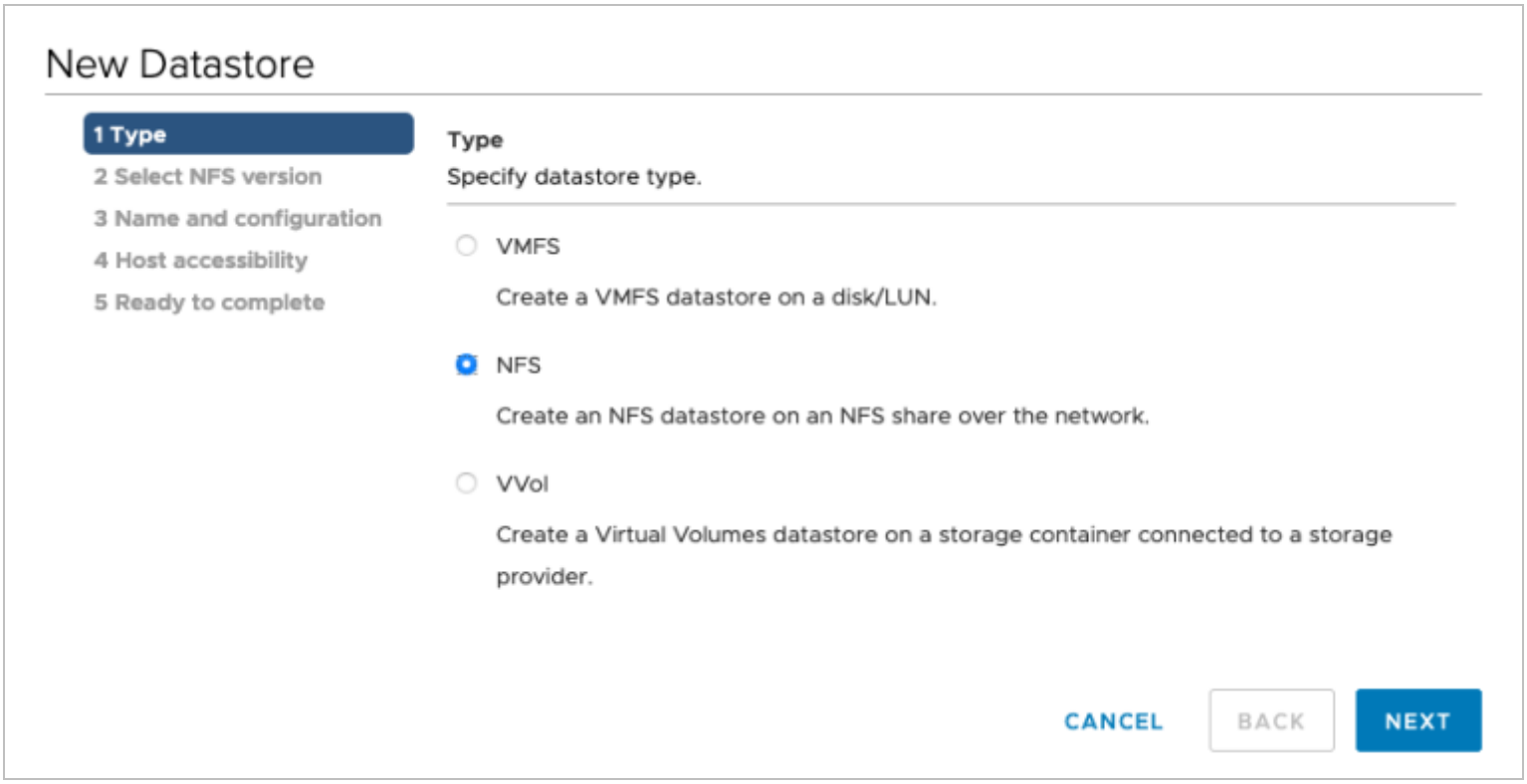
UNUM HA - Hosts Dashboard

Add NFS

Configure the **VMWare Cluster** to use the shared datastore.

The example below shows how to configure for **NFS**,the shared medium we have chosen:

Create a new **NFS** datastore under **Cluster** → **Storage** → **New Datastore**.

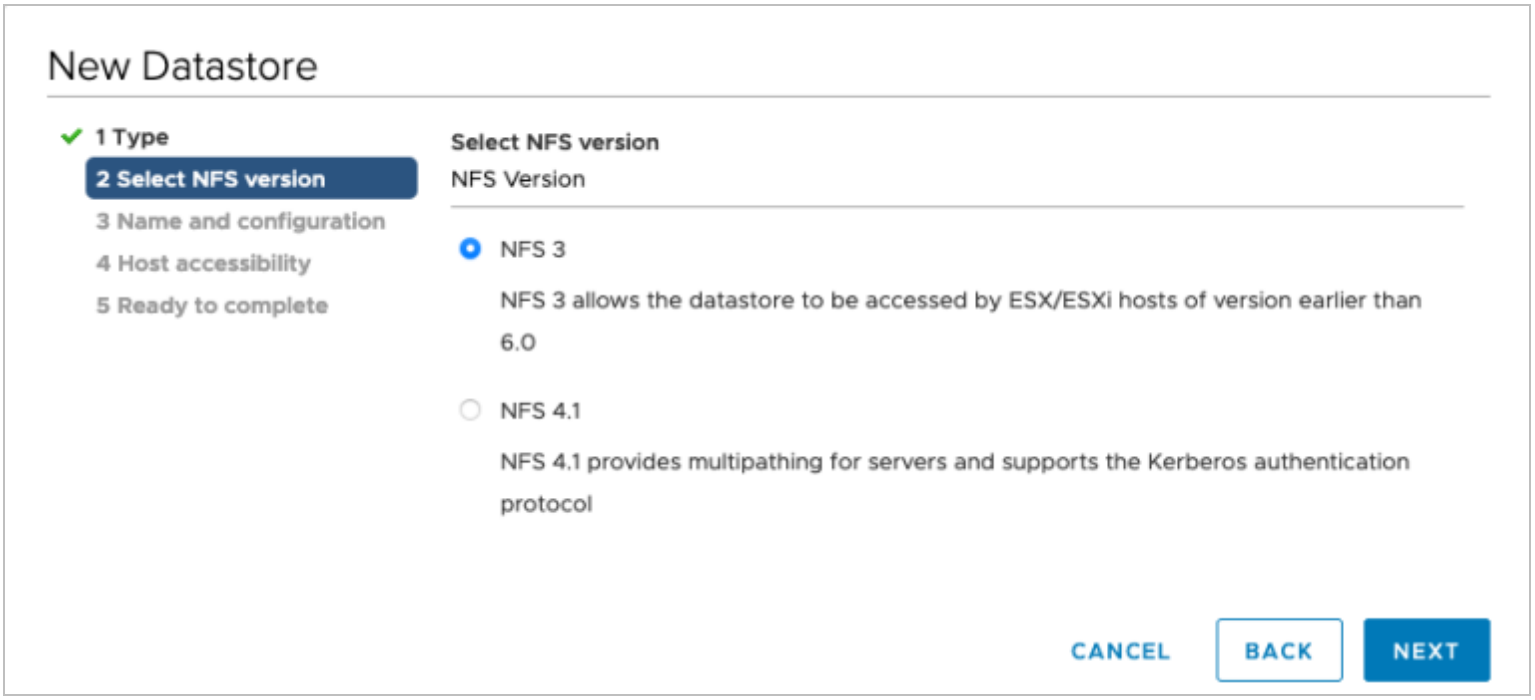


UNUM HA - Create Datastore

Click on **Next**.

High Availability (cont'd)

Enter **NFS** type and details.

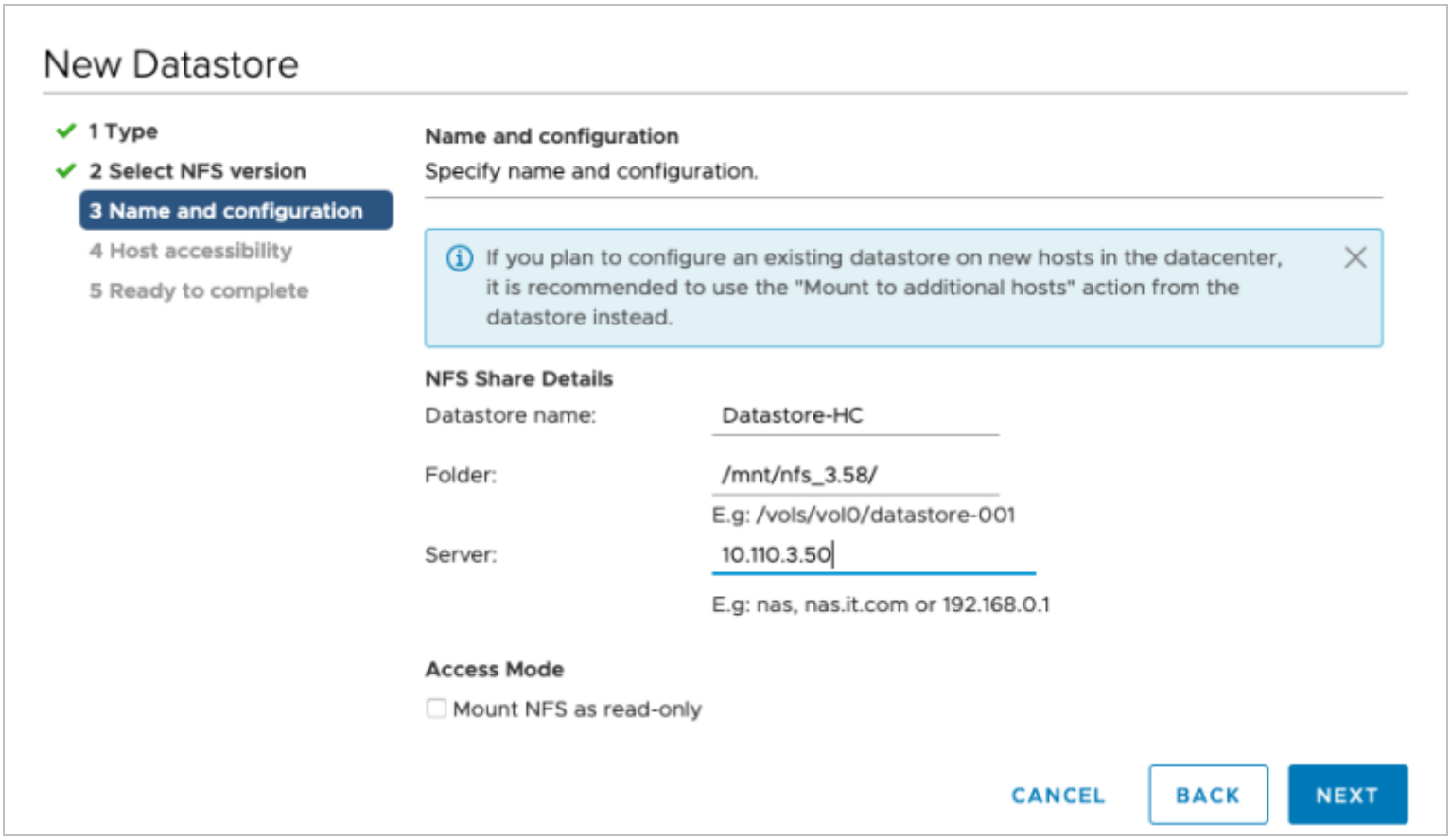


UNUM HA - Create Datastore NFS Type

Click on **Next**.

High Availability (cont'd)

Enter the details, including **Name**, **Folder** and **Server**.

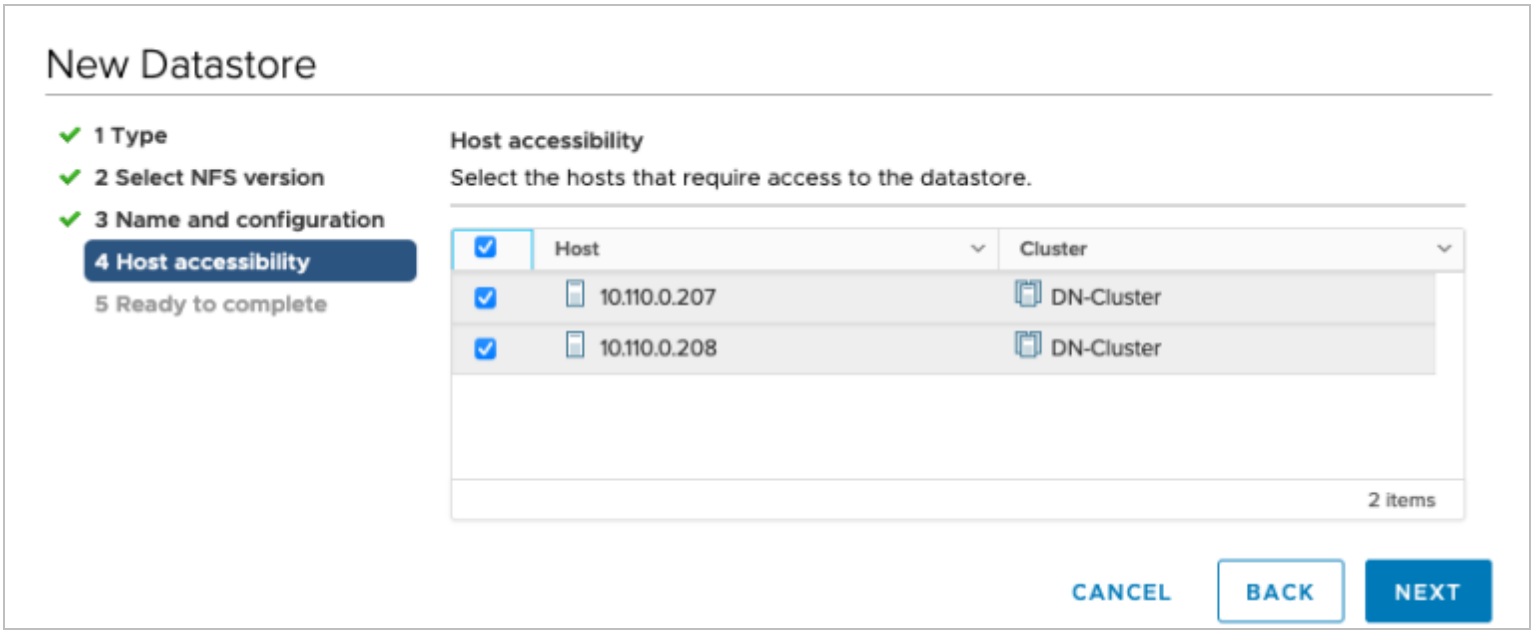


UNUM HA - Enter Datastore Details

Click on **Next**.

High Availability (cont'd)

Select **all** hosts in the cluster.

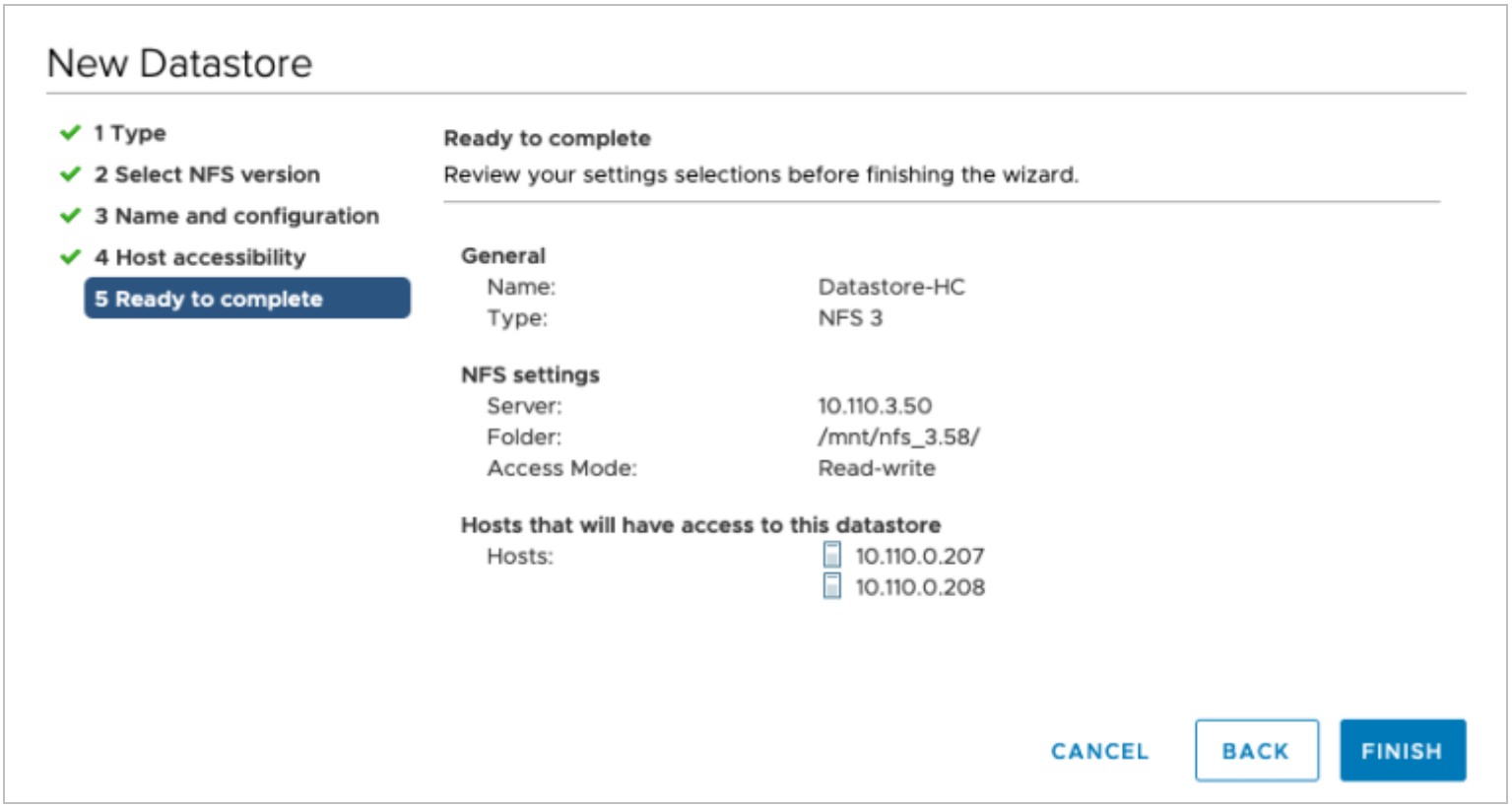


UNUM HA - Select Host Accessibility

Click **Next** to continue.

High Availability (cont'd)

Review all details and click **Finish** to complete the datastore configuration.

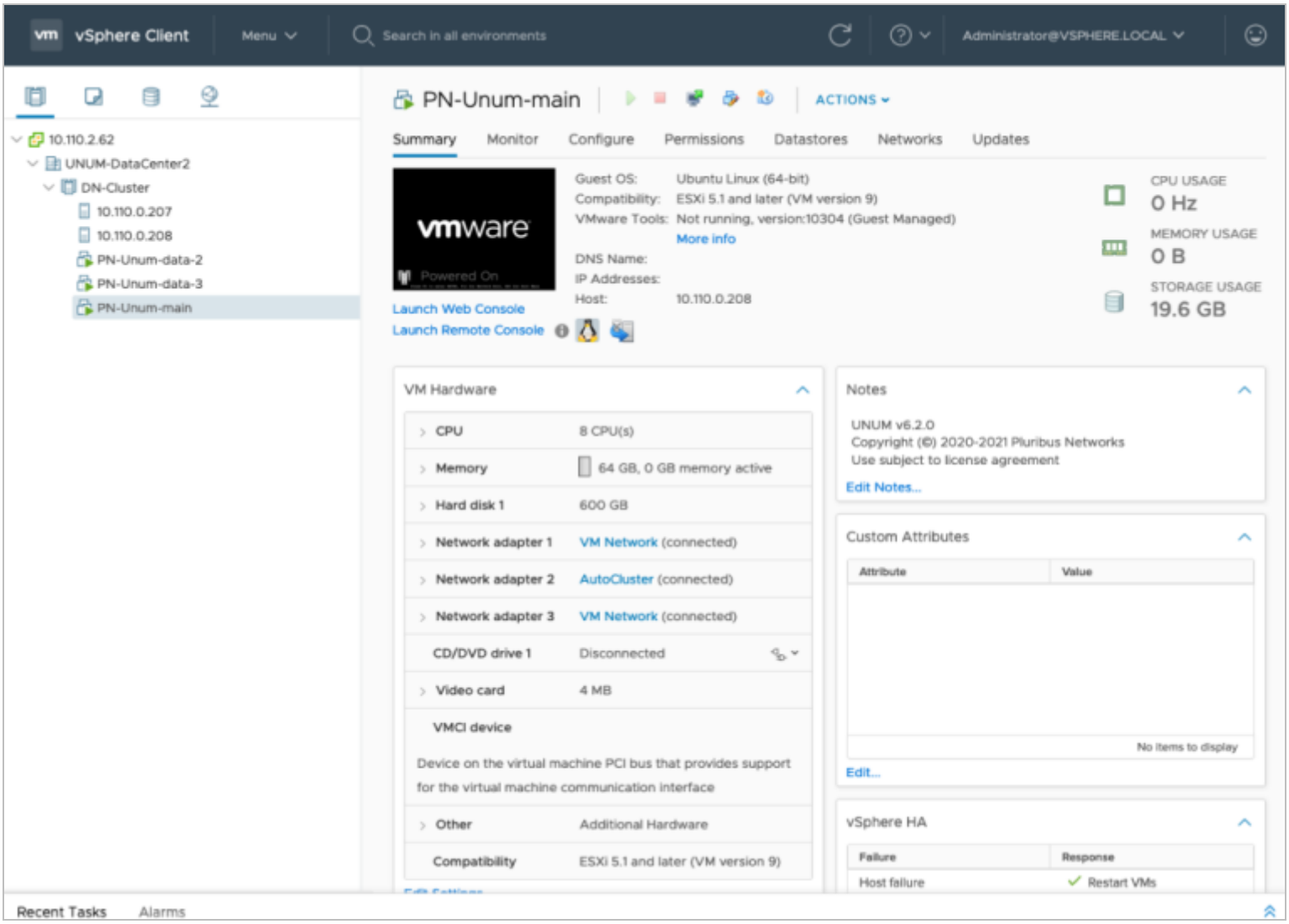


UNUM HA - Complete New Datastore

Note: Repeat the New Datastore process and create a second datastore for redundancy. For example, **Datastore2-HC**.

Migrate Primary UNUM Instance

You must migrate PN-Unum-main instance to the clustered datastore.



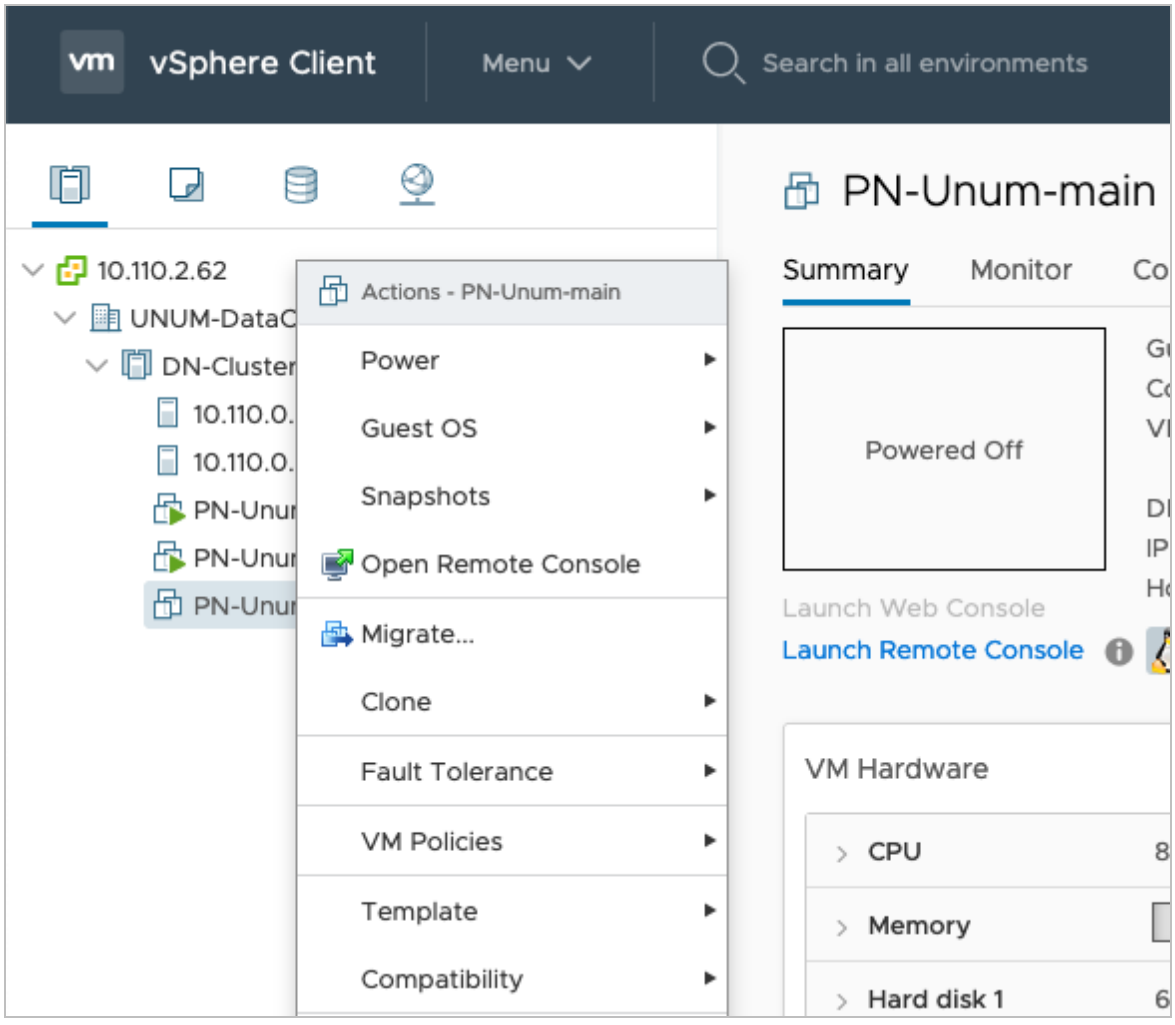
UNUM HA - Dashboard - Ready for Migration

High Availability (cont'd)

Power Off the **PN-Unum-main VM instance** before proceeding.

UNUM HA - Dashboard - Power Off PN-Unum-main

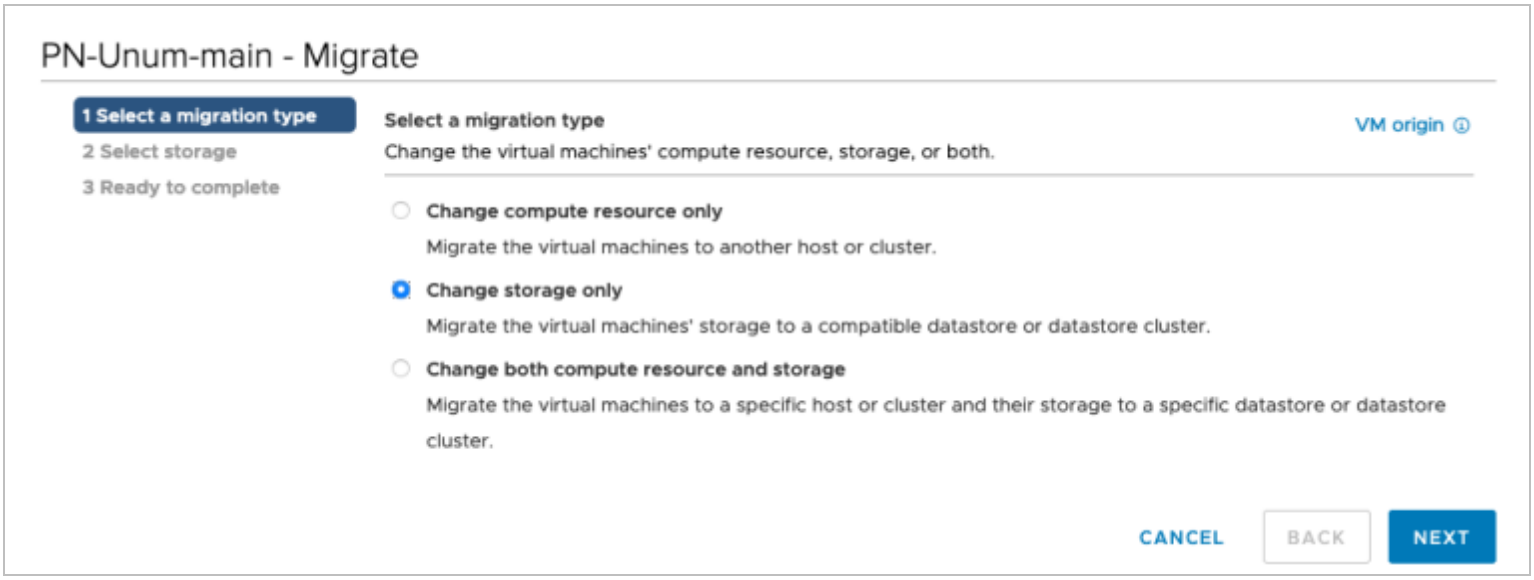
Right-click on the **PN-Unum-main** instance and select **Migrate**.



UNUM HA - Dashboard - Migrate

Select Migration Type

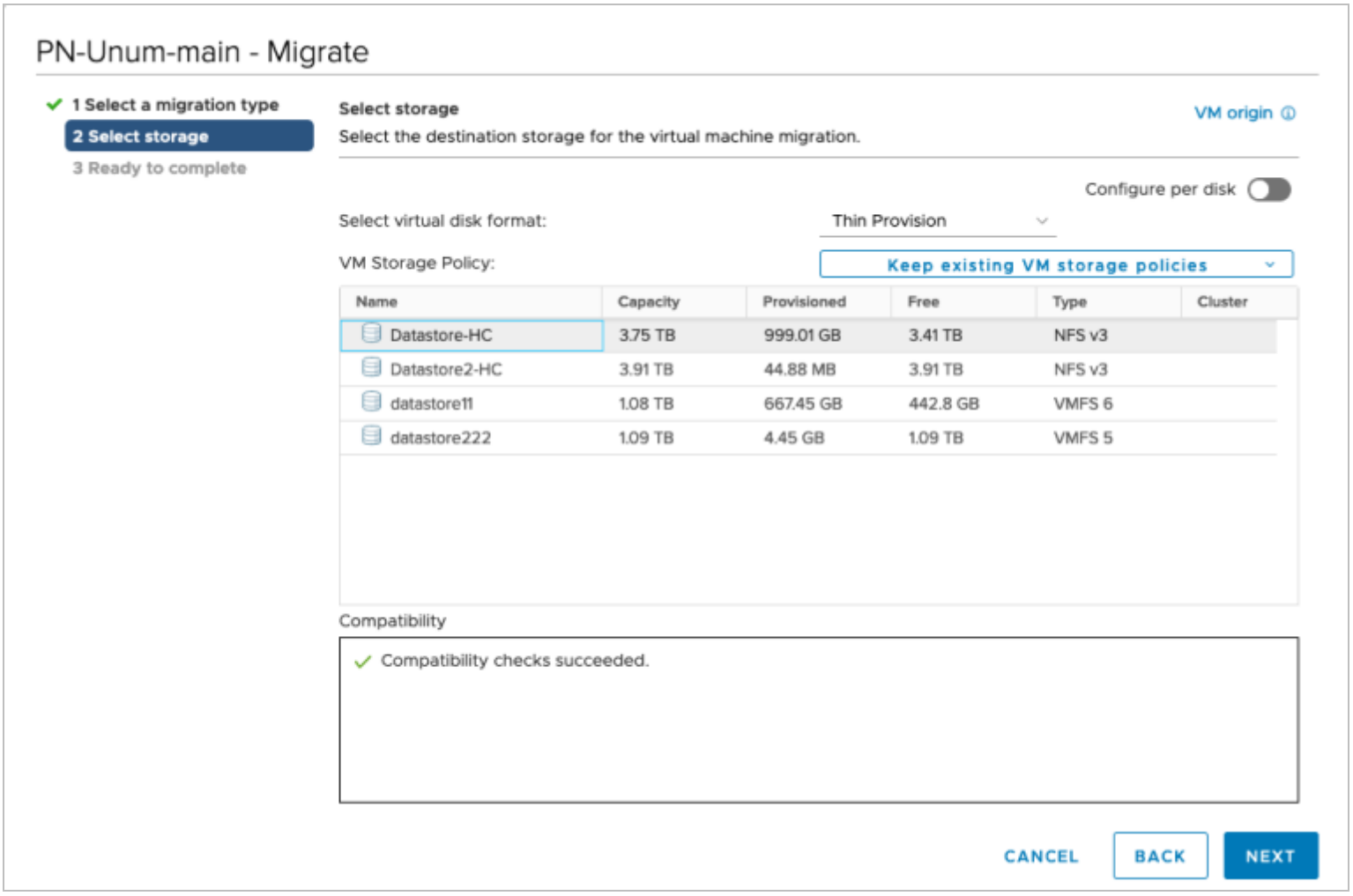
Choose **Change Storage Only** and click **Next** to continue.



UNUM HA - Migrate - Change Storage Only

High Availability (cont'd)

Select the **Datastore** for the migration.

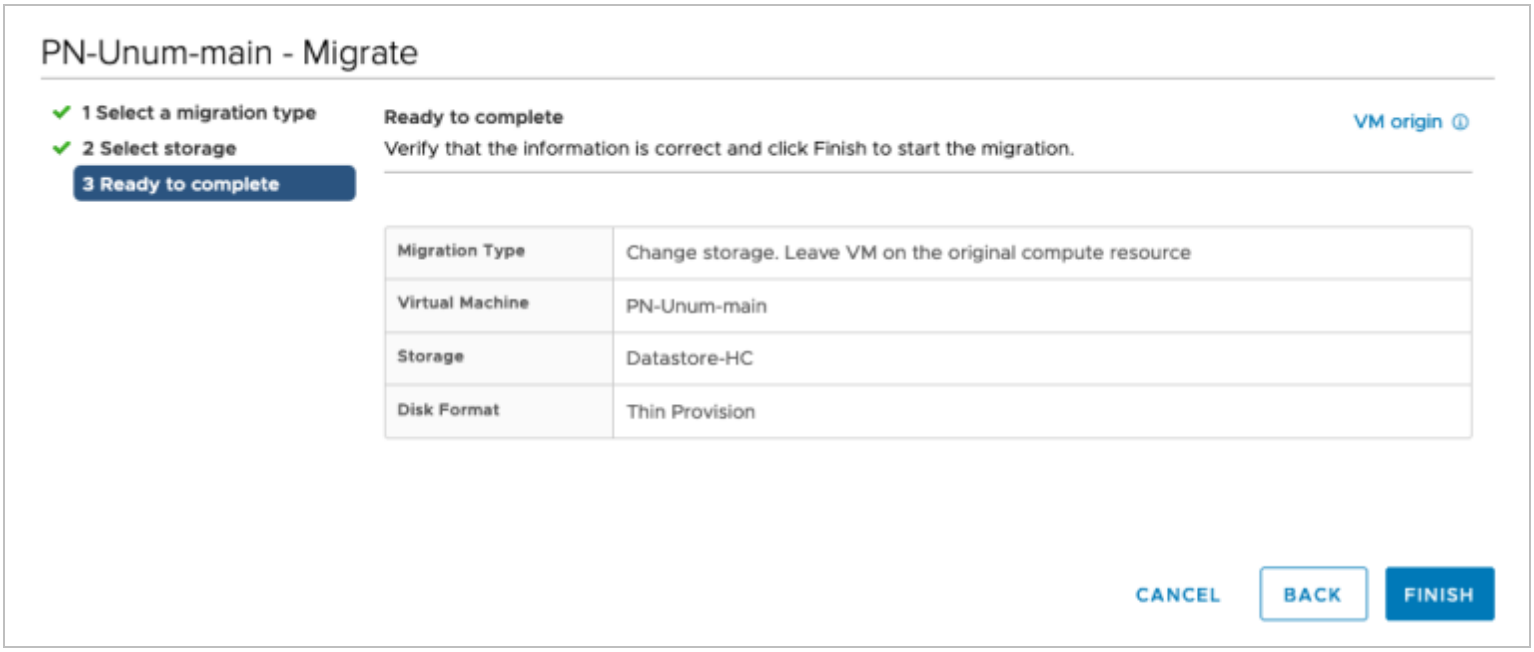


UNUM HA - Migrate - Select Storage for Migration

Click **Next** to continue.

High Availability (cont'd)

Ready To Complete

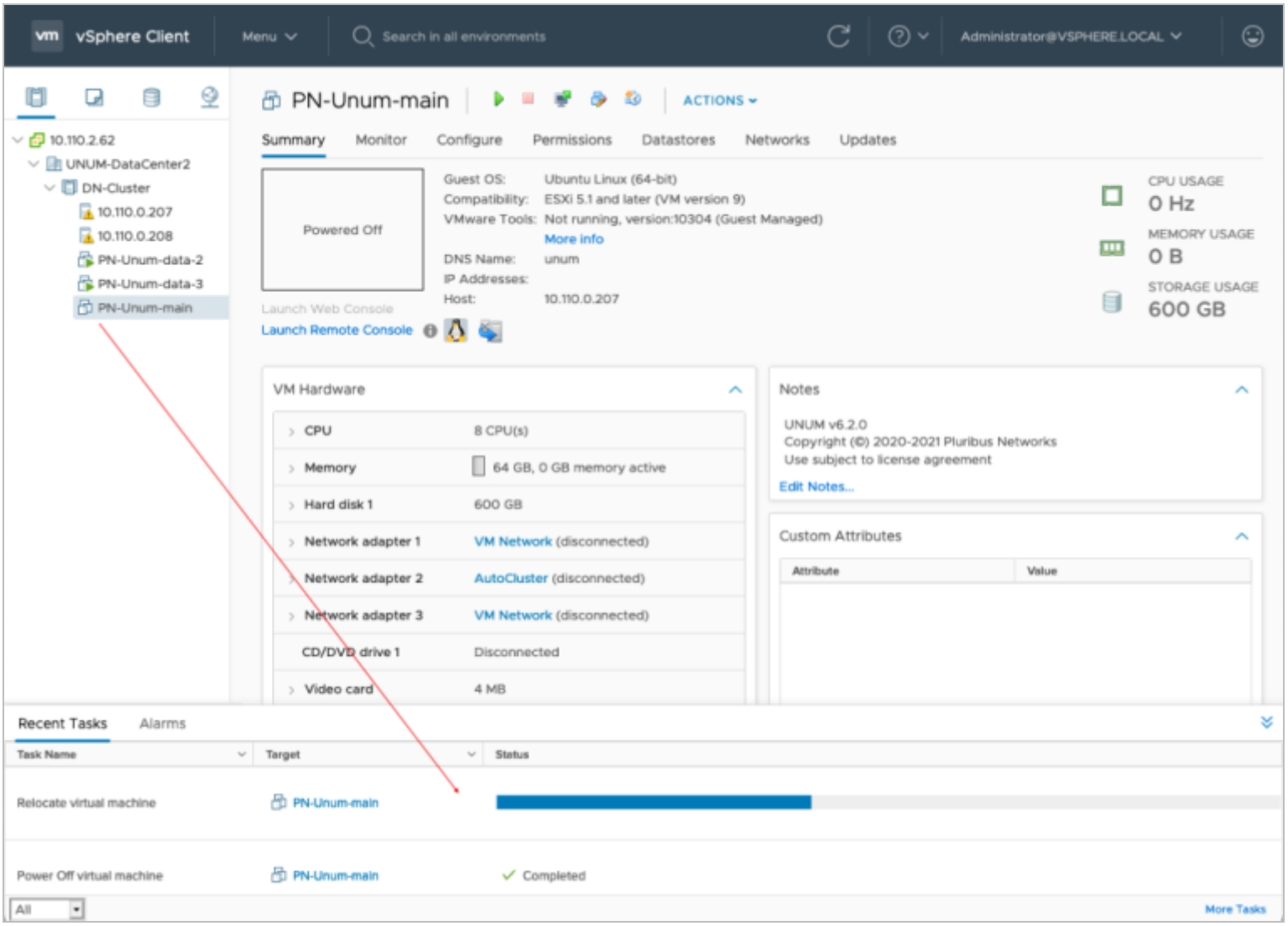


UNUM HA - Migrate - Ready To Complete Migration

Click **Finish** to begin the migration.

High Availability (cont'd)

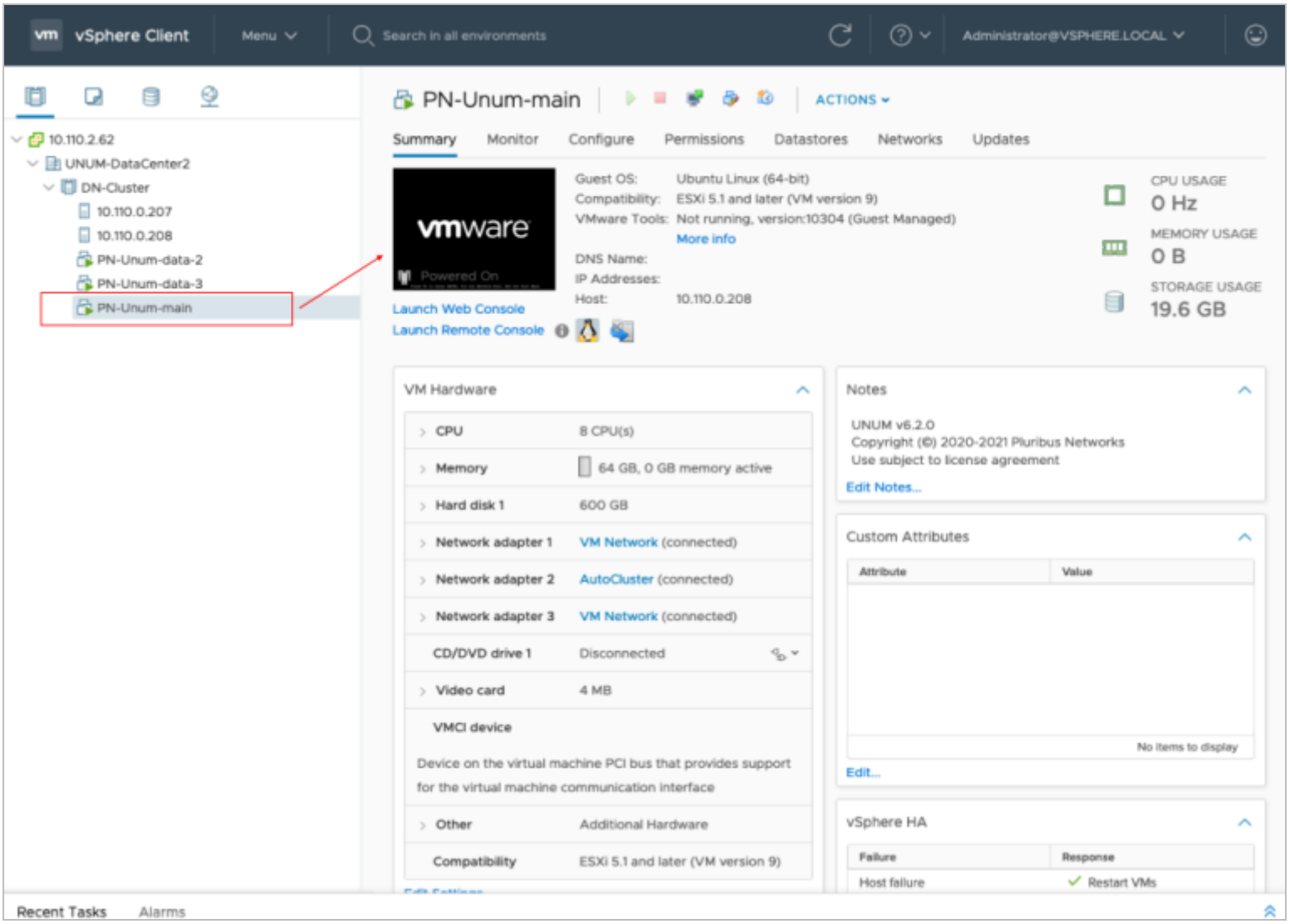
Progress is monitored in the dashboard.



UNUM HA - Migrate - Migration in Progress

High Availability (cont'd)

After the migration completes, **Power On** the **PN-Unum-main** instance.

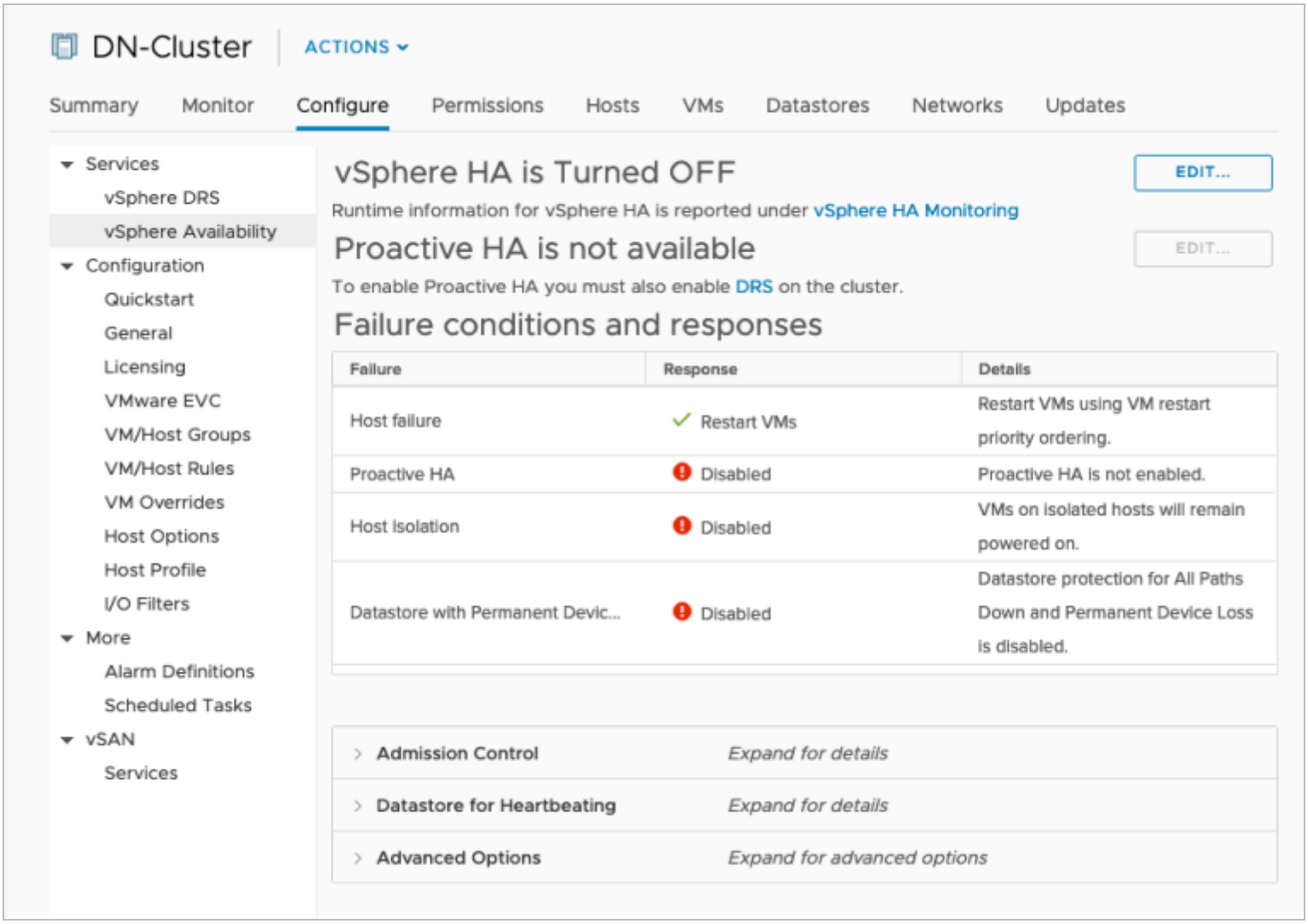


UNUM HA - Migrate - PN-Unum-main Powered On

Configure HA on VMWare Cluster

Setup HA on VMware Cluster (if not previously configured).

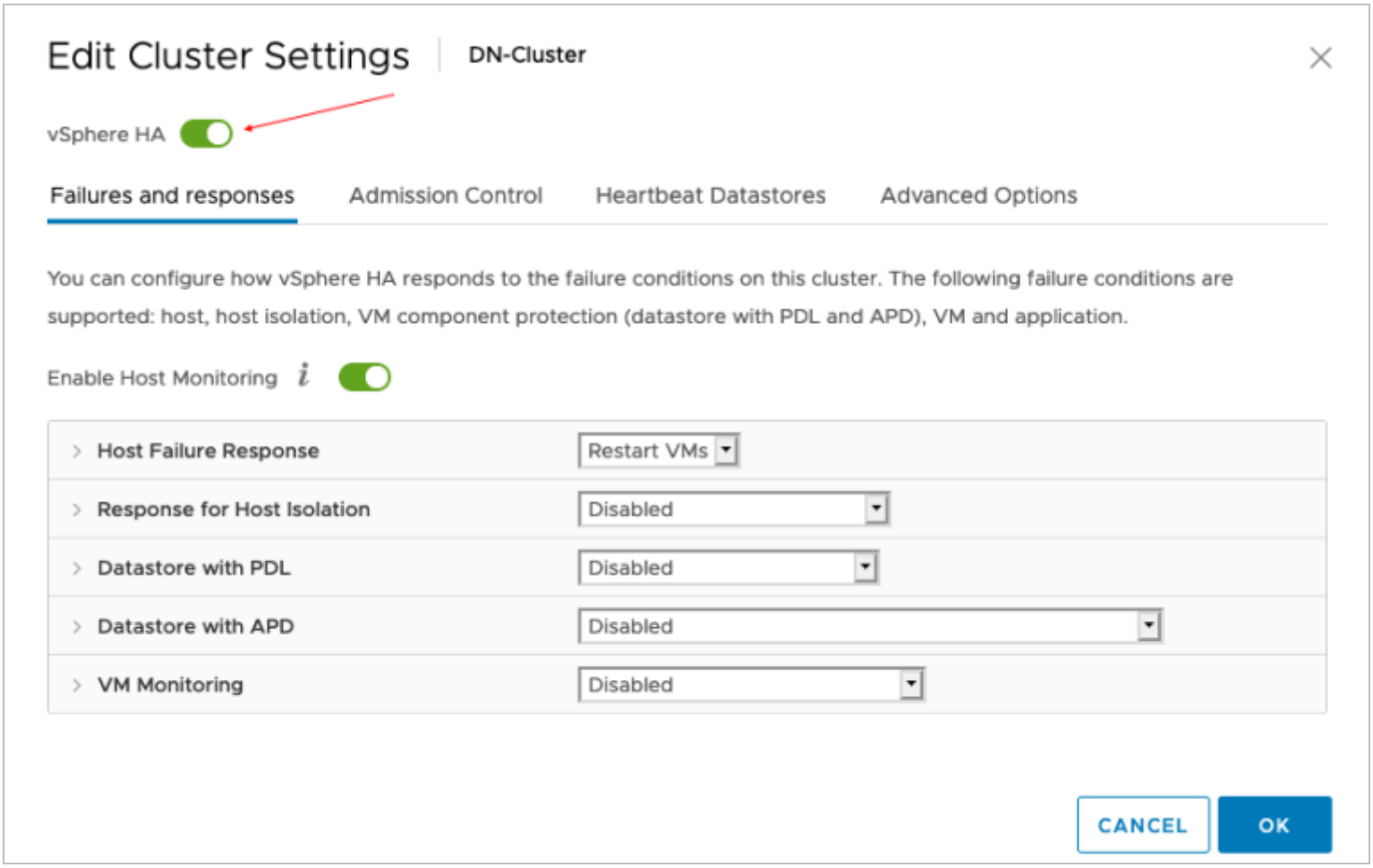
Click on **Configure** → **vSphere Availability** → **Edit**.



UNUM HA - Configure vSphere HA

High Availability (cont'd)

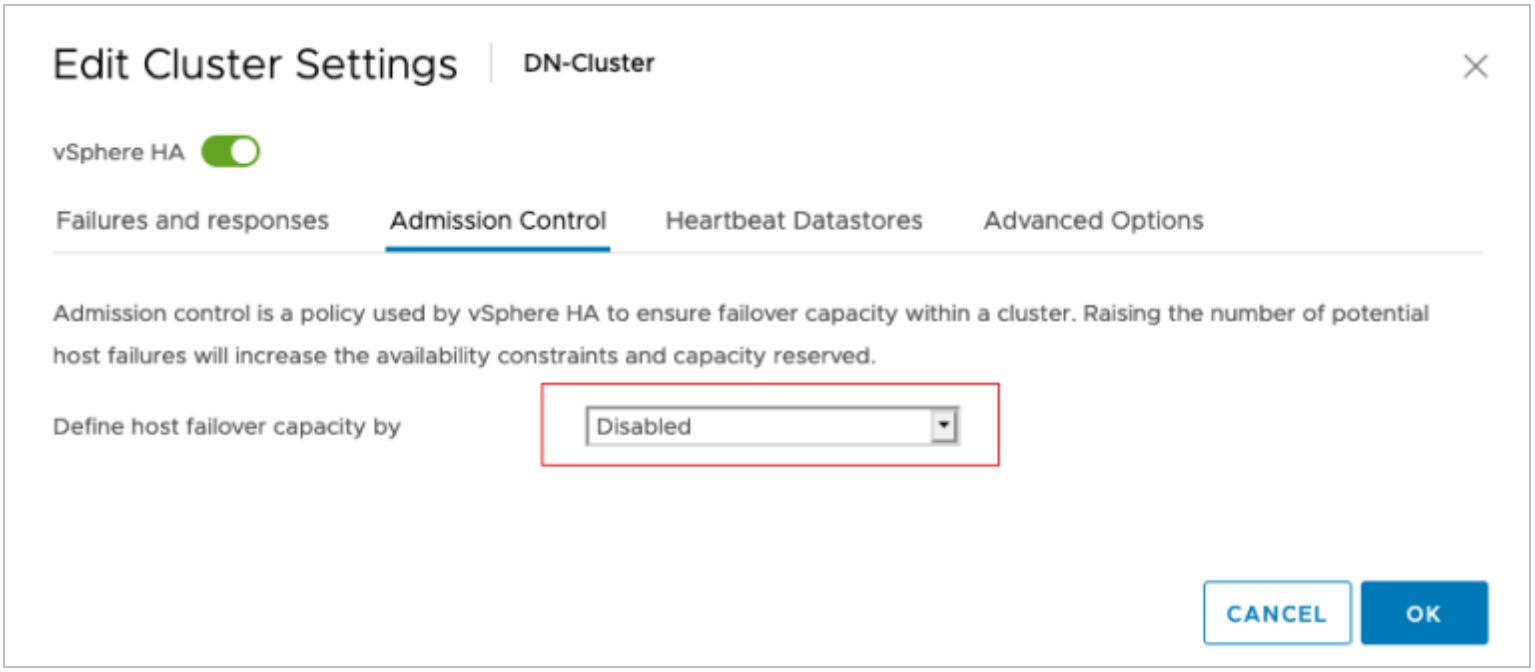
Select **vSphere HA** to **On**.



UNUM HA - Configure vSphere HA On

High Availability (cont'd)

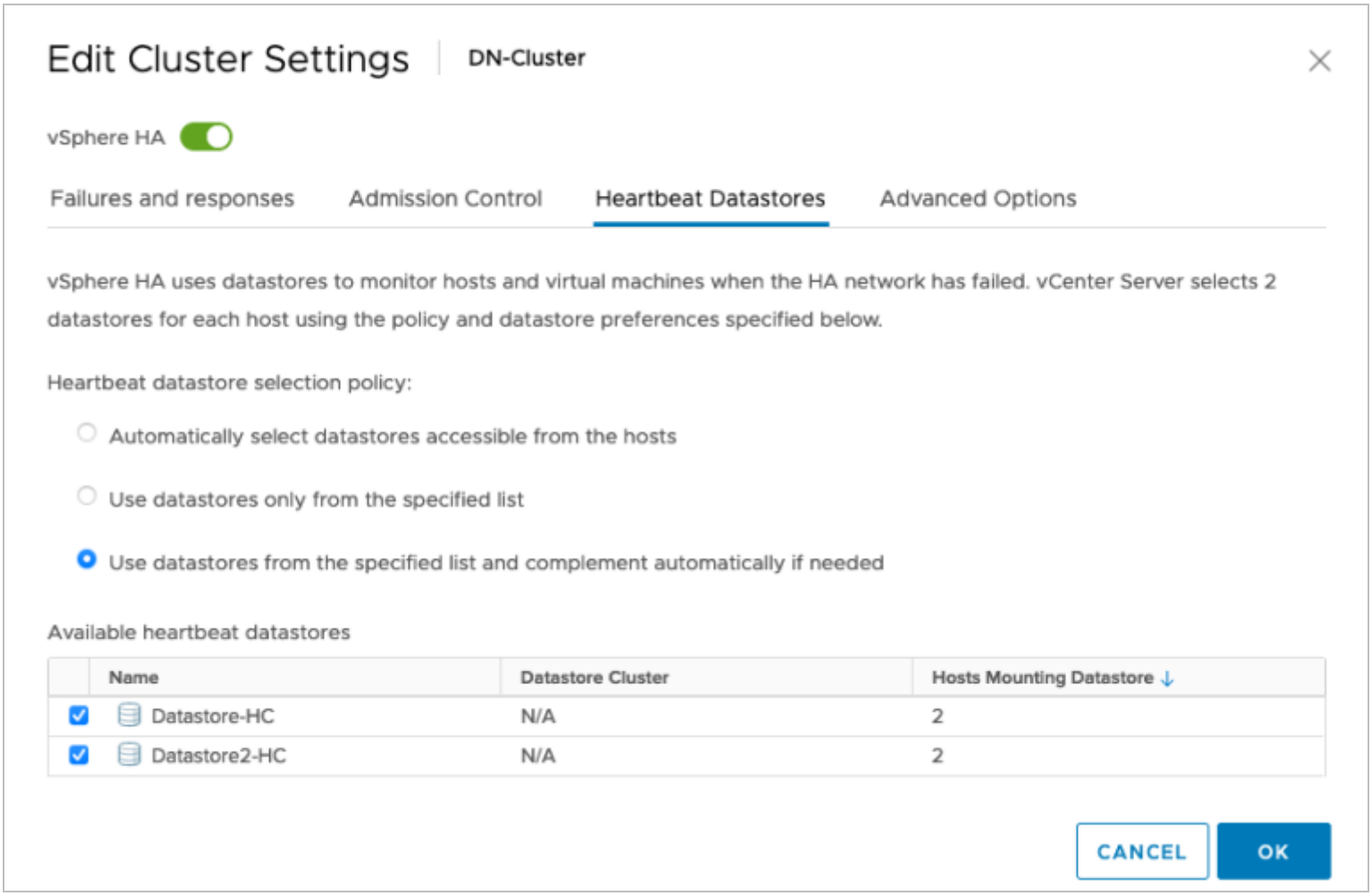
Disable the **Admission Control** setting.



UNUM HA - Configure vSphere Admission Control - Disabled

High Availability (cont'd)

Select **Heartbeat Datastores**.



UNUM HA - Configure vSphere Heartbeat Datastores

Click on **OK**.

High Availability (cont'd)

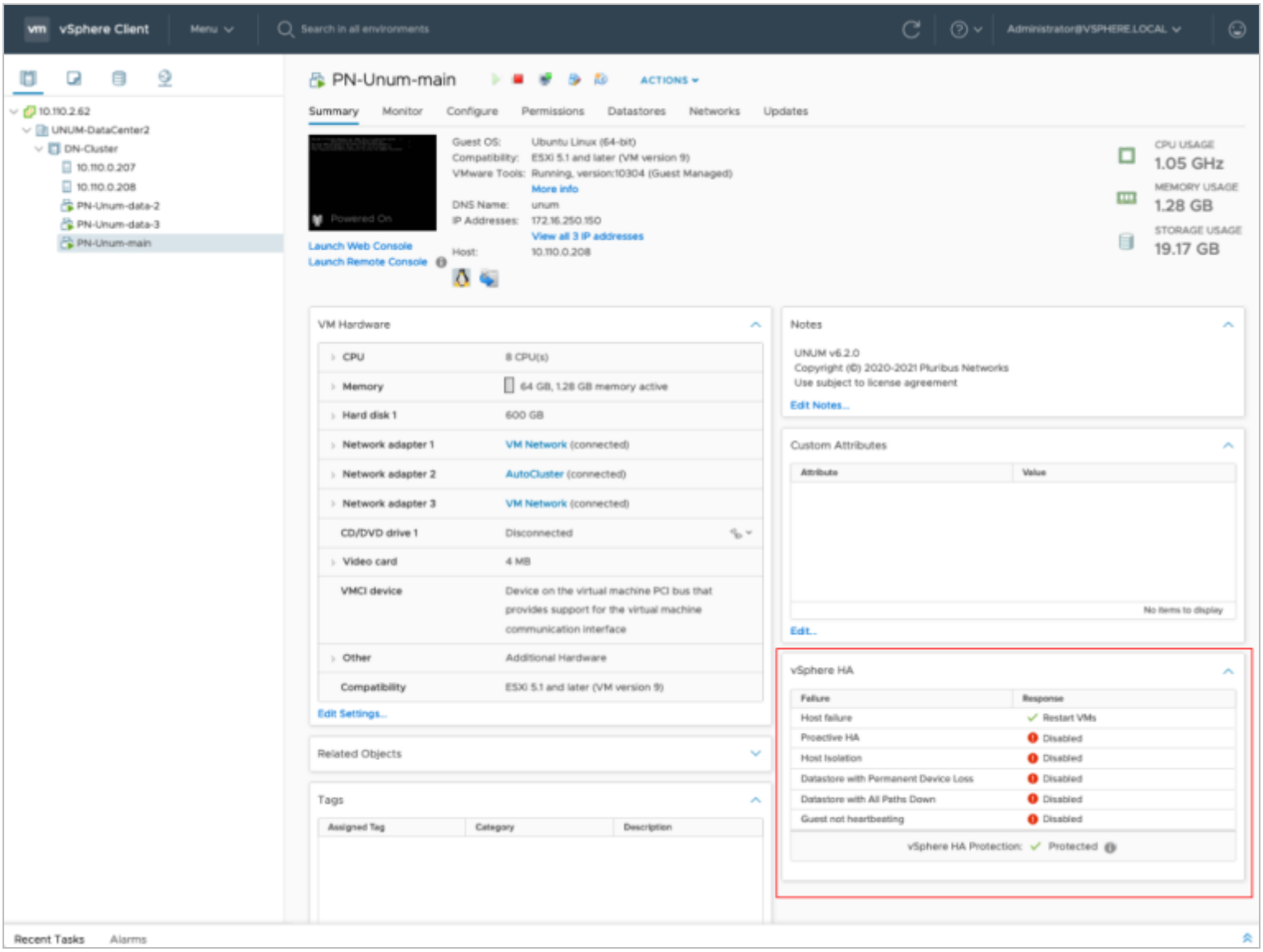
HA Configuration Validation

The **Recent Tasks** pane shows that **HA** configures successfully on the hosts and when **HA** is configured on the VMware cluster.

UNUM HA - Configuration Validation

The VM on **Shared Storage** shows **HA** protected.

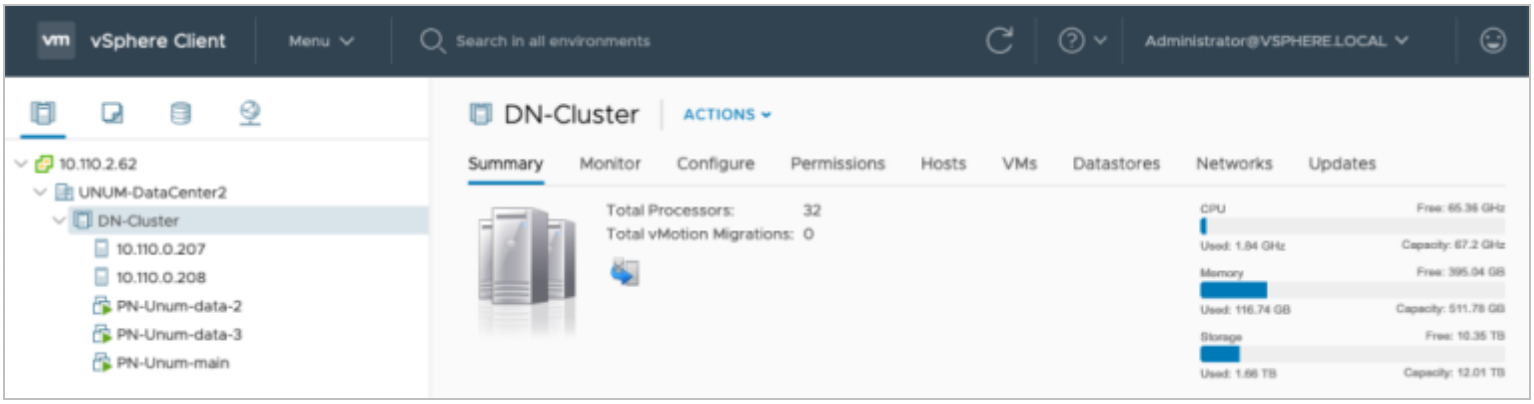
High Availability (cont'd)



UNUM HA - Configuration Validation - vSphere HA Protection Enabled

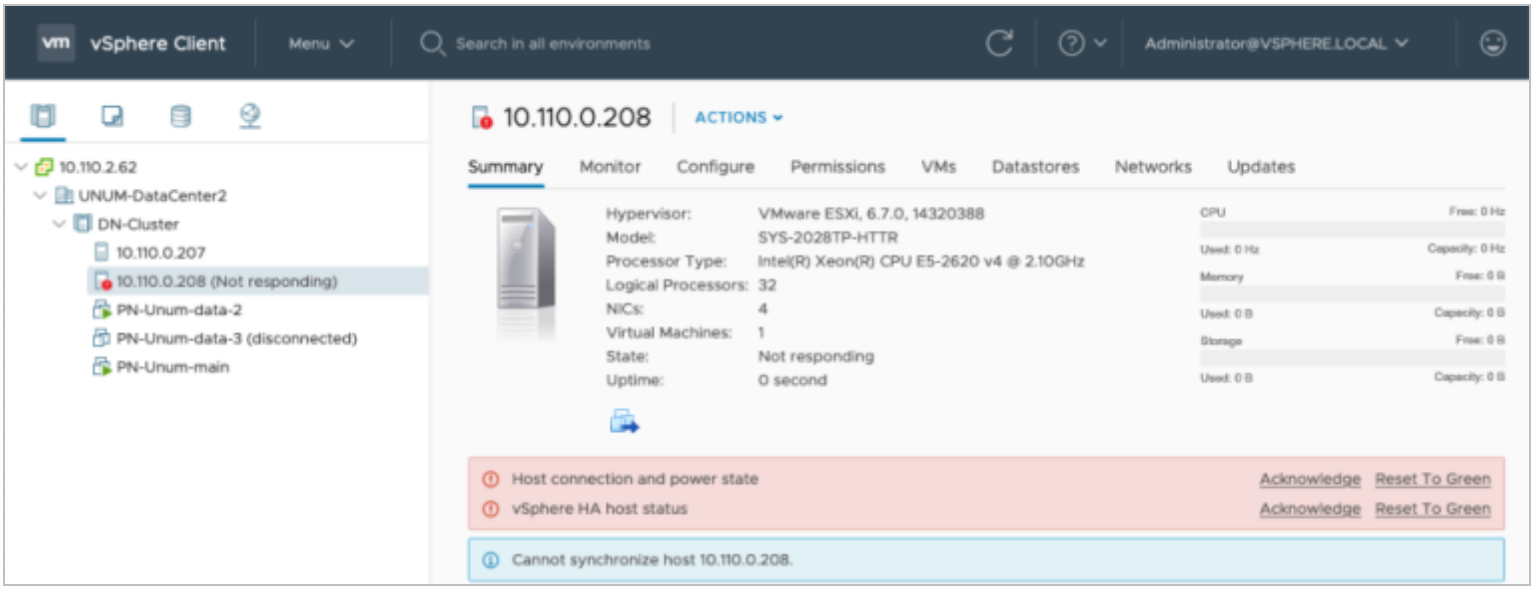
High Availability Validation after Fail-over

In the following example, the UNUM instance runs on one of the instances in the cluster. This instance is HA protected.



UNUM HA - Configuration Validation - Example - Cluster Good

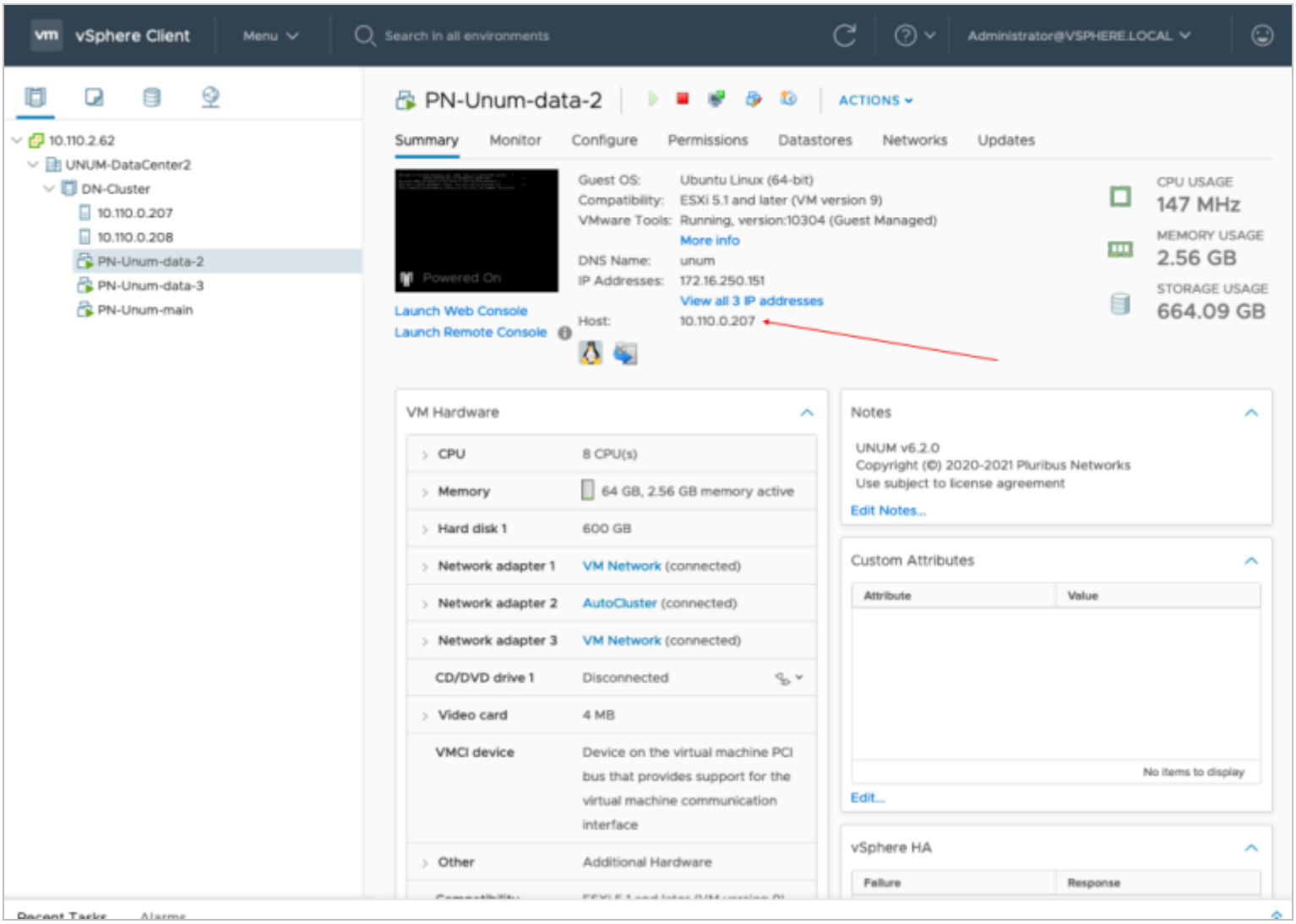
Respective instance (10.110.0.208) then becomes unresponsive or is rebooted.



UNUM HA - Configuration Validation - Example - Cluster Instance Failed or Rebooted

High Availability (cont'd)

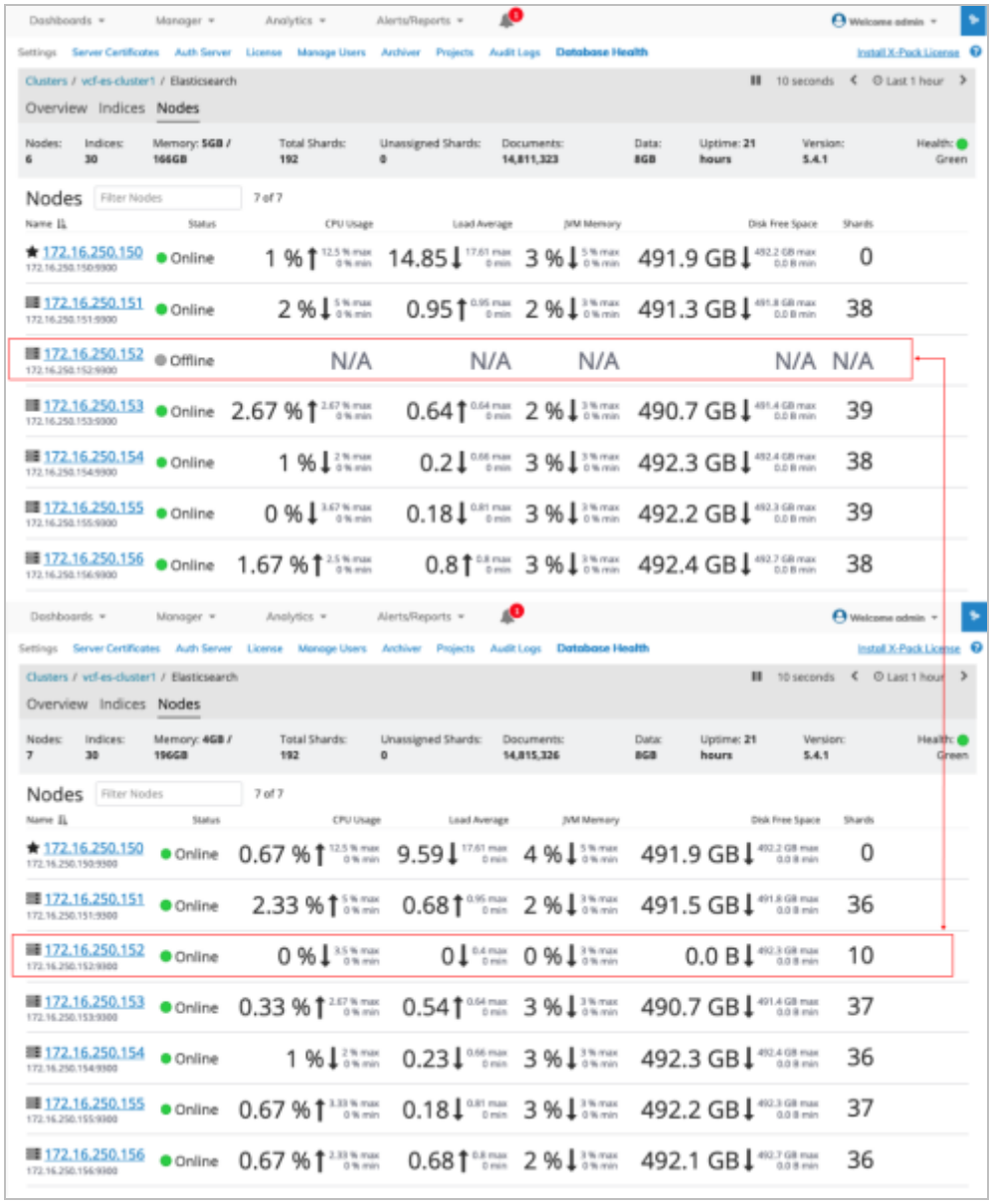
You can confirm the UNUM instance restarts on the second host (10.110.0.207), Host B, in the same VMWare Cluster.



UNUM HA - Configuration Validation - Example - Cluster Instance Failed Over

UNUM Database Health - High Availability Validation after Fail-over

In UNUM, **Settings** → **Database** → **Health** monitor the datanode status. In this example the offline datanode returns to service.



UNUM HA - Configuration Validation - Example - UNUM Datanodes Status

HA Considerations - Cluster

Cluster / Data Node Health:

- Green Cluster is fully operational with replicated data.
- Yellow Cluster is fully operational data is being replicated.
- Red Cluster is operational data has been lost.

Failure of any one Server Node B, C, or D:

Upon failure or removal of any one Server node B, C, or D, the Pluribus UNUM High Capacity Appliance will redistribute data such that no data will be lost.

The Cluster will temporarily go to Yellow, then will recover to Green after data is fully redistributed.

Redistribution of data times will vary depending on system / traffic load.

Normal operation can continue; however, the system is operating in a non-redundant configuration.

The failed or removed Server node, must be replaced as soon as possible.

Failure of more than one Server Node B, C, or D:

Upon failure or removal of more than one Server node B, C, or D will likely result in permanent data loss.

Two of the three Server nodes B, C, and D must be operational for the system to collect, manage and store data properly.

Upon data loss the Cluster status will likely go Red and require replacement of failed or removed Server nodes until at a minimum, two of the three are replaced.

Failure of Server Node A:

Upon failure or removal of the Primary Server node A, data will not be lost, however data collection and connectivity to Pluribus UNUM will stop.

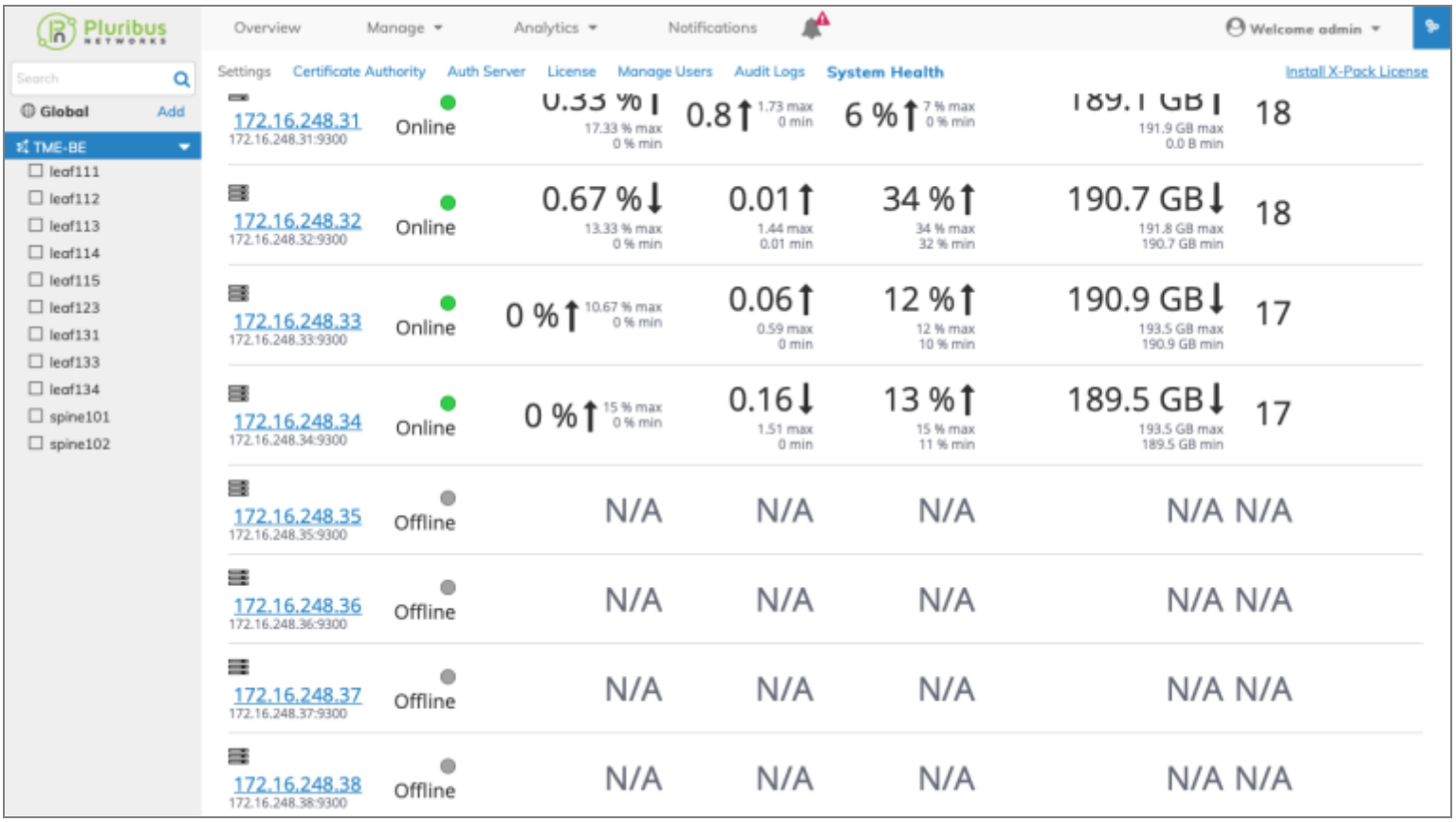
The Primary Server node A must be replaced as soon as possible for normal operation to resume.

Replace a Failed Cluster Server

Data Server Node Replacement

One symptom of a failed **Data Server Node** is the appearance of offline nodes in the UNUM **System Health** dashboard as shown in the example below.

In the example, UNUM displays single ESXi instance with 4 data nodes, all offline.



UNUM System Health Dashboard - Cluster

In the event of a **Cluster Server** failure and you have received a replacement **Server** from Pluribus Networks please use the following instructions to rebuild the **Cluster**.

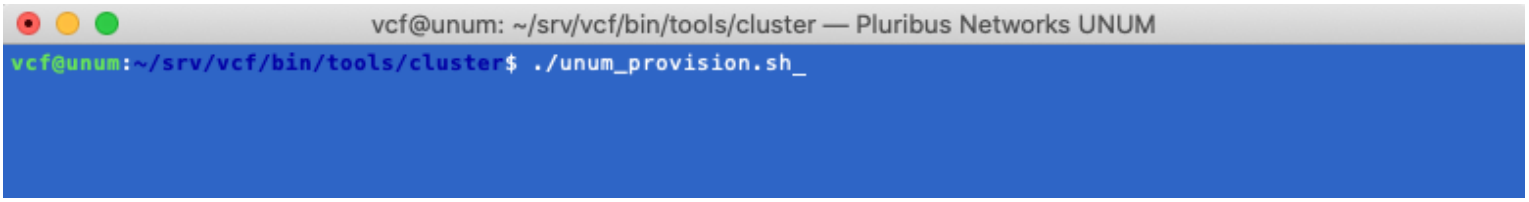
Note: The replacement **Server** you receive has **VMware ESXi** installed. You need to add the Server to the Cluster using the `cluster_menu.sh` configuration script.

Note: The **replacement Server Node** must be connected via the **Eth0** Ethernet interface. Specify **Static IP** address when using static IPs otherwise **DHCP** settings are used.

Replace a Failed Cluster Server (cont'd)

1. Login into the Remote Console of a **Primary VM** instance with your login credential. If you have not changed the default credentials the username and password is "`vcf`" and the password is "`changeme`". The UNUM Cluster setup script is named "`unum_provision.sh`" and is located in the default folder "`/home/vcf/srv/vcf/bin/tools/cluster`".

2. Run the setup script: `./unum_provision.sh`



UNUM Cluster Menu -Setup Script

3. Select Option 2 - **Manage Cluster** from the deployment menu.

UNUM Cluster Menu - Manage Cluster

4. Select Option 5 - **Node Management** - from the setup menu.

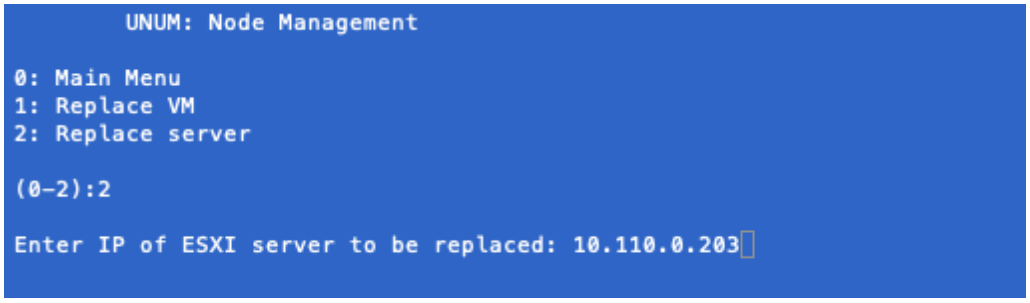
UNUM Cluster Menu - Node Management

5. Select Option 2 - **Replace Server** - from Node Management.

UNUM Cluster Menu - Node Management - Replace Server

Replace a Failed Cluster Server (cont'd)

6. Follow the on-screen instructions. Enter the **IP address** of the **VMWare ESXi Primary Node**. In the event of a **Primary Server Node** failure you use the IP address of a **Data Server Node**. However, the instructions for replacing a **Primary Server Node** server differ slightly. Refer to Primary Server Node replacement for more instructions.



UNUM Cluster Menu - Primary Server Node IP Address

7. Download the applicable **Cluster OVA Template** from the **Pluribus Cloud**. The downloaded OVA version must be the same version as previously installed. Enter the absolute path of the OVA template. Enter **Shift U** and then press the **Tab** key on your keyboard. The downloaded **OVA** template name will be displayed. Press **Enter** to continue. For the **VM Port Group Name** press **Enter** and use the default **AutoCluster**.

UNUM Cluster Menu - OVA Template Path - VM Port Group Name

8. Provisioning of the replacement **Server** begins.

Replace a Failed Cluster Server (cont'd)

```
        UNUM: Node Management

0: Main Menu
1: Replace VM
2: Replace server

(0-2):2

Enter IP of ESXI server to be replaced: 10.110.0.203
Enter absolute path of OVA: UNUM-3.1.0-6176.5-cl.ova
Enter VM port group name [AutoCluster]:
Wed Oct  3 13:15:01 PDT 2018: Invoking provisioning script. Please wait
JSON:{"nodes": [{"host": "172.16.248.31", "serverId": "10.110.0.202", "service": "data,kafka"}, {"host": "172.16.248.32", "serverId": "10.110.0.202", "service":
 "data"}, {"host": "172.16.248.33", "serverId": "10.110.0.202", "service": "data"}, {"host": "172.16.248.34", "serverId": "10.110.0.202", "service": "data"}, {"
host": "172.16.248.35", "serverId": "10.110.0.203", "service": "data,kafka"}, {"host": "172.16.248.36", "serverId": "10.110.0.203", "service": "data"}, {"host":
 "172.16.248.37", "serverId": "10.110.0.203", "service": "data"}, {"host": "172.16.248.38", "serverId": "10.110.0.203", "service": "data"}, {"host": "172.16.248
.39", "serverId": "10.110.0.204", "service": "data"}, {"host": "172.16.248.40", "serverId": "10.110.0.204", "service": "data"}, {"host": "172.16.248.41", "serve
rId": "10.110.0.204", "service": "data"}, {"host": "172.16.248.42", "serverId": "10.110.0.204", "service": "data"}], "esShards": "6"}

Starting thread with arguments: blade_ip: 10.110.0.203 ds_name: datastore1 vm_name: dn-6 node_no: 5
Starting thread with arguments: blade_ip: 10.110.0.203 ds_name: datastore1 vm_name: dn-7 node_no: 6
Starting thread with arguments: blade_ip: 10.110.0.203 ds_name: datastore1 vm_name: dn-8 node_no: 7
Starting thread with arguments: blade_ip: 10.110.0.203 ds_name: datastore1 vm_name: dn-9 node_no: 8
```

UNUM Cluster Menu - Replacement Server Provisioning

When you replace a **Data Node Server** auto-provisioning starts and details appear as the process continues.

The auto-provisioning process typically begins within 10 minutes and provisions the new **Data Node Server**.

```
        UNUM: Node Management

0: Main Menu
1: Replace VM
2: Replace server

(0-2):2

Enter IP of ESXI server to be replaced: 10.110.0.203
Enter absolute path of OVA: UNUM-3.1.0-6176.5-cl.ova
Enter VM port group name [AutoCluster]:
Wed Oct  3 13:15:01 PDT 2018: Invoking provisioning script. Please wait
JSON:{"nodes": [{"host": "172.16.248.31", "serverId": "10.110.0.202", "service": "data,kafka"}, {"host": "172.16.248.32", "serverId": "10.110.0.202", "service":
 "data"}, {"host": "172.16.248.33", "serverId": "10.110.0.202", "service": "data"}, {"host": "172.16.248.34", "serverId": "10.110.0.202", "service": "data"}, {"
host": "172.16.248.35", "serverId": "10.110.0.203", "service": "data,kafka"}, {"host": "172.16.248.36", "serverId": "10.110.0.203", "service": "data"}, {"host":
 "172.16.248.37", "serverId": "10.110.0.203", "service": "data"}, {"host": "172.16.248.38", "serverId": "10.110.0.203", "service": "data"}, {"host": "172.16.248
.39", "serverId": "10.110.0.204", "service": "data"}, {"host": "172.16.248.40", "serverId": "10.110.0.204", "service": "data"}, {"host": "172.16.248.41", "serve
rId": "10.110.0.204", "service": "data"}, {"host": "172.16.248.42", "serverId": "10.110.0.204", "service": "data"}], "esShards": "6"}

Starting thread with arguments: blade_ip: 10.110.0.203 ds_name: datastore1 vm_name: dn-6 node_no: 5
Starting thread with arguments: blade_ip: 10.110.0.203 ds_name: datastore1 vm_name: dn-7 node_no: 6
Starting thread with arguments: blade_ip: 10.110.0.203 ds_name: datastore1 vm_name: dn-8 node_no: 7
Starting thread with arguments: blade_ip: 10.110.0.203 ds_name: datastore1 vm_name: dn-9 node_no: 8
eth0 IP for dn-6 on ESXi host 10.110.0.203 is 10.110.3.115
eth0 IP for dn-7 on ESXi host 10.110.0.203 is 10.110.3.48
eth0 IP for dn-8 on ESXi host 10.110.0.203 is 10.110.3.217
Ping to 10.110.3.115 detected 0% loss
Ping to IP 10.110.3.115 was successful
Logging into 10.110.3.115
eth0 IP for dn-9 on ESXi host 10.110.0.203 is 10.110.3.135
Ping to 10.110.3.48 detected 0% loss
Ping to IP 10.110.3.48 was successful
Logging into 10.110.3.48
Ping to 10.110.3.217 detected 0% loss
Ping to IP 10.110.3.217 was successful
Logging into 10.110.3.217
Ping to 10.110.3.135 detected 0% loss
Ping to IP 10.110.3.135 was successful
Logging into 10.110.3.135
```

UNUM Cluster Menu - Replacement Server Provisioning Details

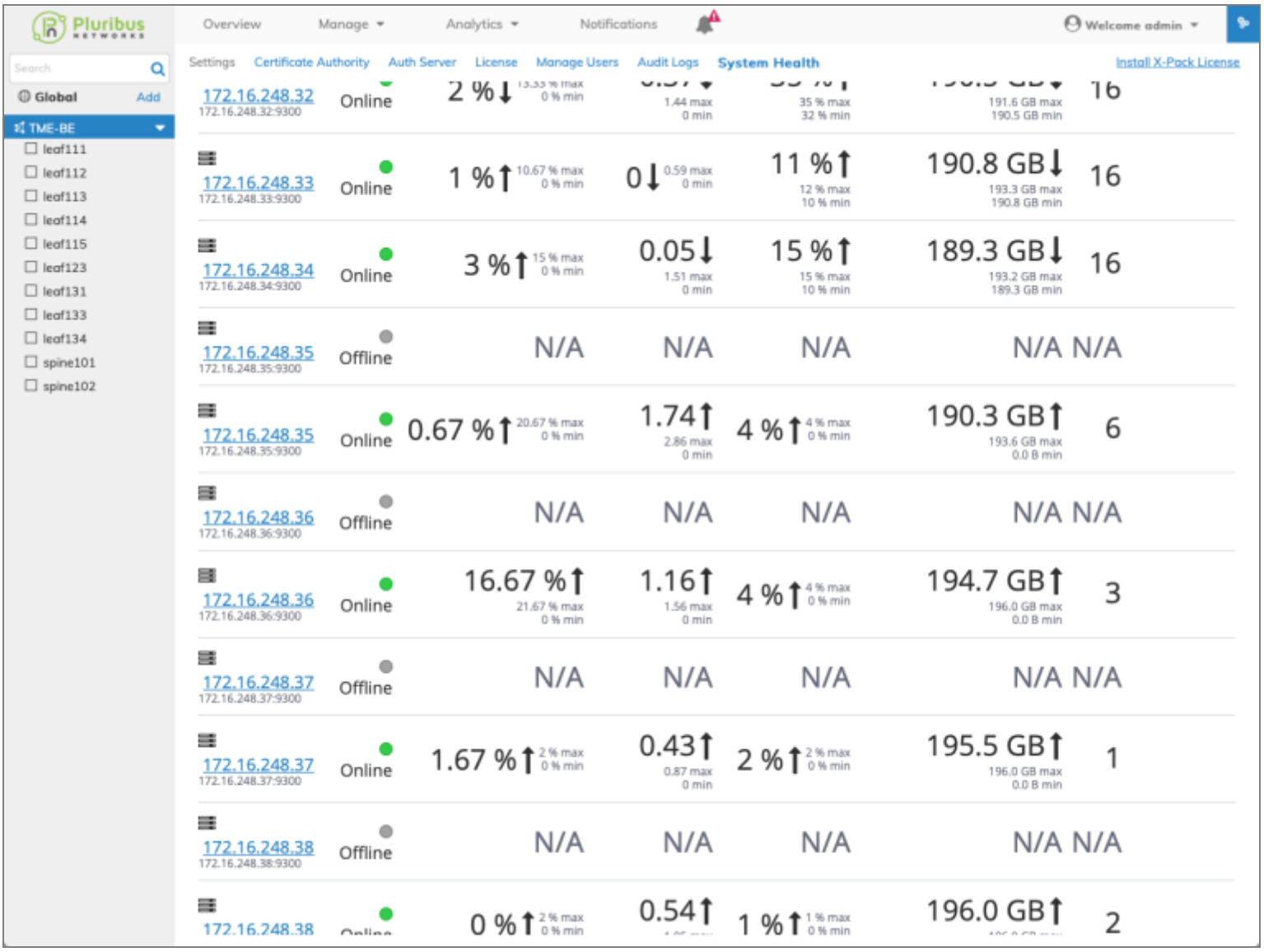
UNUM will restart and **NTP** details for each new **Data Server Node** are displayed along with a summary message indicating Cluster Provisioning passed.

9. Press any key to continue and you return to the configuration menu. Press **0 (zero)** to exit.

Replace a Failed Cluster Server (cont'd)

At any time during the provisioning process you can review the status of the **Data Server Nodes** in the **UNUM System Health** dashboard.

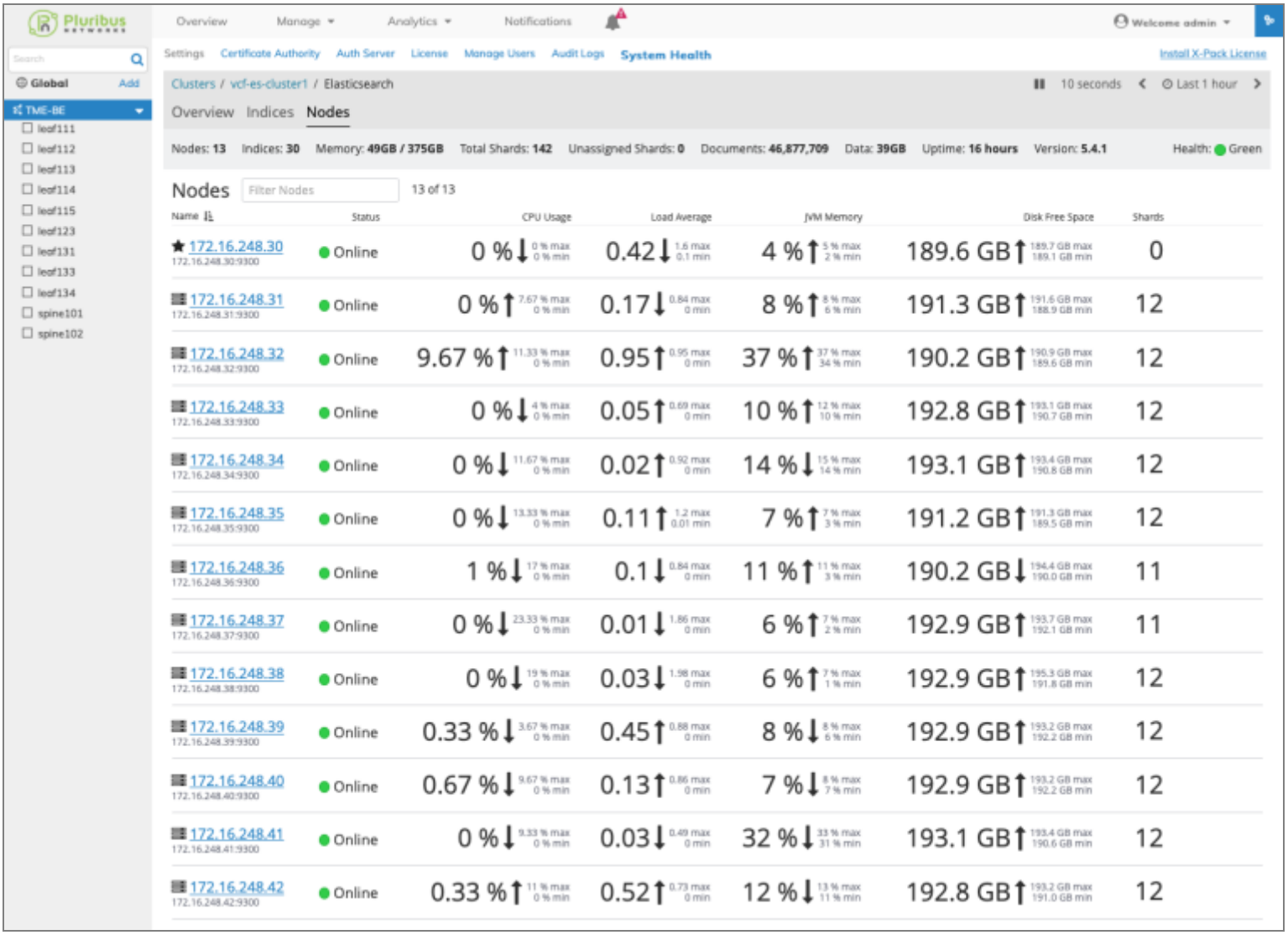
> **Note:** For each **Data Server Node** there is an an **Eth1 IP Address** entry and you may observe two entries per **IP Address**, one **Offline** and one **Online**. This is a normal and expected condition and is temporary until the next automatic data refresh is performed by **UNUM** as shown in the images below. This should normally occur with 20 - 25 minutes.



UNUM Cluster Menu - Replacement Server Offline / Online

Replace a Failed Cluster Server (cont'd)

Data Server Nodes in the UNUM System Health dashboard. (cont'd)



UNUM Cluster Menu - Replacement Server Online

Replace a Failed Cluster Server (cont'd)

Primary Server Node Replacement

Follow the instructions provided above for **Data Server Node** replacement, however you will login to an existing **Data Server Node**.

> **Note:** When the new **Primary Server Node** is inserted into the **Cluster** with already provisioned **Data Server Nodes** and their respective IP addresses match, the **Cluster** will form.

You must run a "**Restore Configuration**" from the "`UNUM_setup.sh`" script located on the new **Primary Server Node** in the "`/home/vcf`" directory to restore previously stored data and configuration. On an UNUM Primary Server Node data is automatically backed up on a daily basis.

Select **Option 8: Advanced Settings** - **Restore Configuration**

Restore Configuration

Select **Option 2** to restore your configuration.

Select the desired backup file from the list of Available Backups and follow the on-screen instructions.

Note: UNUM will be restarted during the process.

```
        UNUM: Advanced Settings

0: Main Menu
1: Backup Configuration
2: Restore Configuration
3: Delete Backup
4: Enable|Disable Debug Mode

(0-4):2

Available backups:  BACKUP-3.1.0-SNAPSHOT-2018-08-23_16:25:22
Enter the backup to restore from []: BACKUP-3.1.0-SNAPSHOT-2018-08-23_16:25:22
To restore configurations, UNUM will be restarted during the process.
Continue? ([Y]es or [N]o) [Yes]:
```

Option 2 - Advanced Settings Restore Configuration

Replace a Failed Cluster Server (cont'd)

Primary Server Node Replacement (cont'd)

```
        UNUM: Advanced Settings

0: Main Menu
1: Backup Configuration
2: Restore Configuration
3: Delete Backup
4: Enable|Disable Debug Mode

(0-4):2

Available backups:  BACKUP-3.1.0-SNAPSHOT-2018-08-23_16:25:22
Enter the backup to restore from []: BACKUP-3.1.0-SNAPSHOT-2018-08-23_16:25:22
To restore configurations, UNUM will be restarted during the process.
Continue? ([Y]es or [N]o) [Yes]: Yes
2018-08-23 16:33:29 Preparing to restore, please wait ...
2018-08-23 16:33:40 Downloading files ..........................
2018-08-23 16:34:06 Restoring database from /tmp/unum_backup/postgres-dump.sql ...
2018-08-23 16:34:15 Restore completed successfully.
2018-08-23 16:34:15 Stopping UNUM 3.1.0-SNAPSHOT ...
2018-08-23 16:34:17 Stopping vcf-elastic ...
2018-08-23 16:34:31 Stopping vcf-collector ...
2018-08-23 16:34:33 Stopping vcf-mgr ...
2018-08-23 16:34:40 Stopping skedler ...
2018-08-23 16:34:41 Stopping vcf-center ...
2018-08-23 16:34:42 Stopping vcf-dhcp ...
2018-08-23 16:34:43 Services have been successfully stopped.
2018-08-23 16:34:43 Starting UNUM 3.1.0-SNAPSHOT ...
2018-08-23 16:34:44 Starting vcf-elastic ...
2018-08-23 16:34:44 Starting vcf-collector ...
2018-08-23 16:34:46 Starting vcf-mgr ...
2018-08-23 16:34:46 Starting skedler ...
2018-08-23 16:34:47 Starting vcf-center ...
2018-08-23 16:34:48 Starting vcf-dhcp ...
2018-08-23 16:34:49 Services have been successfully started.
Press any key to continue ...
```

Option 2 - Advanced Settings Restore Process

When the **Data Server Node** (with data node VMs) is inserted into the Cluster with **Primary Server Node** and **Data Server Node** and the IP address matches the previous IP Address the auto provisioning begins and the **Cluster** will eventually form.

Pluribus Software Support

For Pluribus software support, you can purchase optional support contracts from your partner, reseller, or Pluribus Networks.

Purchasing a support contract from a local partner is sometimes preferred due to geographical or language requirements.

Please contract your local partner to better understand the available service programs and pricing.

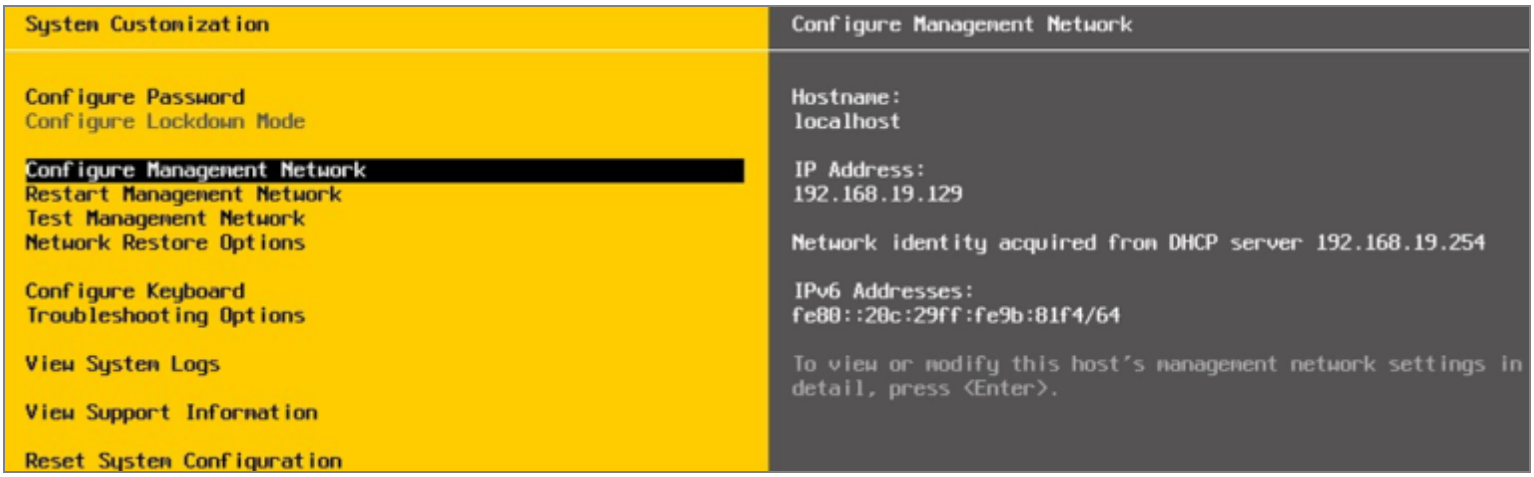
If you purchased a Pluribus FreedomCare maintenance agreement, you can contact Pluribus Networks directly for support requirements.

Appendix A

Static IP Assignment for ESXI Management (eth0) Interface

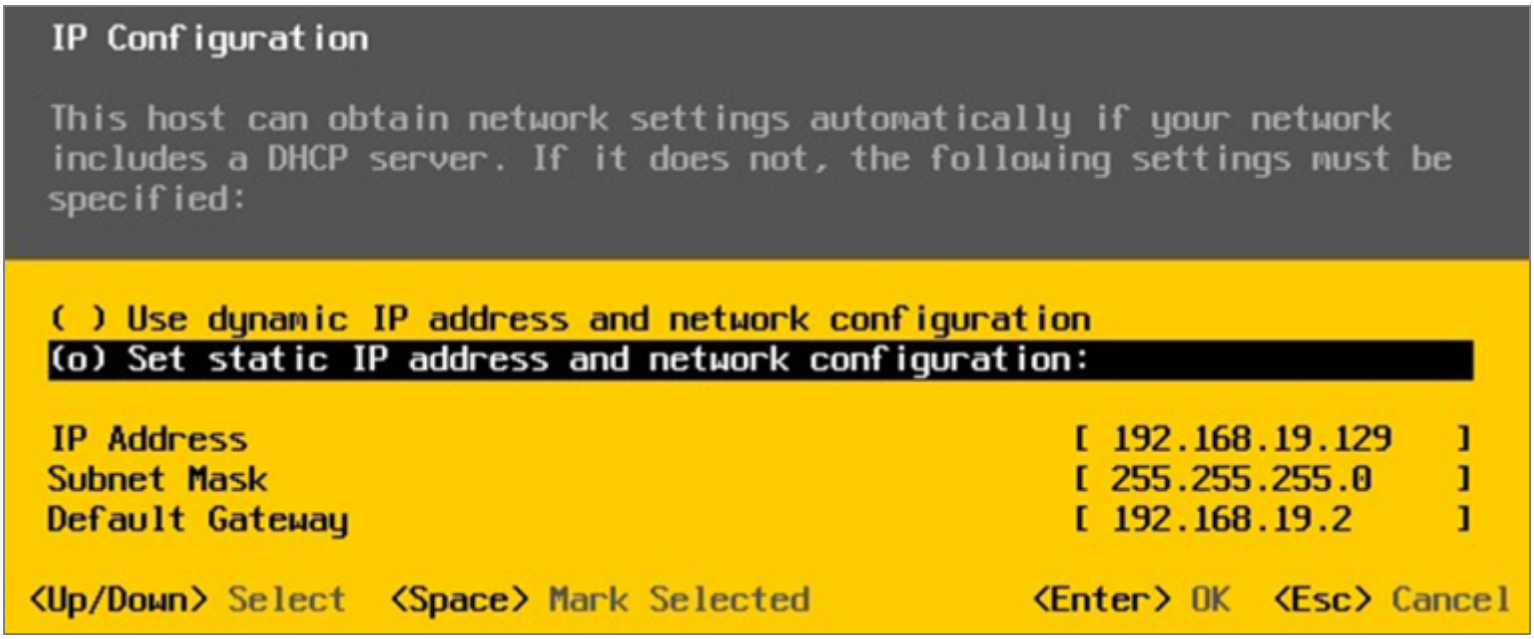
1. Connect to the ESXi console and Press **F2** to log in to DCUI.

2. In the **System Customization** screen, move the cursor down and select **Configure Management Network**:



EXSI Management - Configure Management Network

3. Select **IP Configuration** and press **Enter** to assign an IP address:



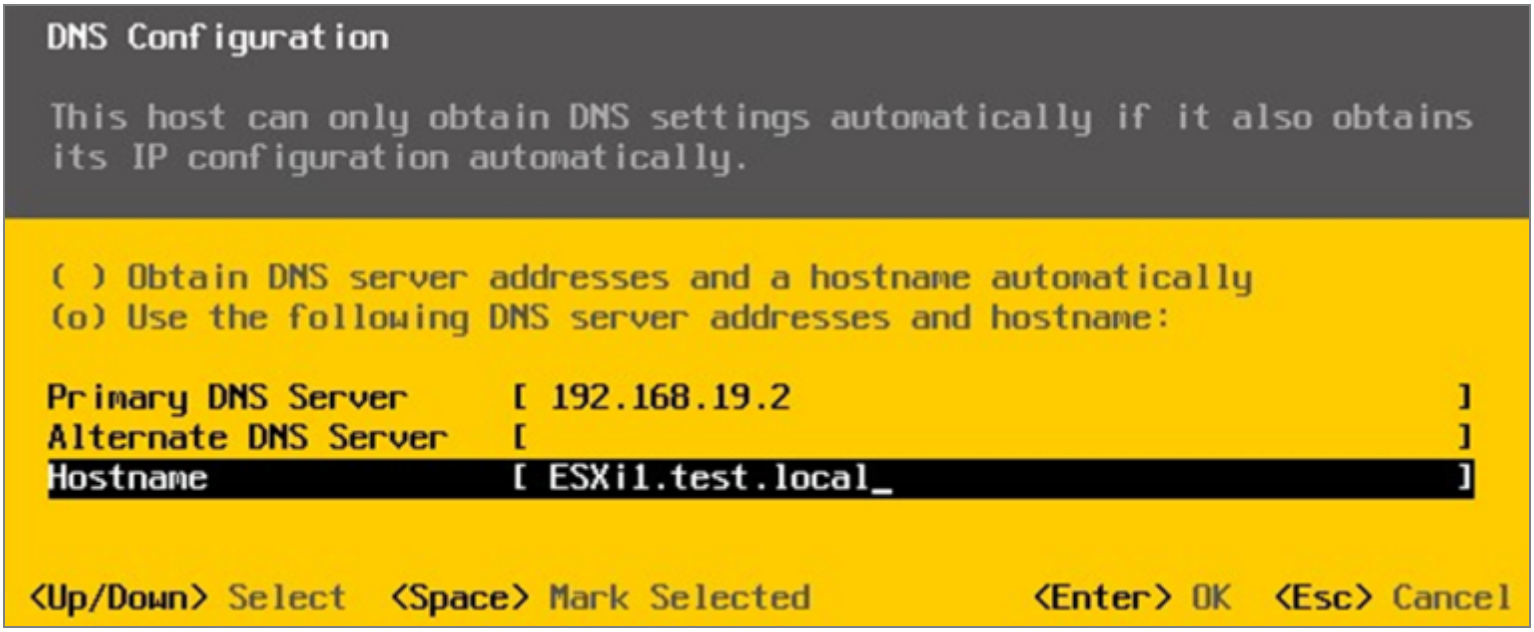
EXSI IP Configuration

4. Select "Set static IP address and network configuration" and press **Enter**.

Appendix A (cont'd)

5. Now, you will be back on the **Configure Management** screen; scroll down to the DNS Configuration and press **Enter** to modify the DNS IP settings.

6. You will be presented with the DNS configuration where you need to enter the DNS Server IP address and hostname. When you have finished entering the details, press **Enter**.



EXSI DNS Configuration

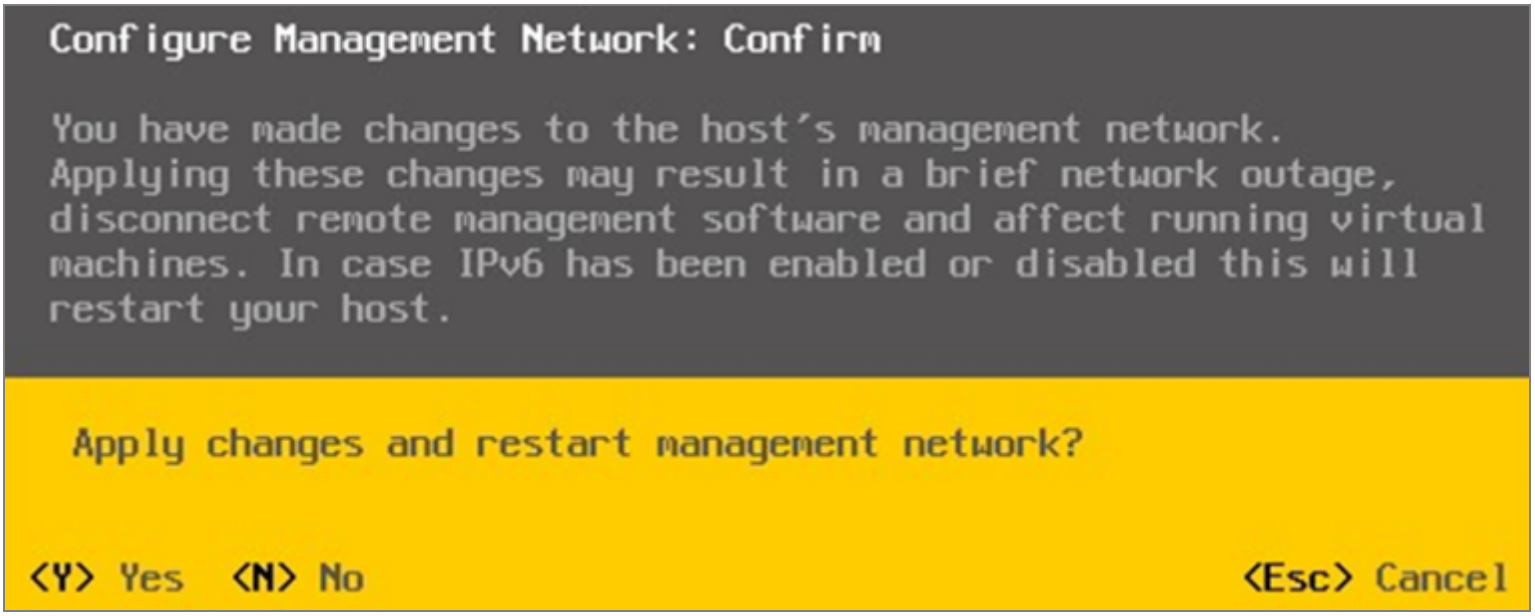
7. Now, you will be back on the **Configure Management** screen. Scroll down to **Custom DNS Suffixes** and press **Enter** to change DNS suffixes.

8. In **Custom DNS Suffixes**, modify the **suffixes** as required, press **Enter**:

EXSI Custom DNS Suffixes

Appendix A (cont'd)

9. You need to save the configuration that has been changed, from the **Configure Management Network**, press **Esc** and you will be asked for confirmation on the **Configure Management Network** scene:



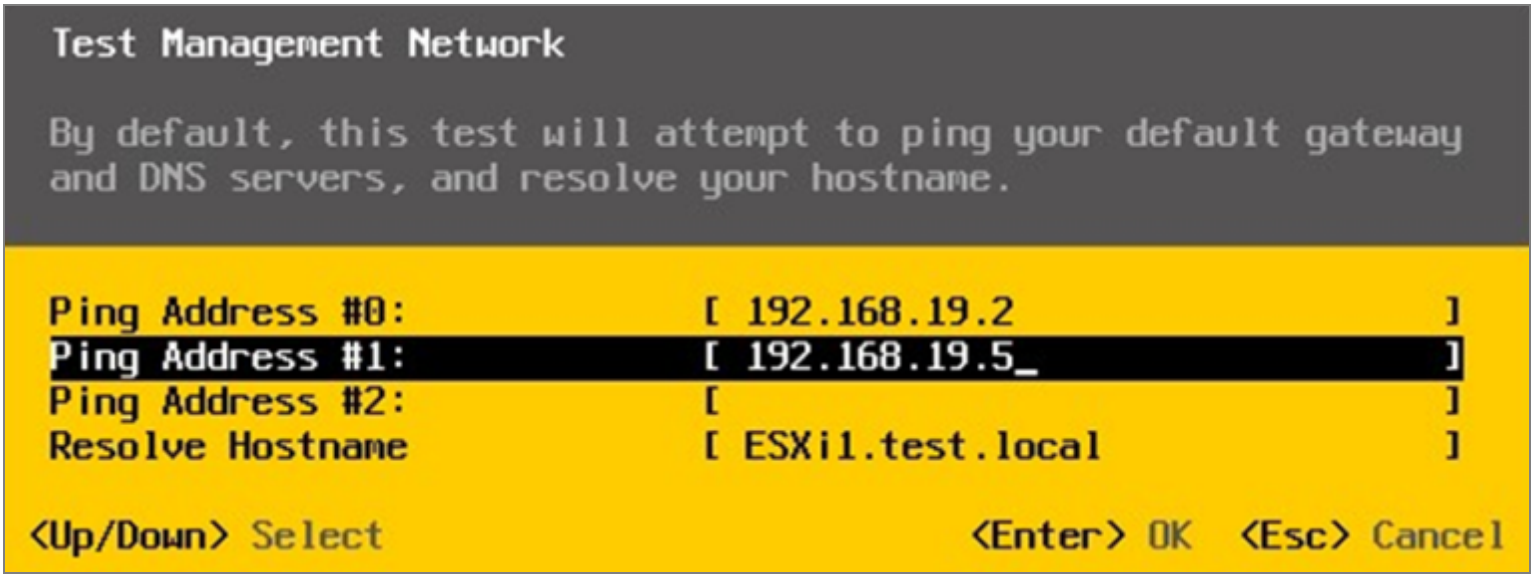
EXSI Configure Management Network - Confirm

10. Press **Y** to confirm the settings; this will save the settings and restart the management network.

11. If you want to make sure that the configuration is correct, from the **System Customization** screen you can perform the test management network operation. To proceed with the test, select **Test Management Network** and press **Enter**.

12. The ESXi host will try to ping the DNS servers and the default gateway and resolve the configured host name:

Appendix A (cont'd)



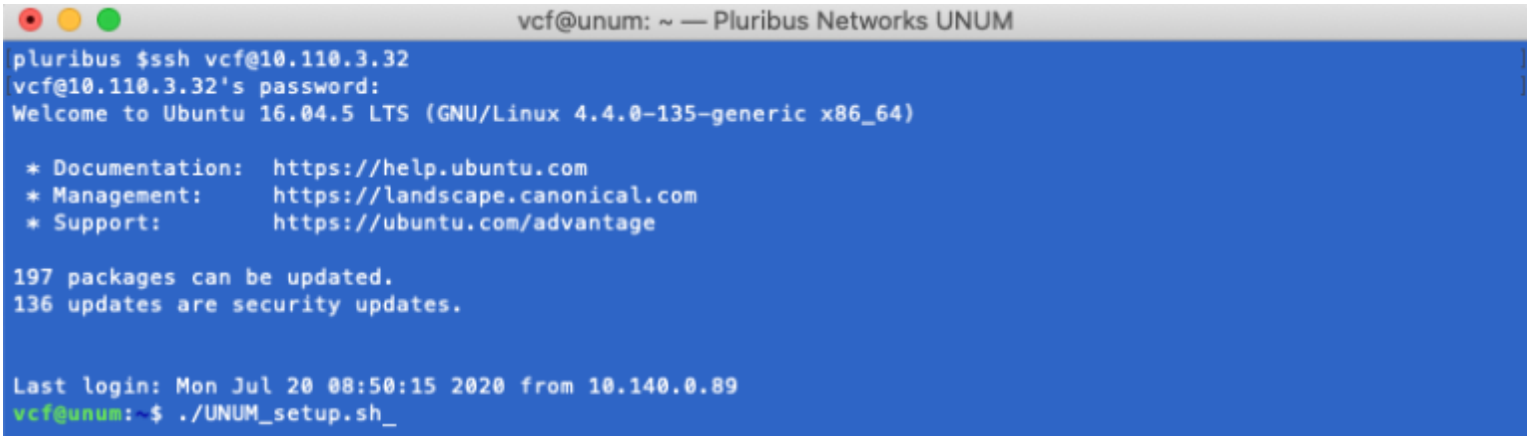
ESXI Test Management Network

13. Press **Enter** to proceed with the testing, and the test will show the status as **OK** or **Failed**. If you notice any failure, make sure that you have configured the correct settings.

Appendix B

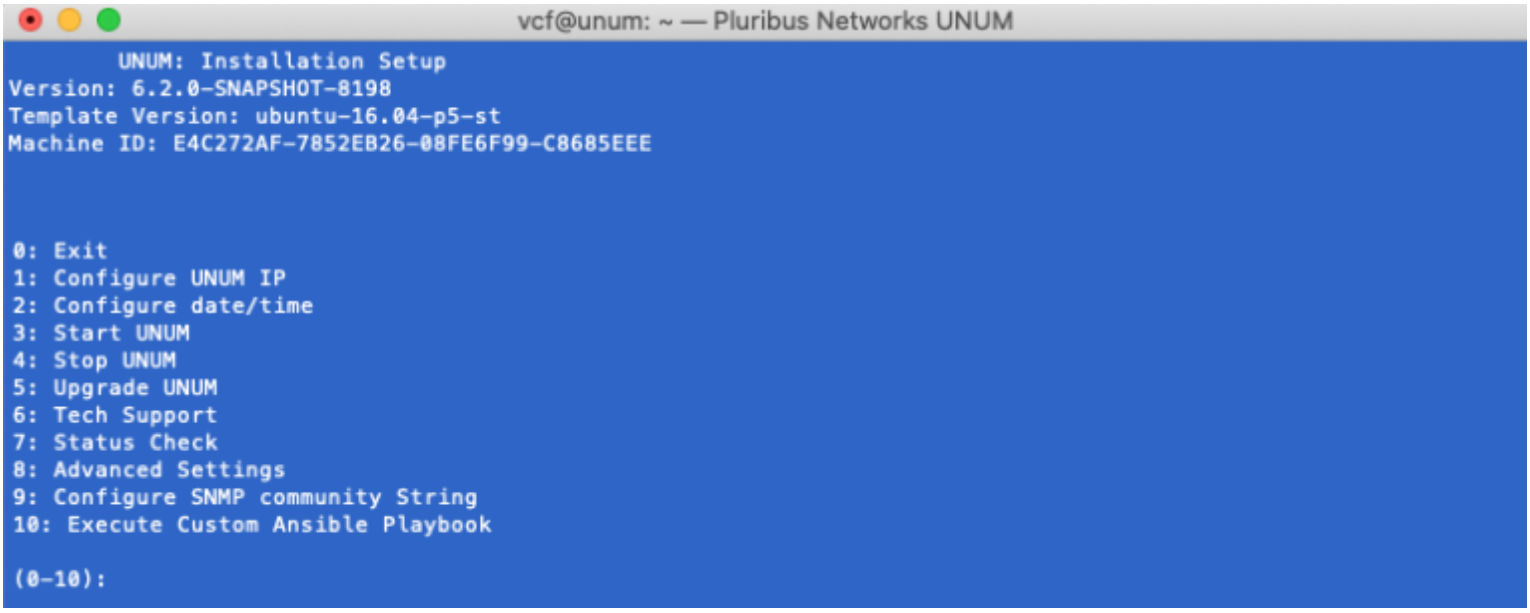
Static IP Assignment Pluribus UNUM Management (eth0) Interface

1. **Login** - If desired to set a static IP for Pluribus UNUM, log into the VM via the console with the credentials `vcf/changeme`.



UNUM Console Login Screen

2. **Run** `./UNUM_setup.sh`:



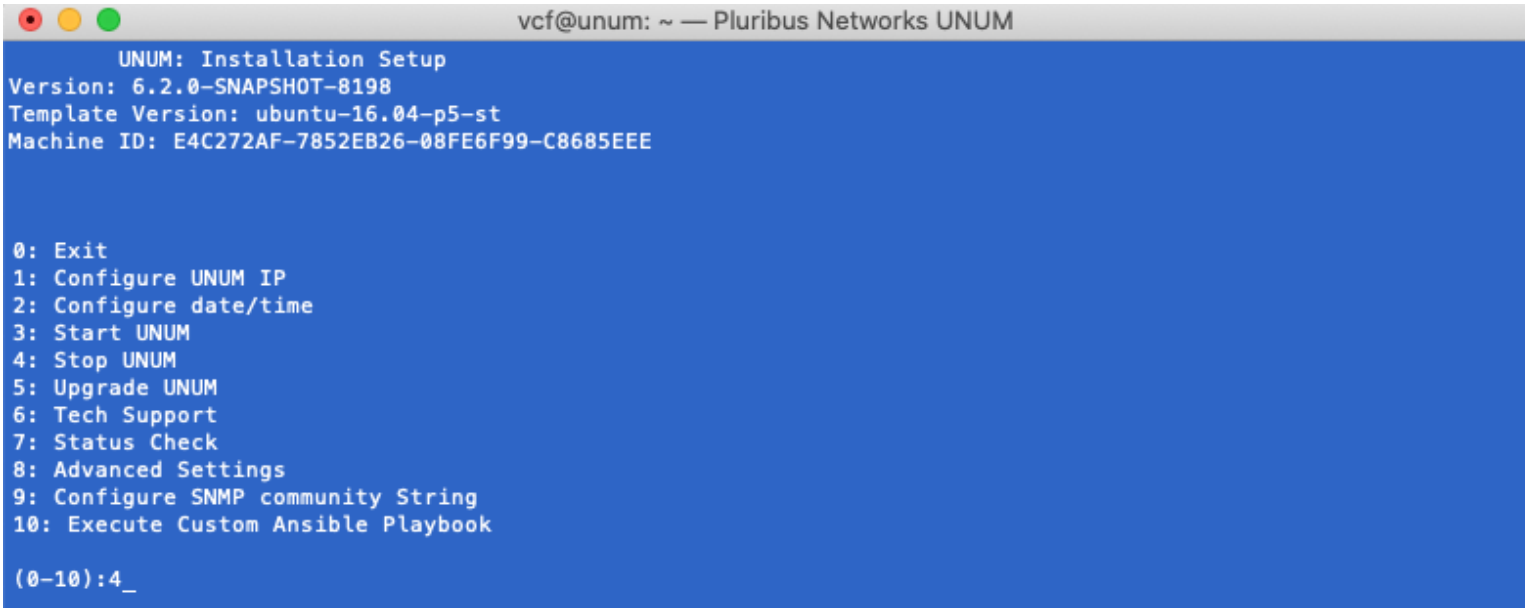
Run UNUM_setup.sh Script

Appendix B (cont'd)

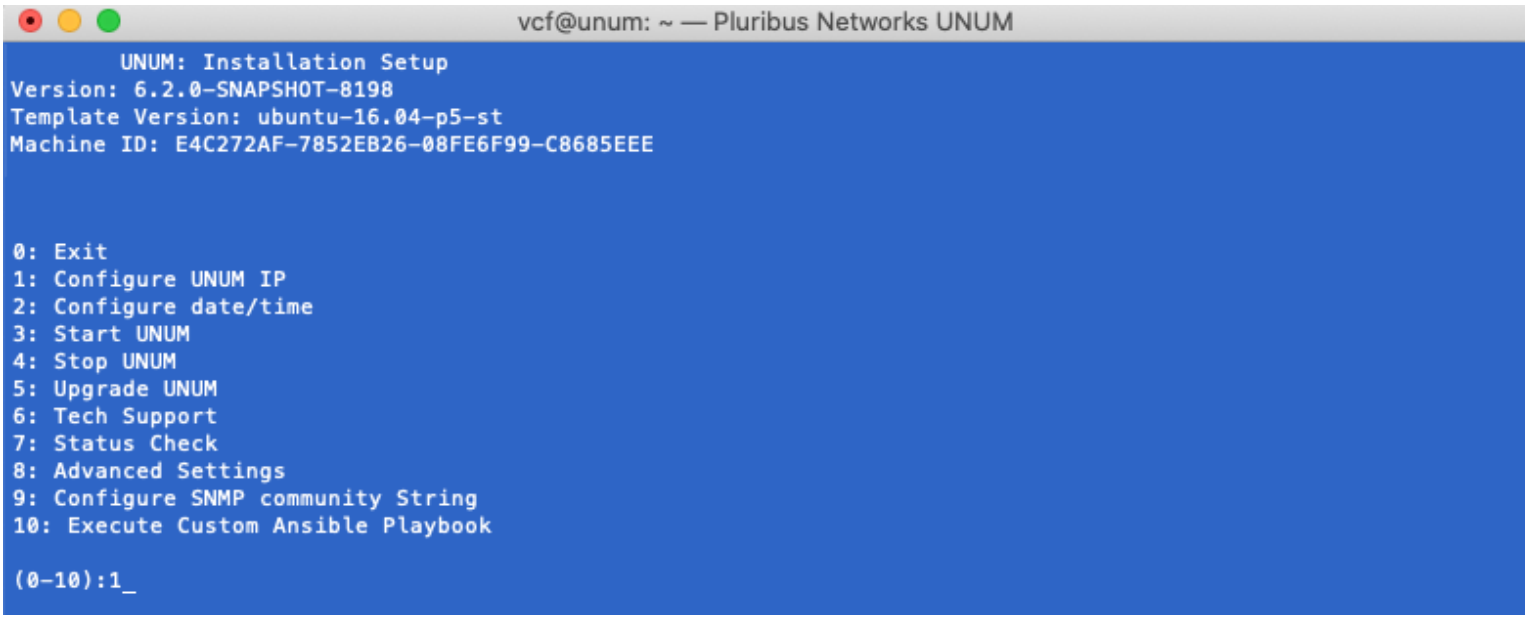
Configure UNUM IP

You may now configure the **Host IP** by selecting **Option 1**. Follow the on-screen instructions for entering the **Host IP** address.

> **Note:** Before you can configure or edit **UNUM IP Addresses**, you must first stop UNUM using **Option 4**.



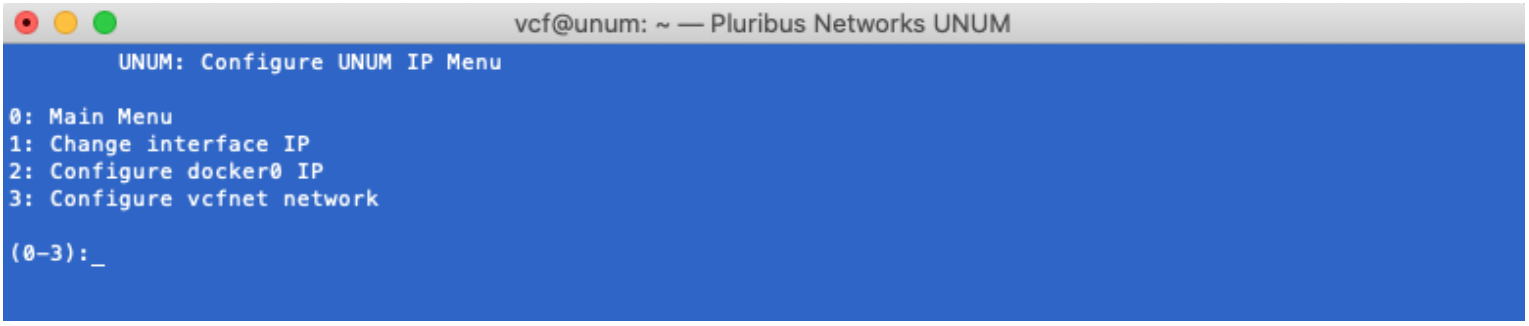
UNUM Options Menu - Stop UNUM



UNUM Options Menu - Configure IP

Appendix B (cont'd)

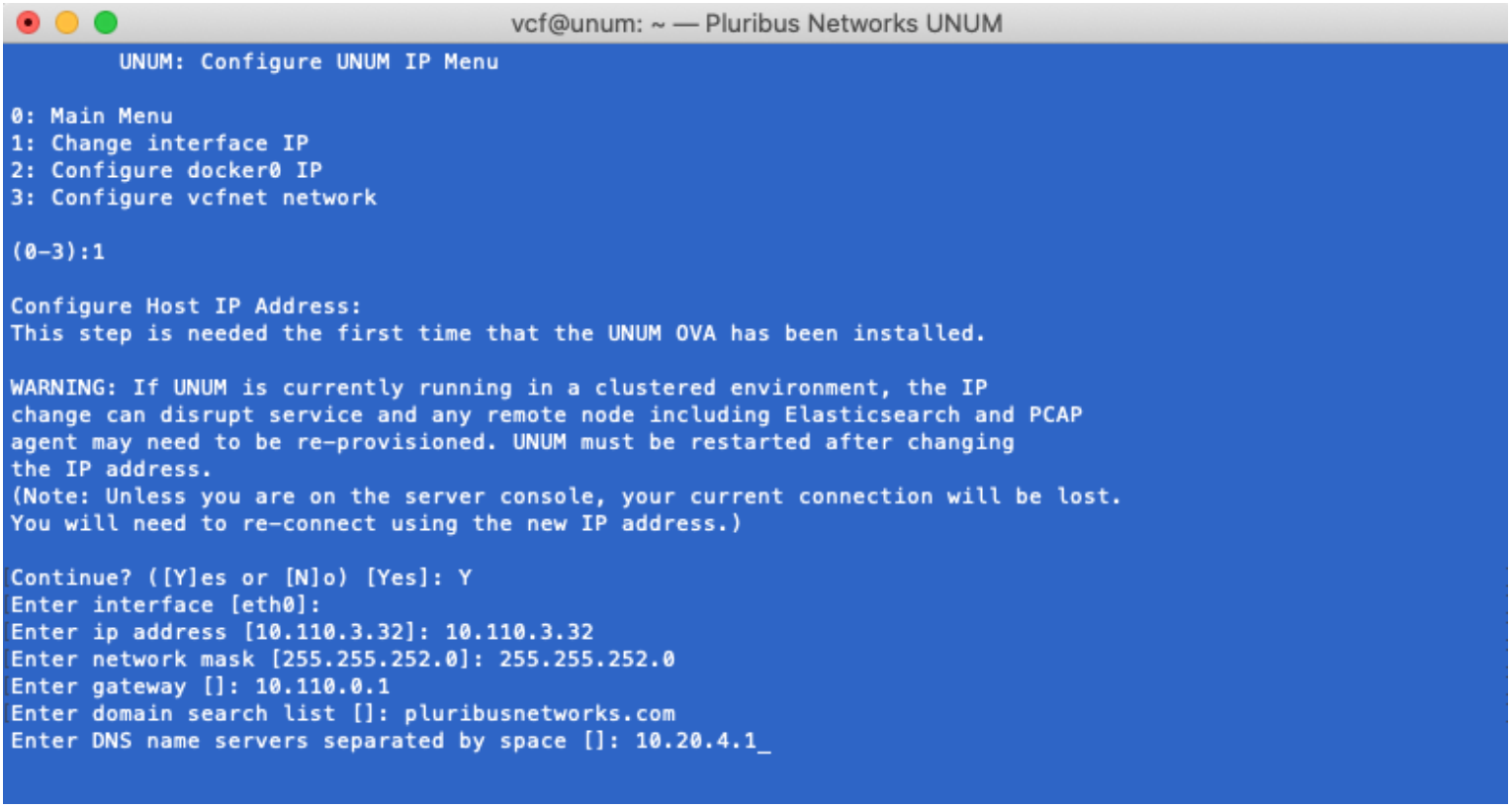
Configure UNUM IP (cont'd)



UNUM Configure UNUM IP Menu

Appendix B (cont'd)

Configure UNUM IP (cont'd)



UNUM - Configure Host IP

Note: Please review the following usage information regarding the Ethernet adapters used by UNUM:

Eth0:	used for management, GUI (user interaction) and data collection via Netvisor REST. This interface uses DHCP by default.
Eth1:	used for internal system communication as clustered UNUM VM instances **REQUIRE** a range of IP address settings for **Eth1** before normal operations begin. **Eth1** is set to IP address `172.16.250.150/24` by default. **WARNING!** If you change the IP addresses of **Eth1** in a cluster configuration, you disrupt normal operations. Please contact **Pluribus Networks Technical Support** if you need or want to change the **Eth1** address in a cluster configuration.
Eth2:	<Optional> used to connect a Seed Switch or Fabric via an inband connection.

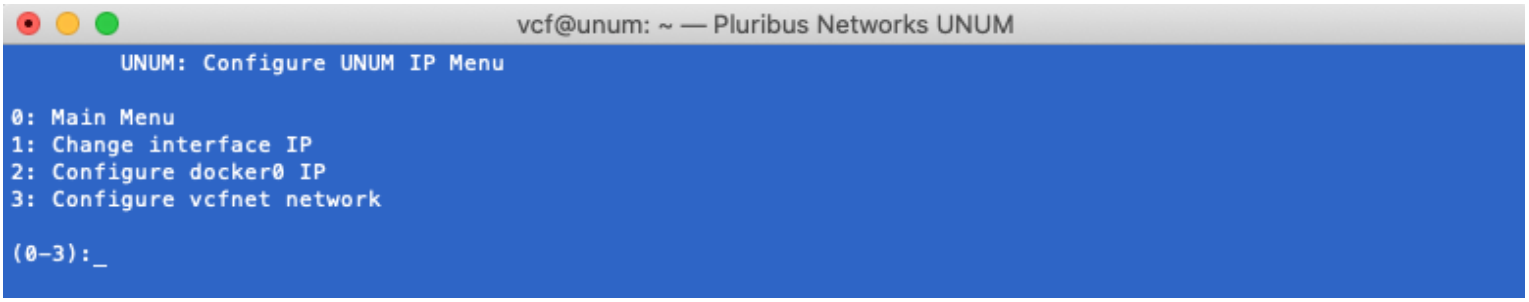
UNUM Ethernet Adapters Usage Table

Configure Docker0 IP

UNUM uses a default docker **IP** address of **172.17.251.1/24** for internal communication.

> **Warning:** **In the majority of deployments, there is no need to change this address.**

However, if you use the default range as the UNUM management network there could be network conflicts within your network. Therefore, you have the ability to modify the **docker0** interface **IP** address using **Option 2** - **Configure docker0 IP**.



UNUM - Configure Docker0 & VCFnet Bridge IP

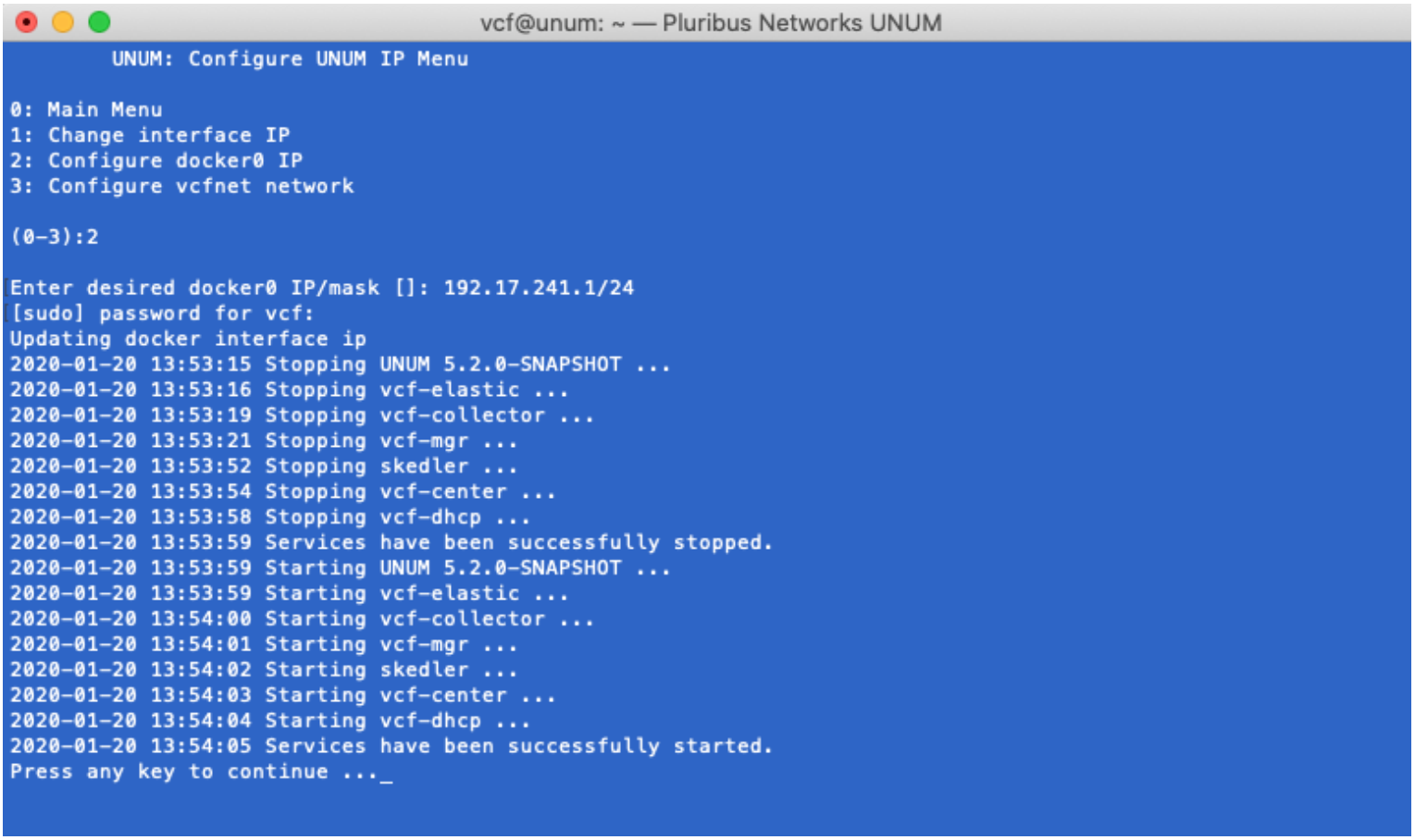
Select **Option 2 - Configure docker0 IP.**

Enter the desired **IP** address range and mask. (Shown below as example only.)

Enter the sudo password.

UNUM updates the **docker0 IP** address, stopping and restarting services.

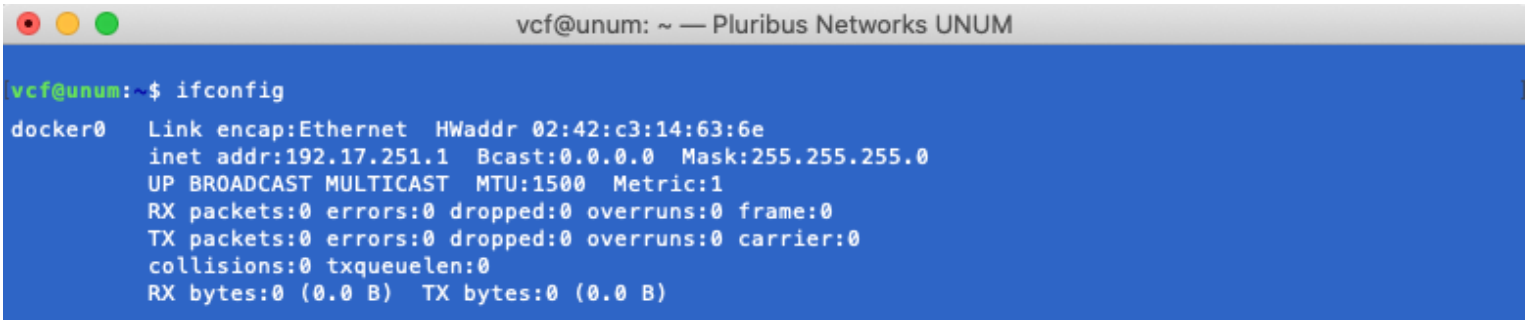
Appendix B (cont'd)



UNUM - Configure Docker0 IP

Press any key to continue.

If required, view the new **docker0 IP** address using **ifconfig** from a command prompt.



UNUM - New Docker0 IP Address

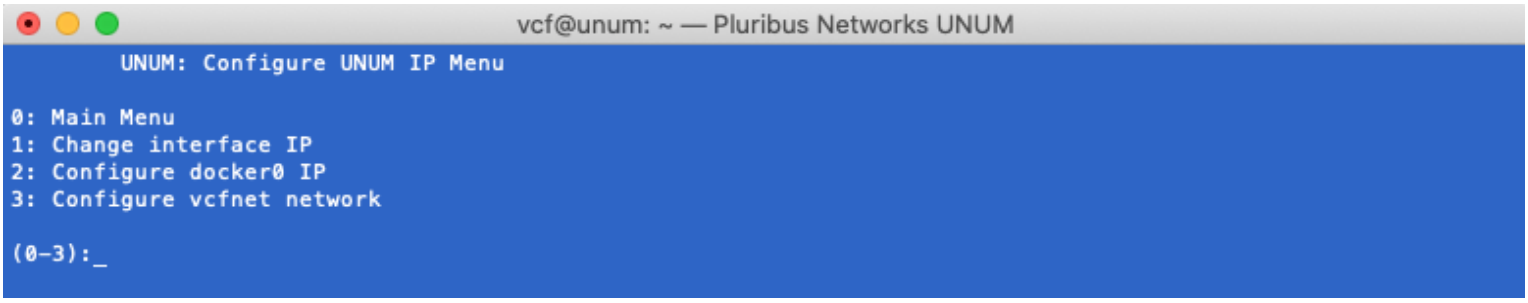
Note: The **docker0 IP** address has to be a specific host IP address and mask.

Configure VCFnet Network

UNUM uses a default **VCFnet IP** address of **172.18.251.1/24** for internal communication.

However, if you use the default range as the UNUM management network there could be network conflicts within your network.

Therefore, you have the ability to modify the **VCFnet** interface **IP** address using **Option 3** - **Configure vcfnet network**.



UNUM - Configure VCFnet Network IP

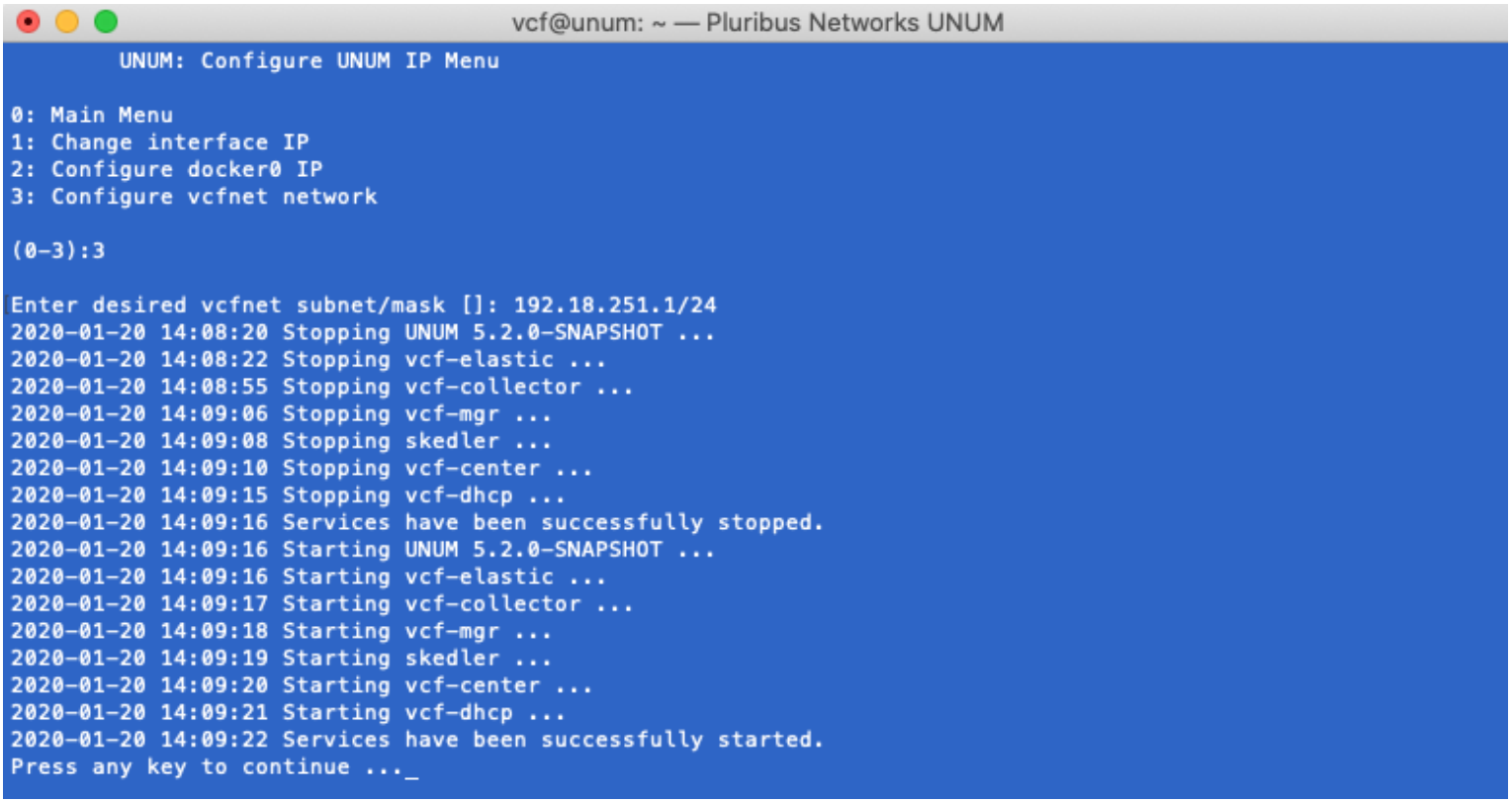
Select **Option 3 - Configure vcfnet Network.**

Enter the desired **IP** address range and mask. (Shown below as example only.)

Enter the sudo password.

UNUM updates the **vcfnet IP** address, stopping and restarting services.

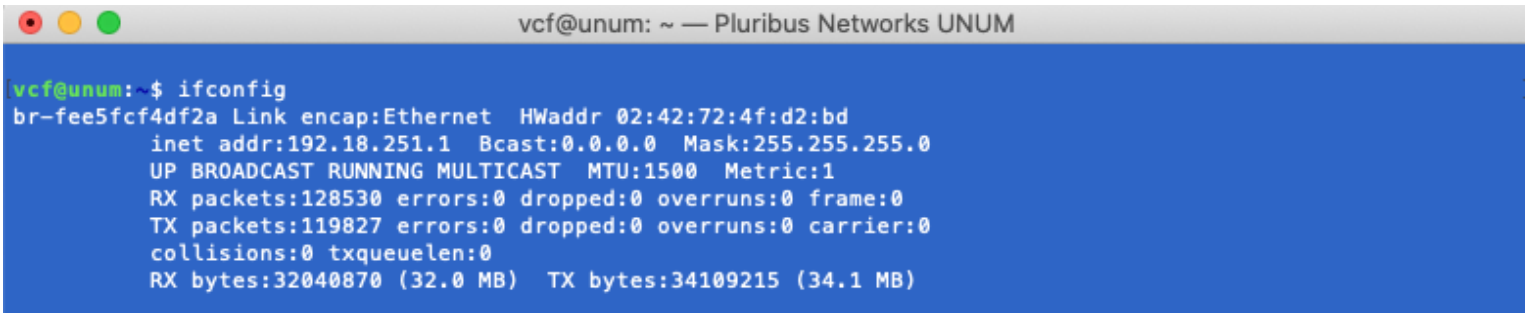
Appendix B (cont'd)



UNUM - Configure VCFnet Network IP

Press any key to continue.

If required, view the new **vcfnet IP** address using **ifconfig** from a command prompt.



UNUM - New vcfnet IP Address

> **Note:** The **vcfnet IP** address has to be a specific network IP address and mask.

If no further configuration changes are required, use **Option 3** to restart UNUM otherwise proceed to the next step.

About Pluribus Networks

Pluribus Networks delivers an open, controllerless software-defined network fabric for modern data centers, multi-site data centers, and distributed cloud edge environments.

The Linux-based Netvisor® ONE operating system and the Unified Cloud Fabric™ have been purpose-built to deliver radically simplified networking and comprehensive visibility along with white box economics by leveraging hardware from our partners Dell EMC, Edgecore, Celestica and Champion ONE, as well as Pluribus' own Freedom™ Series of switches.

The Unified Cloud Fabric provides a fully automated underlay and virtualized overlay with comprehensive visibility and brownfield interoperability and optimized to deliver rich and highly secure per-tenant services across data center sites with simple operations having no single point of failure.

Further simplifying network operations is Pluribus UNUM™, an agile, multi-functional web management portal that provides a rich graphical user interface to manage the Unified Cloud Fabric. UNUM has two key modules - UNUM Fabric Manager for provisioning and management of the fabric and UNUM Insight Analytics to quickly examine billions of flows traversing the fabric to ensure quality and performance.

Pluribus is deployed in more than 275 customers worldwide, including the 4G and 5G mobile cores of more than 75 Tier 1 service providers delivering mission-critical traffic across the data center for hundreds of millions of connected devices. Pluribus is networking, simplified.

For additional information contact Pluribus Networks at info@pluribusnetworks.com or visit www.pluribusnetworks.com

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