Hitachi Vantara

Configuring Hitachi Dynamic Link Manager on VMware ESXi using Cisco Unified Computing System and a Hitachi Storage System

v1.0

Configuration Guide

This guide shows how to configure Hitachi Dynamic Link Manager (HDLM) with VMware ESXi on a Hitachi Virtual Storage Platform (VSP) storage system using Cisco Unified Computing System (Cisco UCS).

MK-SL-328-00

Hitachi Vantara

April 2025

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Preface

About this document

This document shows how to configure Hitachi Dynamic Link Manager (HDLM) with Cisco Unified Computing System (UCS) and VMware ESXi on a Hitachi Virtual Storage Platform (VSP) storage system.

To use this document, you must have a basic understanding of Cisco UCS, VMware ESXi systems, Hitachi VSP storage systems, HDLM, and NMP positions.

Intended audience

This document is intended for technical audiences who need an overview of the configuration of HDLM for Cisco UCS with VMware ESXi on the Hitachi VSP Storage Systems using the GUI.

Revision History

Revision	Changes	Date
v1.0	Initial Release	April 2025

Accessing product downloads

Product user documentation is available on the Hitachi Vantara Support Site: https://docs.hitachivantara.com/. Check this site for the most current documentation, including important updates that may have been made after the release of the product. For more information on the operating system, see the operating system documentation. For the product support matrix, see the Product Compatibility Guide: https://compatibility.hitachivantara.com/

For Cisco UCS support, please check their site:
Cisco UCS Compatibility Matrix: Cisco UCS Hardware Compatibility List

For OS support, please check their support site:
VMware ESXi: https://techdocs.broadcom.com/

Getting Help

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Introduction

Purpose

This document shows how to configure Hitachi Dynamic Link Manager (HDLM) with Cisco Unified Computing System (UCS) in End host mode (EHM) for VMware ESXi 8.0 update 3 on a Hitachi Virtual Storage Platform (VSP) storage system, using Brocade or Cisco FC switches.

HDLM enhances storage performance by managing multiple paths between ESXi hosts and VSP storage systems, offering load balancing and failover capabilities. In addition, this document shows how to integrate VMware Native Multipathing Plugin (NMP) with HDLM.

This configuration ensures improved storage reliability and system resilience.
The purpose of this document is how to configure HDLM on Cisco UCS test setup (with EHM and OS: VMware ESXi 8.0u3).

The following lists the benefits of configuring HDLM on VMware ESXi using the GUI in a Cisco UCS testbed:

- **Ease of use**: The GUI is intuitive and user-friendly, enabling administrators without extensive command-line experience to easily configure and manage HDLM.
- **Visual feedback**: A graphical interface provides real-time visual indicators and status updates, simplifying the process of monitoring installation progress and identifying issues.
- **Reduced errors:** The GUI reduces the risk of syntax errors or incorrect commands that are common in the CLI.
- **Simplified path management**: HDLM management, including load balancing and failover configuration, is more straightforward through the GUI, where options are clearly labelled and easy to navigate.
- **Better monitoring**: The GUI offers a comprehensive visual overview of active paths, performance metrics, and status alerts, improving the ability to monitor and troubleshoot the system.
- **Accessibility**: The GUI is accessible through tools such as vSphere Web Client, which is widely used in VMware environments, offering consistency in management practices.
- **Quicker learning curve**: Using the GUI, administrators who are unfamiliar with VMware ESXCLI or complex scripting can quickly adapt to HDLM management.

  This configuration enhances the overall availability and performance of the storage environment, minimizing downtime and optimizing resource utilization in VMware ESXi with Hitachi VSP storage systems within the Cisco UCS test setup.

Connectivity Diagram

The following diagram shows the connectivity between the hardware components that were used for this test bed:

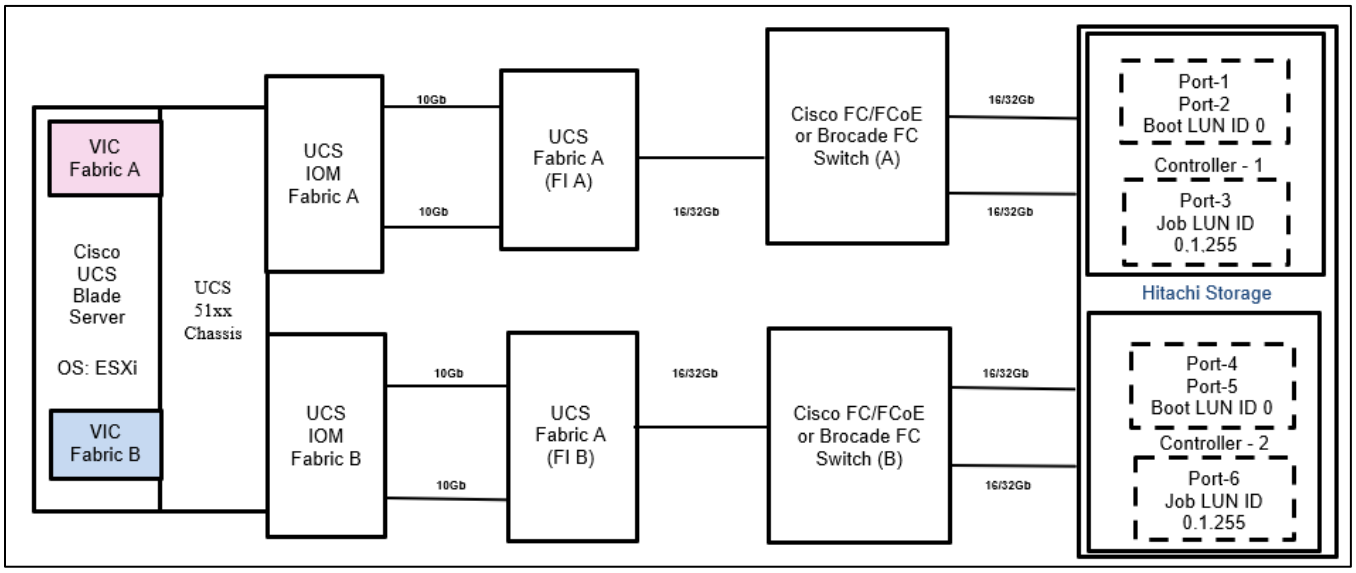


Figure 1: Topology of Cisco UCS EHM with a Hitachi storage system

The following diagram shows how the ESXi host, where the HDLM is installed, is connected to the VSP storage system through two Brocade switches. You can use either Cisco or Brocade switches, or a combination of both.

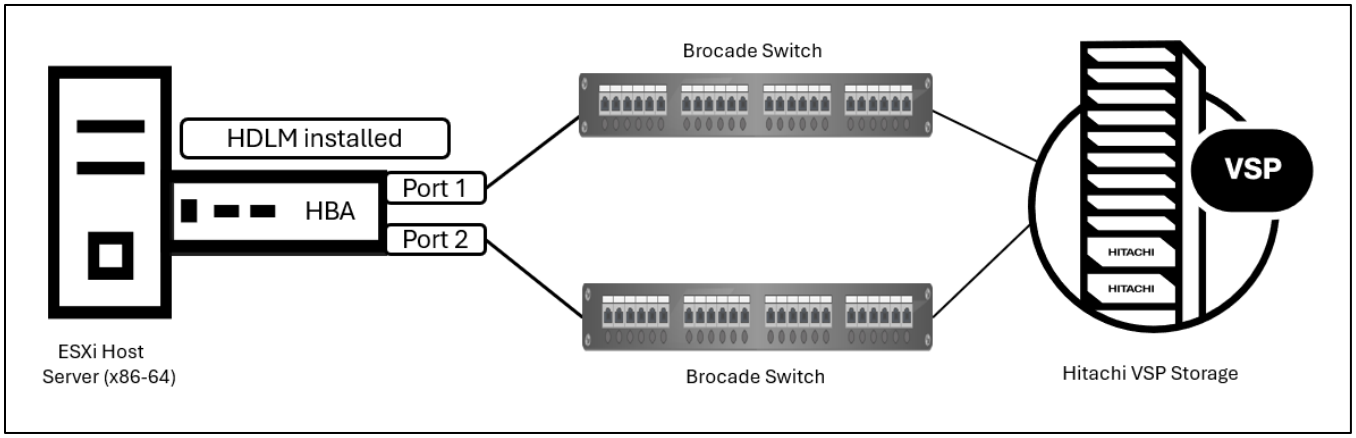


Figure 2: Connectivity of the ESXi host (with HDLM) to the VSP storage system through two Brocade switches

Hardware Requirements

The following lists the hardware components used for this implementation:

- 1 x Cisco UCS Chassis 51xx
- 2 x Cisco UCS FI 6xxx (with 1 x FI FC port from each UCS FI)

- 1 x Cisco UCS Blade Server
- 2 x Cisco UCS I/O Modules (IOM)
- 1 x VSP storage system with 4 x ports: 2 ports for Boot LUN and 2 ports for Job LUN
- 2 x Cisco FC or FCoE switches / Brocade FC switches

Note: You can use either Cisco or Brocade switches, or a combination of both.

Software Requirements

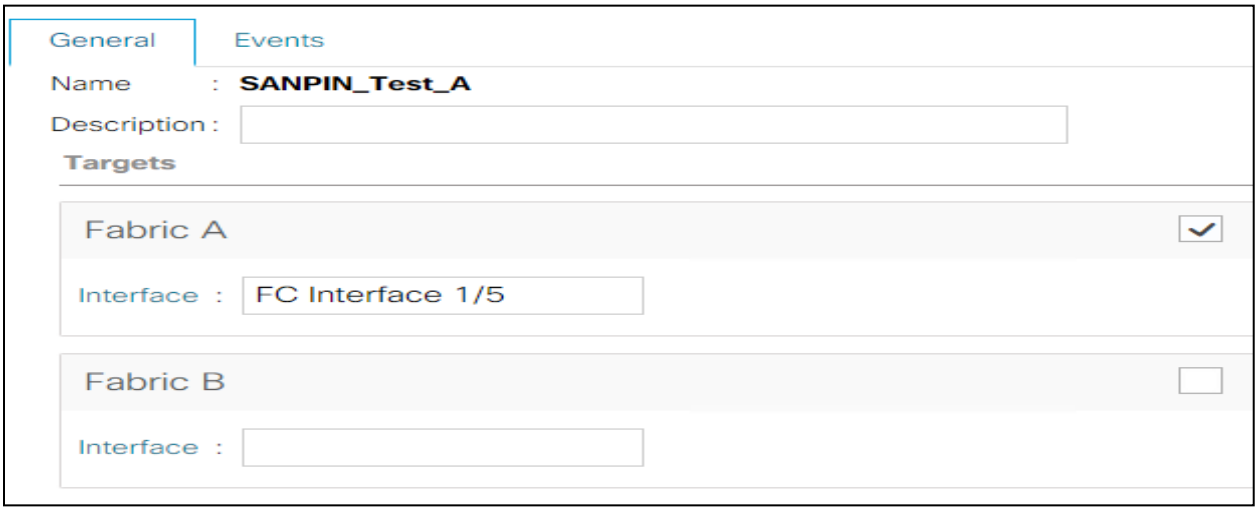
The following lists the software components used for this implementation:

- OS install media: ESXi 8.0U3
- Multipath: HDLM 8.9.0-01

Configuring Cisco UCS

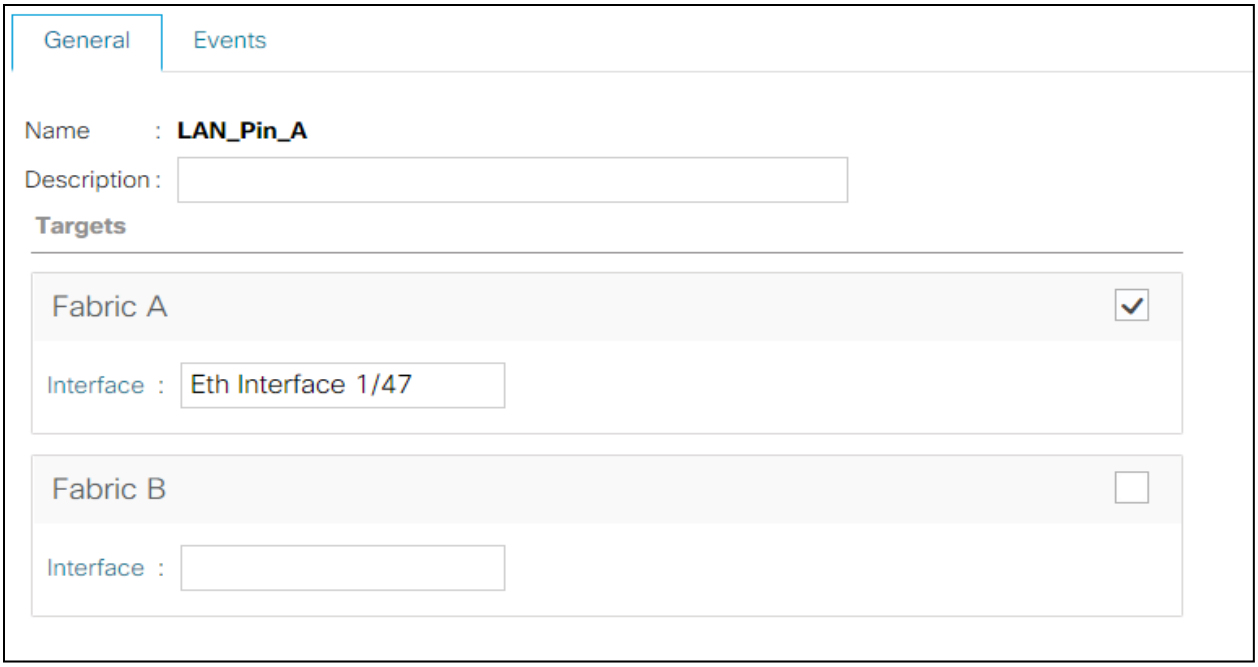
To configure Cisco UCS, complete the following steps:

1. Install the UCS blade in the UCS chassis.
2. Install the UCS supported Cisco Virtual Interface Card (VIC) adapter in the UCS blade.
3. Connect cables between Fabric Interconnect (FI) and Input/Output Modules (IOM).
4. Set FI-A and FI-B as Ethernet End-Host Mode.
5. Connect a cable from the FC port of FI-A to the switch port, and another cable from the FC port of FI-B to the switch port. Set the specified FC FI ports as uplink ports. For example, if FC port-5 of FI-A is connected to the switch port, set port-5 as an uplink port.
6. Create a SAN PIN group using the FC FI ports connected to the FC switch. The following is an example of a SAN PIN group where FC FI port 5 is used (port-5 connected to the external switch). A total of two SAN PIN groups are created, one for Fabric-A and one for Fabric-B.



7. Connect a cable from the Ethernet port of FI-A to the network switch port, and another cable from the Ethernet port of FI-B to the network switch port. Cisco UCS uses LAN pin groups to map the Ethernet traffic from a vNIC on a server to an uplink Ethernet port or port channel on the fabric interconnect. Create LAN pin groups on Fabric-A and Fabric-B using the FI Ethernet ports.

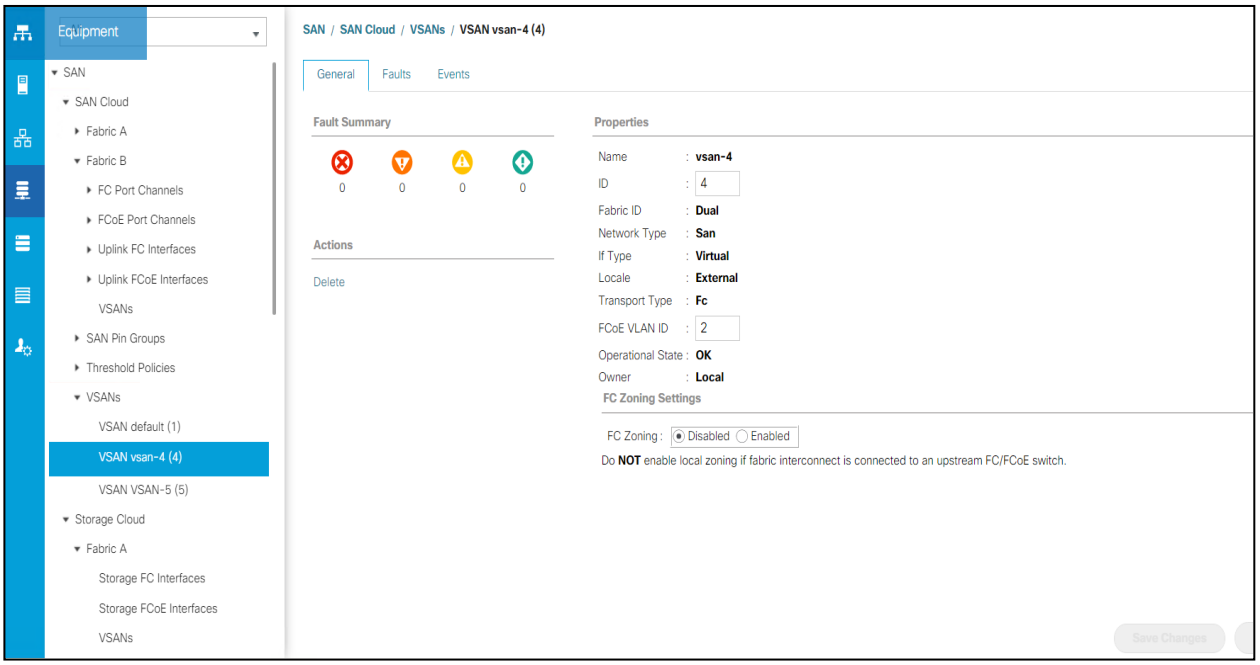
   For example, if Ethernet port 47 of FI-A is connected to the network switch, select port-47 when creating the LAN pin group for fabric A.



8. Create a Common/Global VSAN if you are using a Cisco switch.

   - Disable FC zoning when creating VSAN for EHM.
   - Create two VSANs for each Cisco FC switch.

   For a Brocade switch, the default VSAN is used, with FC zoning in a disabled state. The following example shows VSAN 4 created:



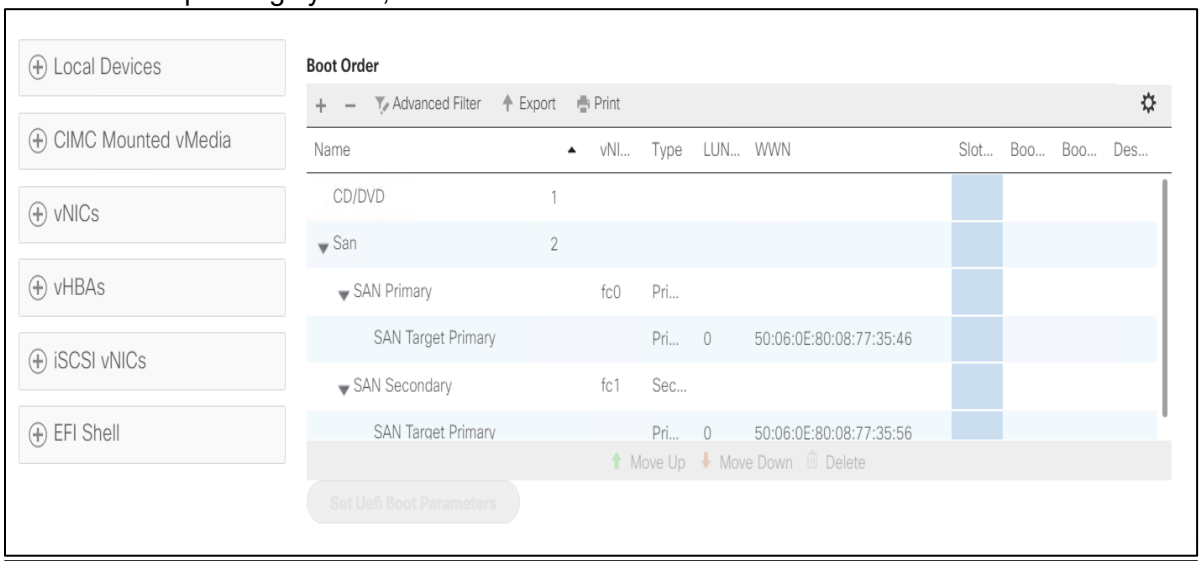
9. Create a SAN Boot Policy.

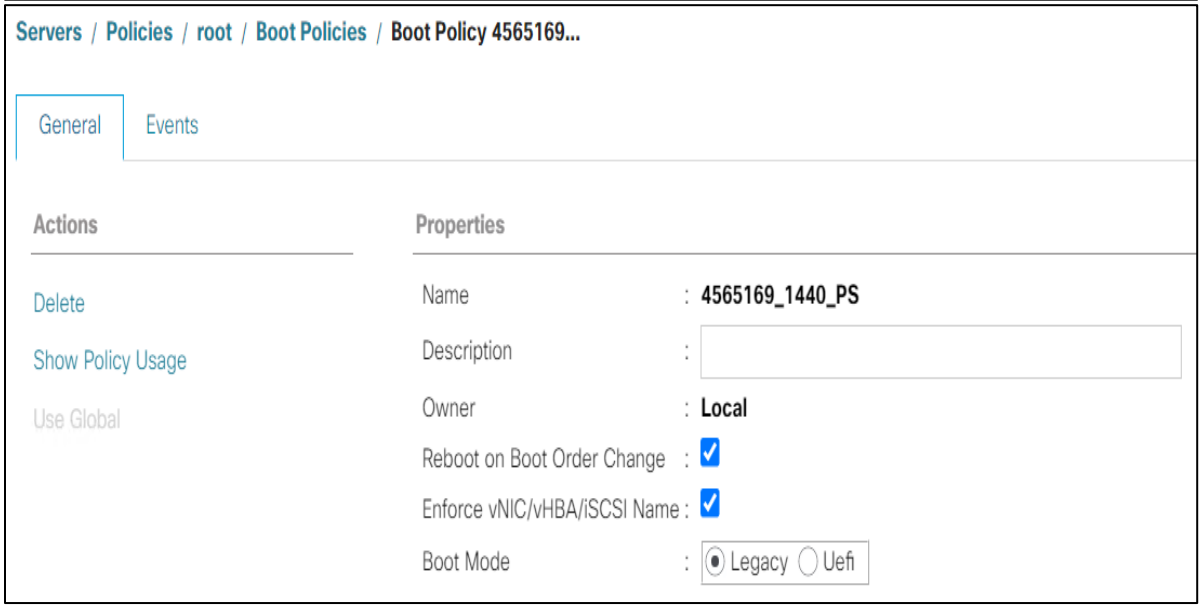
a. Set the path for both the SAN Primary path (fc0) and the SAN Secondary path (fc1) to SAN Target Primary.

b. Enter the WWN of the storage port where the Boot LUN is mapped.

c. When creating the Boot Profile, select Boot Mode as **Legacy** or **UEFI**, depending on the supported configuration.

d. To install the operating system, select **CD/DVD**.





10. Create a Service Profile.

a. Create a Service Profile (expert) with a profile name, set the UUID Assignment to Hardware Default, and associate the profile with the blade server.

b. Create two vNICs with VLAN. Assign the Fabric ID and the LAN Pin Group you previously created when creating each vNIC.

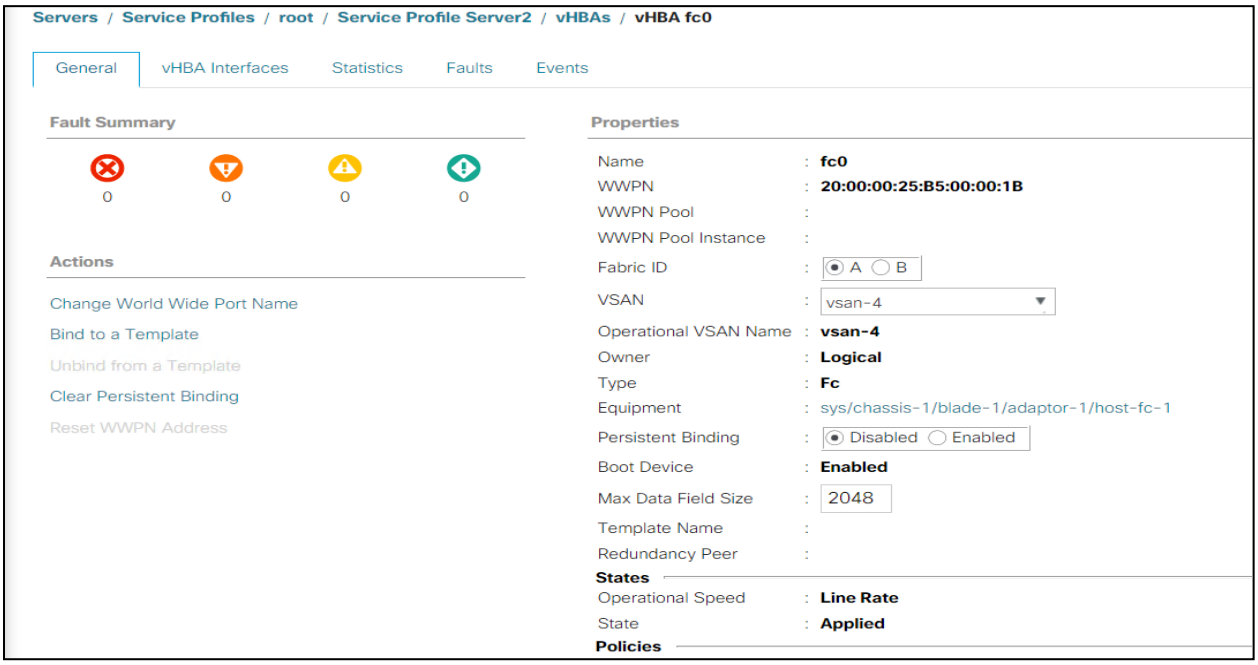
c. Create two vHBAs:

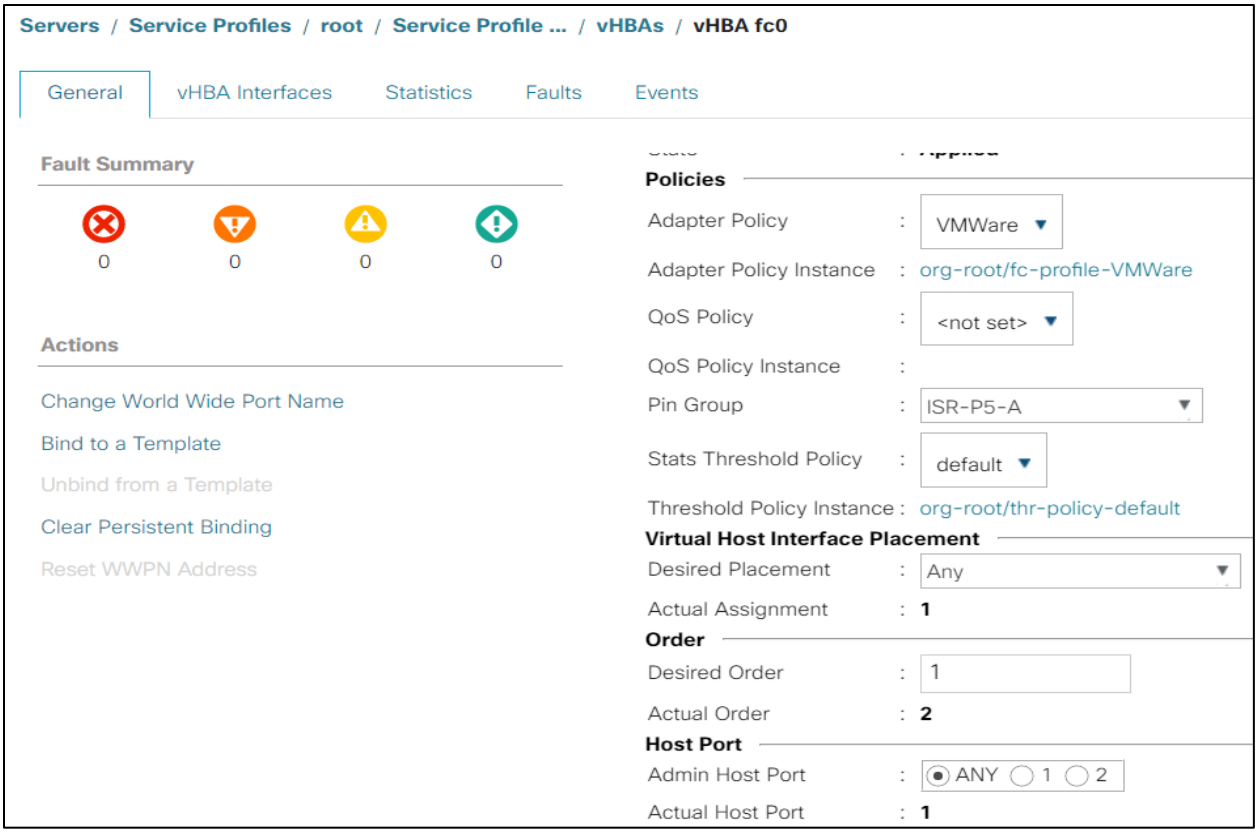
- The first two vHBAs (vHBA fc0 and vHBA fc1) are for Boot LUN.
- The next two vHBAs (vHBA fc2 and vHBA fc3) are for Job LUNs.

d. Assign the Fabric ID, VSAN, SAN Pin Group, and adapter policy when creating each vHBA. Ensure that FI-A is associated with fc0, and FI-B is associated with fc1.

e. Add the SAN boot policy you created.

f. Associate the Service Profile with the blade server.





Configuring the Switch

To configure the switched, you need 2 x Cisco FC or FCoE switches / Brocade FC switches. You can use either Cisco or Brocade switches, or a combination of both.

1. For Cisco switch, create VSAN for Cisco switch:

```
switch# config t
switch(config)# vsan database
switch(config-vsan-db)#
switch(config-vsan-db)# vsan 4
switch(config-vsan-db)#
```

   For each Cisco switch, create a VSAN. The name of the VSAN must match the VSAN created in Cisco UCS. In the topology diagram, FI-A is connected to Cisco External Switch-A. Therefore, the VSAN associated with Cisco External Switch-A must be associated with Fabric-A of the required vHBA while creating the Cisco UCS service profile.

2. Assign the VSAN to the Cisco switch ports where host and storage WWNs are logged in:

```
switch(config-vsan-db)# vsan 4 interface fc1/8
switch(config-vsan-db)#
```

3. Create two zones: one for Boot LUN and one for Job LUN:

```
config t
```

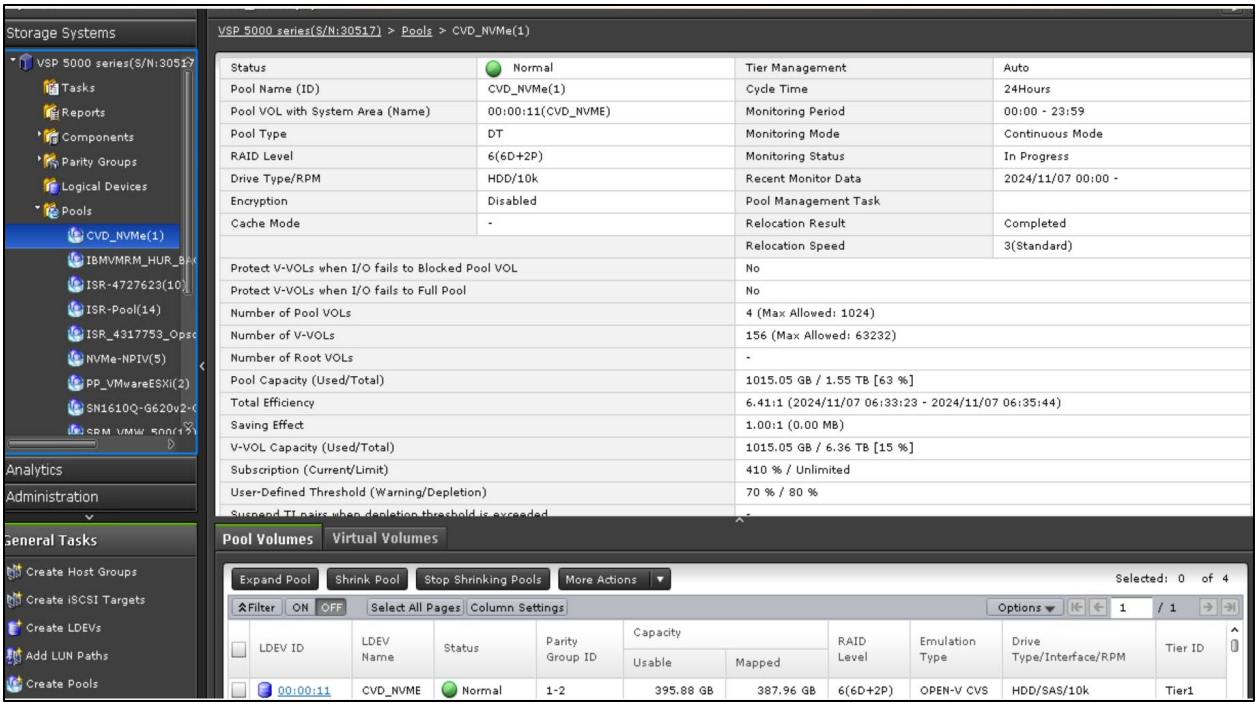
```
zoneset name Zoneset_Test vsan 4
zone name HostA_Target1 vsan 4
member pwwn “storage WWN”
member pwwn “host WWN”
zoneset name Zoneset_Test vsan 4
member HostA_Target1
zoneset activate name Zoneset_Test vsan 4
copy r s
```

Note: VSAN is inapplicable for a Brocade switch.

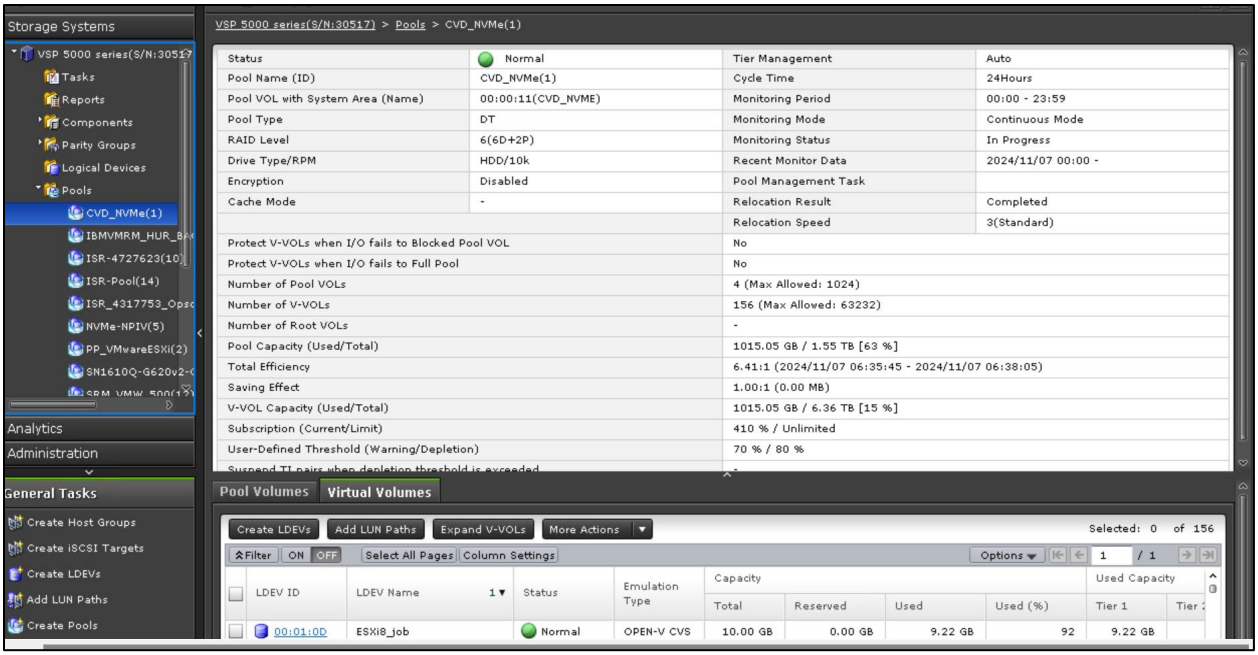
Configuring the Storage System

Configure a VSP storage system and connect it to the FC switches as shown in Figure 2. The storage system contains one Boot LUN and 10 Job LUNs.

1. Create a DP Pool with a minimum size of 600GB size.

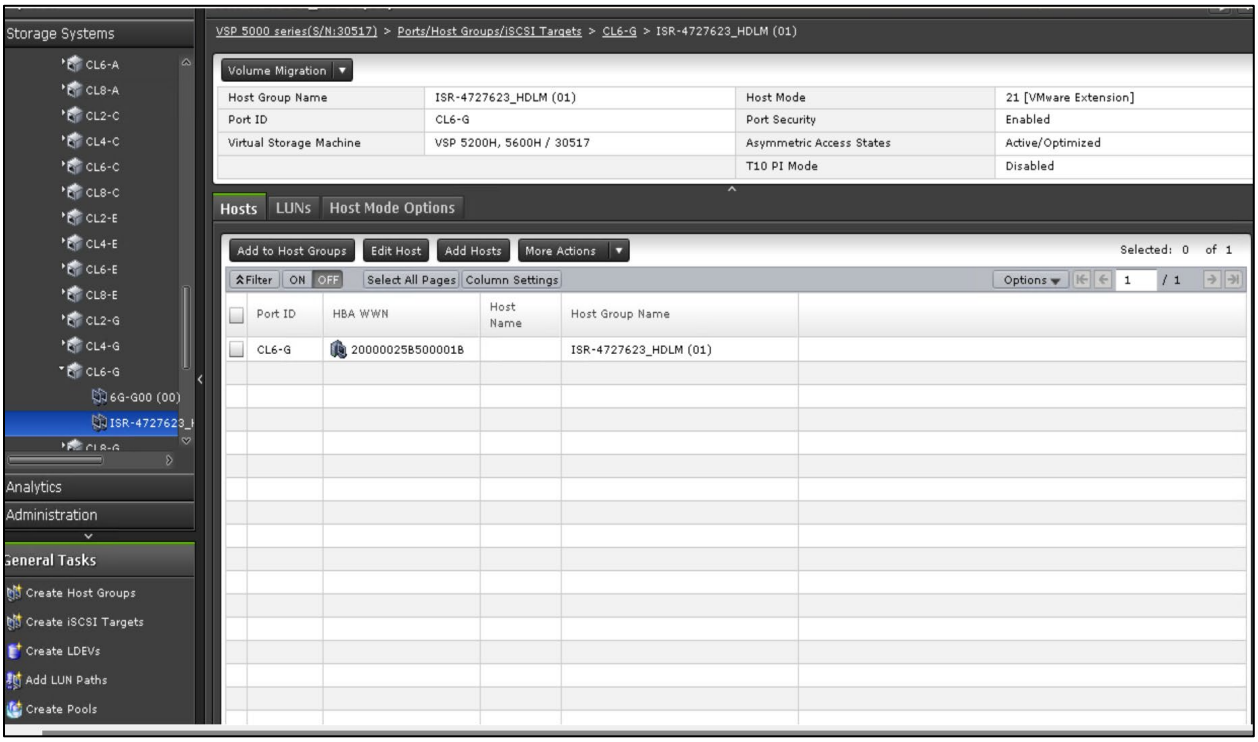


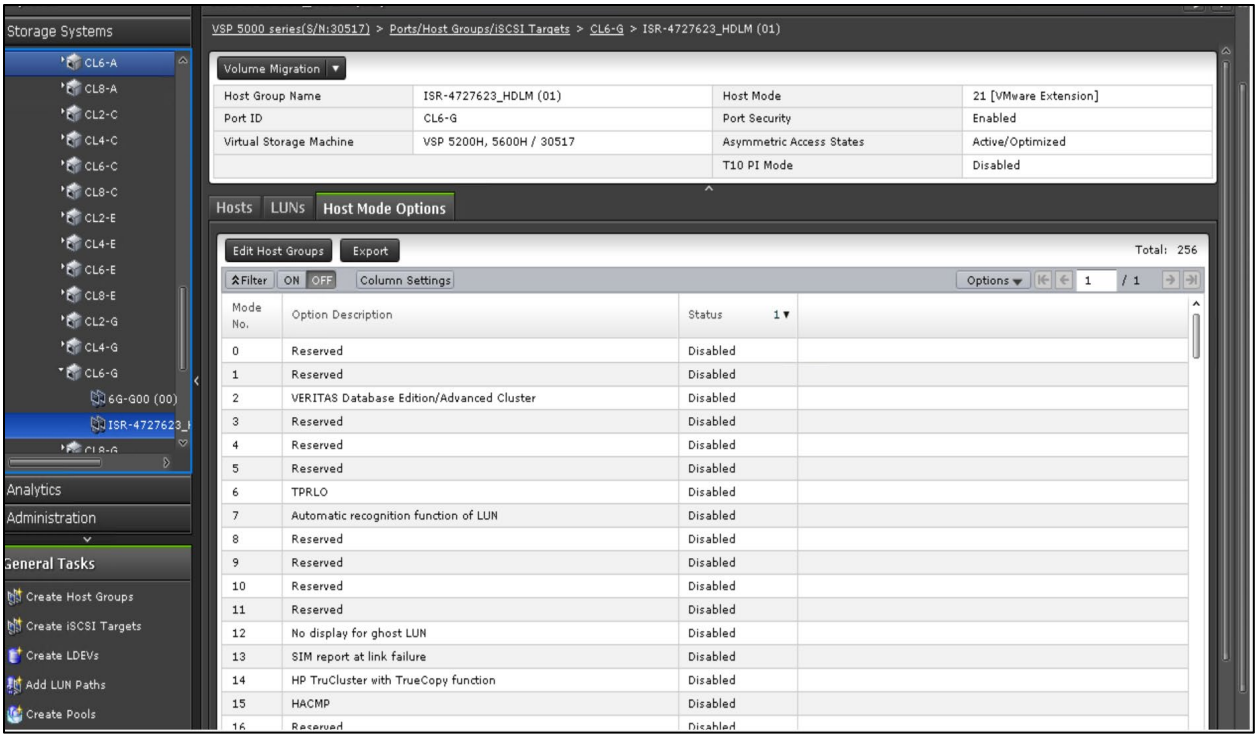
2. Create 11 LDEVs: one 500GB Boot LUN and 10 Job LUNs of 10GB each.



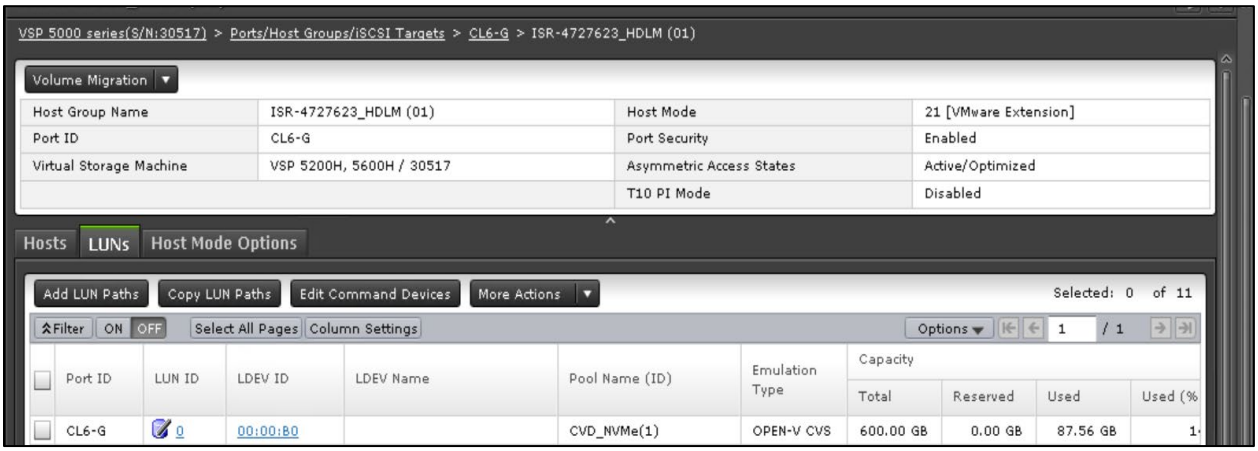
3. Create two host groups: one for the primary Boot LUN path, one for the primary Job LUN path, two for the secondary Boot LUN path, and one for the secondary Job LUN path.

   For all the host groups, set the host mode to 21 (VMware Extension) and enable Host Mode options 54 and 63. Add the host WWNs to the host groups.





4. Assign the LDEVs to the host groups.



Configuring the Host

1. Install VMware ESXi on the Cisco UCS blade server.

2. Configure hosts with multipathing software and use NMP (VMware Native Multipathing) to load balance I/O between all available preferred and non-preferred paths.

3. Verify the status of the Hitachi-managed LUNs:

```
esxcli storage nmp device list
```

Configuring HDLM on VMware ESXi Host

Workflow for Configuring HDLM with ESXi

Configuring HDLM involves several steps to ensure proper path management and optimal performance in your storage environment. The following is a typical workflow for configuring HDLM:

```
Start
 |
 +--> Verify compatibility with ESXi OS version.
 |
 +--> Backup the ESXi host configuration data.
 |
 +--> Optionally, schedule downtime.
 |
 +--> Download the HDLM software from the Hitachi Vantara support site.
 |
 +--> Upload the HDLM package to the ESXi datastore.
 |
 +--> Install HDLM.
 |     |
 |     +--> Navigate to the HDLM Package Directory.
 |     |
 |     +--> Run the installation.
 |
 +--> Restart the ESXi host.
 |
 +--> Verify the installation.
 |     |
 |     +--> Verify the HDLM status.
 |     |
 |     +--> Ensure that the paths are managed by HDLM.
 |
End
```

Prerequisites

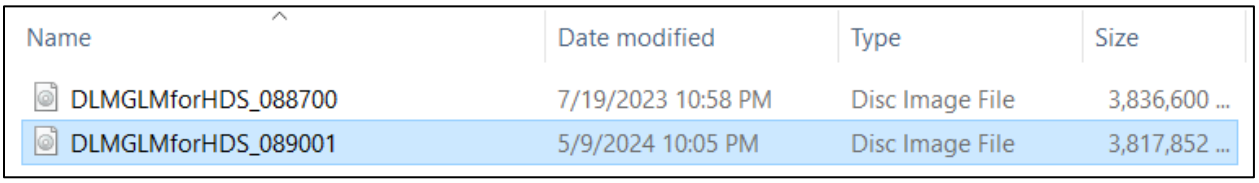
- Verify that the VMware ESXi version is compatible with the HDLM software. Check the compatibility matrix provided by Hitachi Vantara: Product Compatibility Guide : Hitachi Dynamic Link Manager (HDLM) (hitachivantara.com)
- Download the Hitachi Dynamic Link Manager software: Downloads Detail - Support | Hitachi Vantara
- Confirm that the ESXi host is connected to the VSP storage system through Fibre Channel (FC) or iSCSI.
- Verify the availability of the Host Bus Adapters (HBAs) for redundancy.

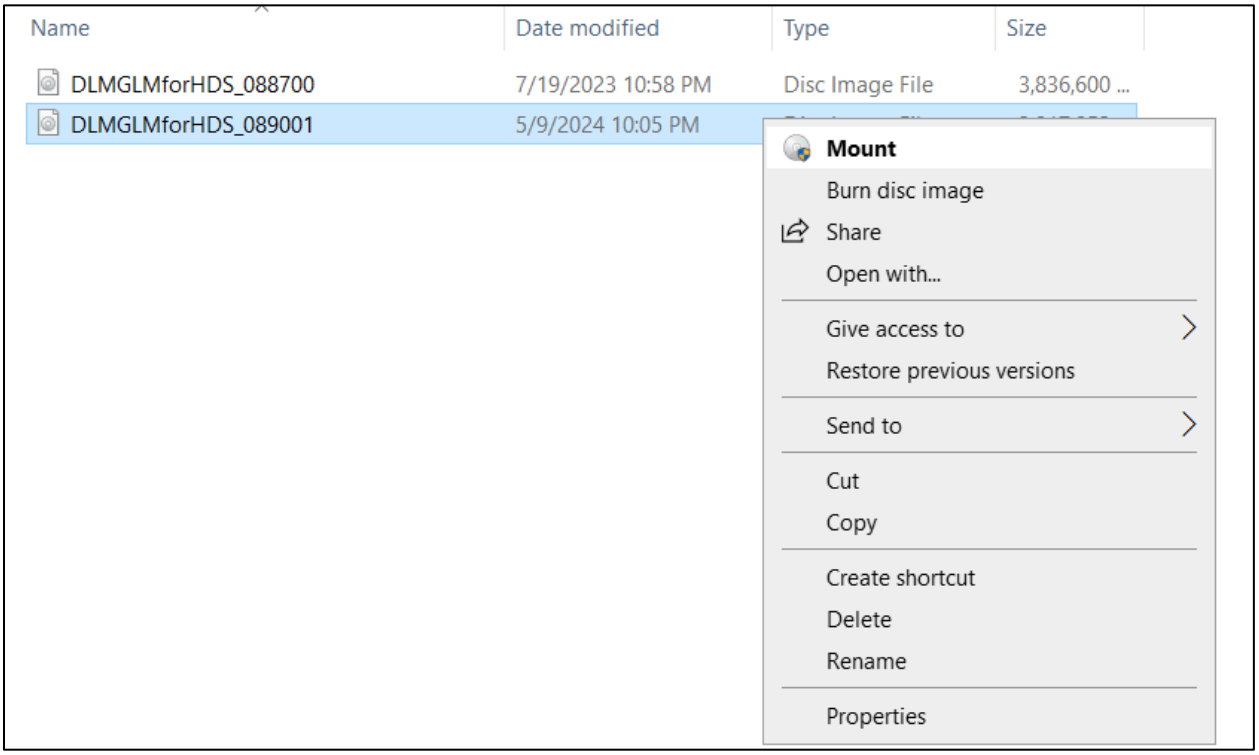
- Verify that all HBAs on a single host, connected to HDLM-managed disks, are of the same type and have the same microprogram version. If you are using more than one HBA type, paths cannot be switched when an error occurs.
- If the Windows version of HDLM is already installed on the machine for use as the remote management client, remove it before proceeding. The VMware and Windows versions of HDLM cannot coexist on the same remote management client.
- A license key is required if you are installing HDLM for the first time or upgrading HDLM after the license has expired. Keep the license key available before proceeding with the installation or upgrade.

Installing HDLM on ESXi

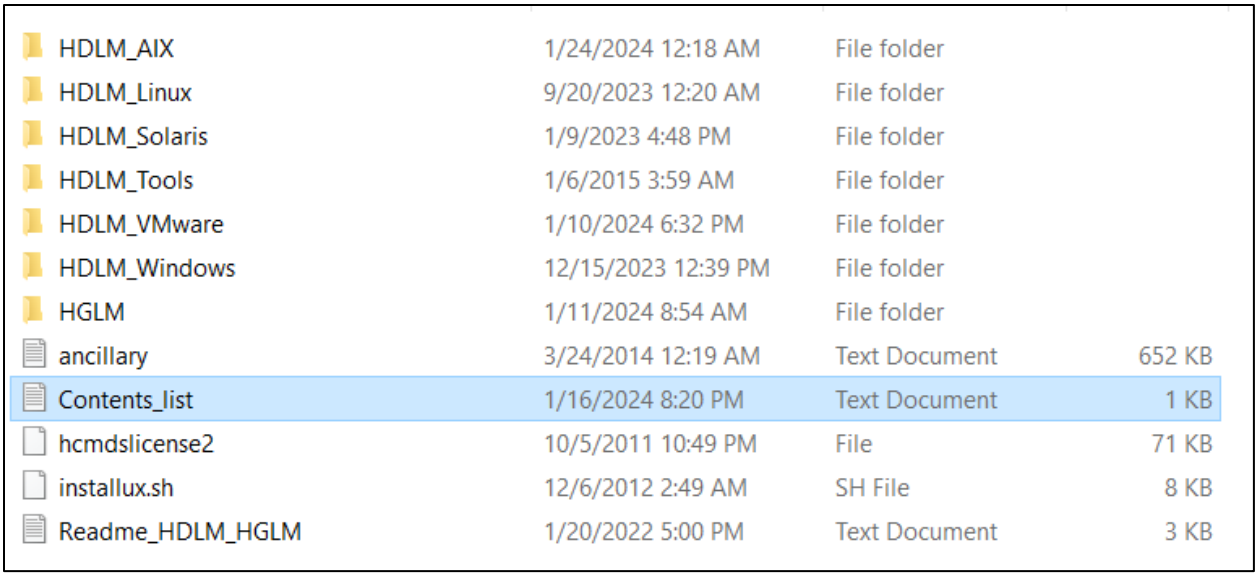
To configure HDLM on ESXi hosts, using the vSphere Client GUI, complete the following steps:

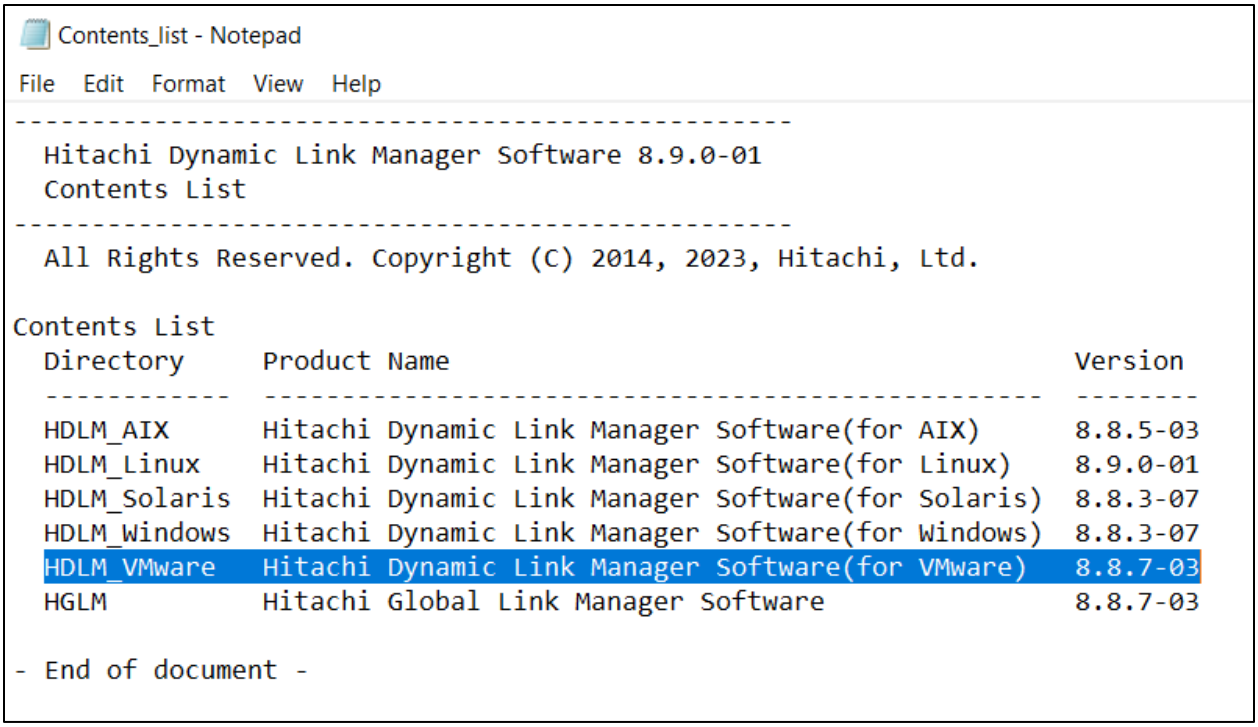
1. Mount the downloaded HDLM ISO file on a Windows machine.



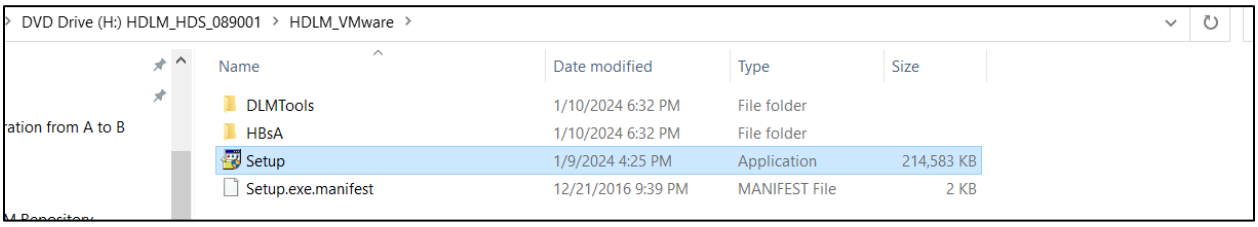


2. Navigate to the ‘Contents_list’ file and verify the VMware HDLM Software version for installing HDLM 8.9.0-01.

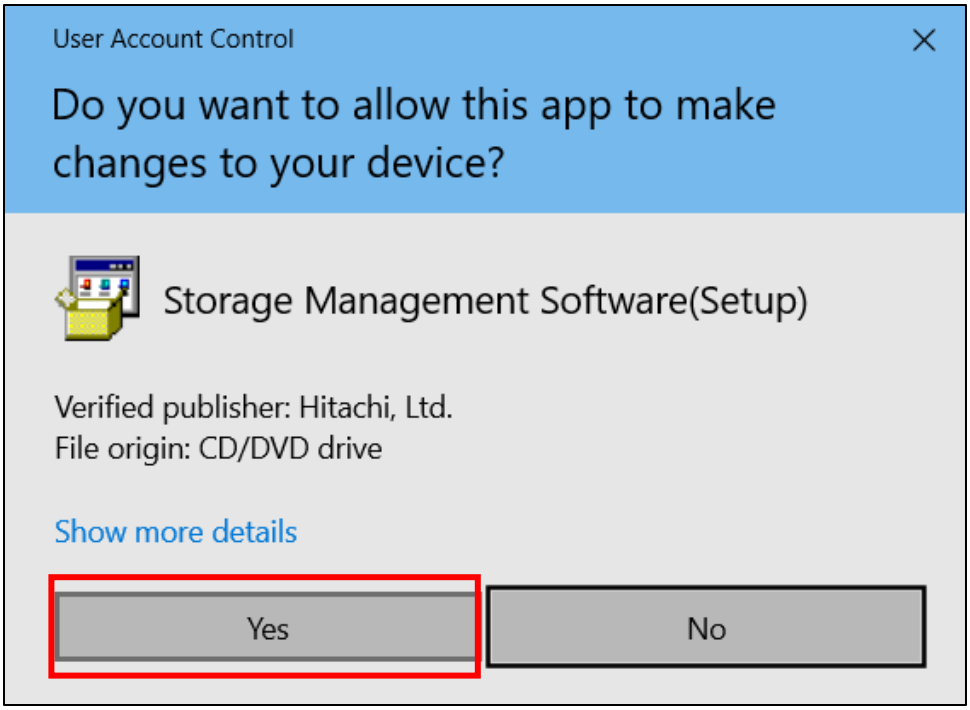




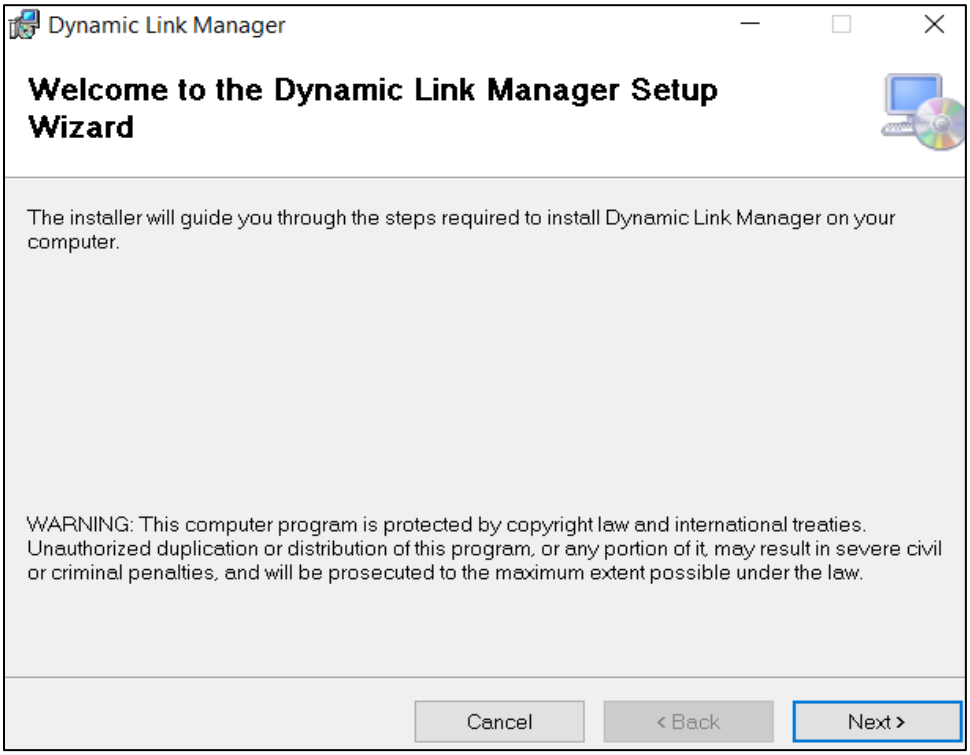
3. Navigate to the HDLM_VMware directory with the executable setup file.



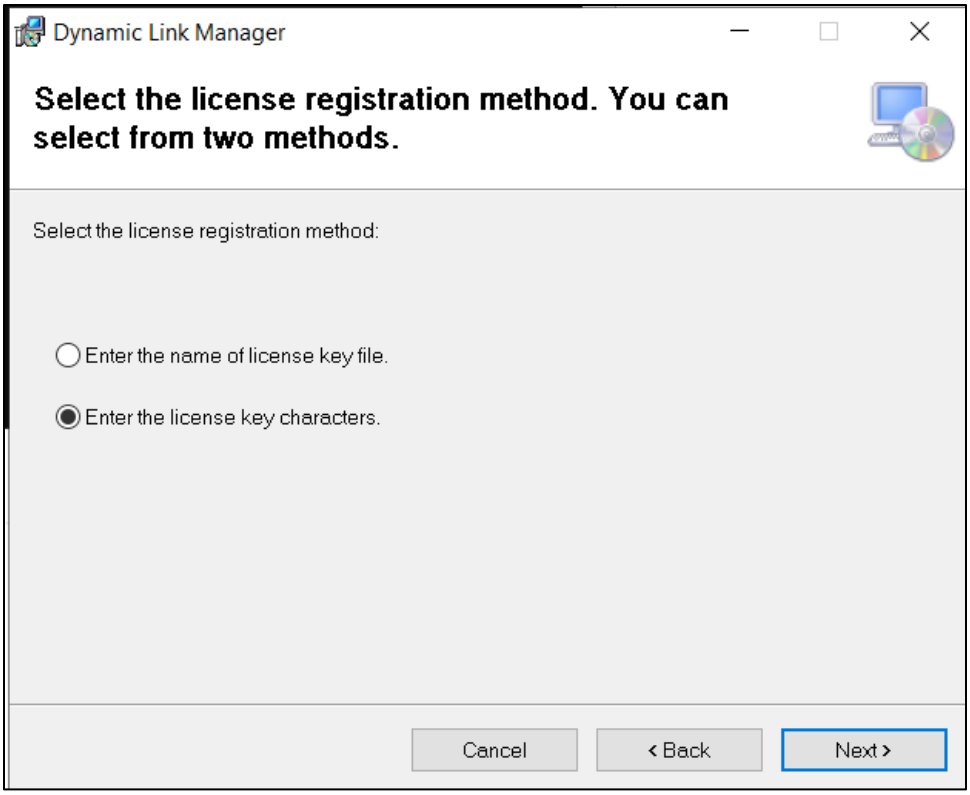
4. Run the setup file and click **Yes**.



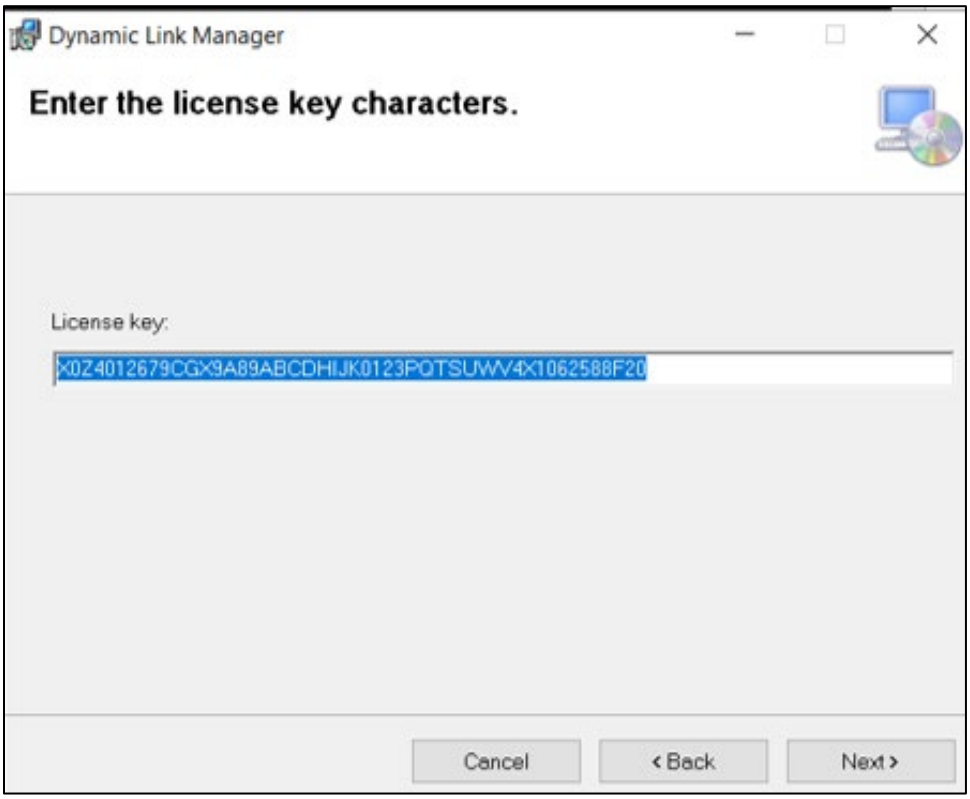
5. When the Dynamic Link Manager setup wizard appears, click **Next**.



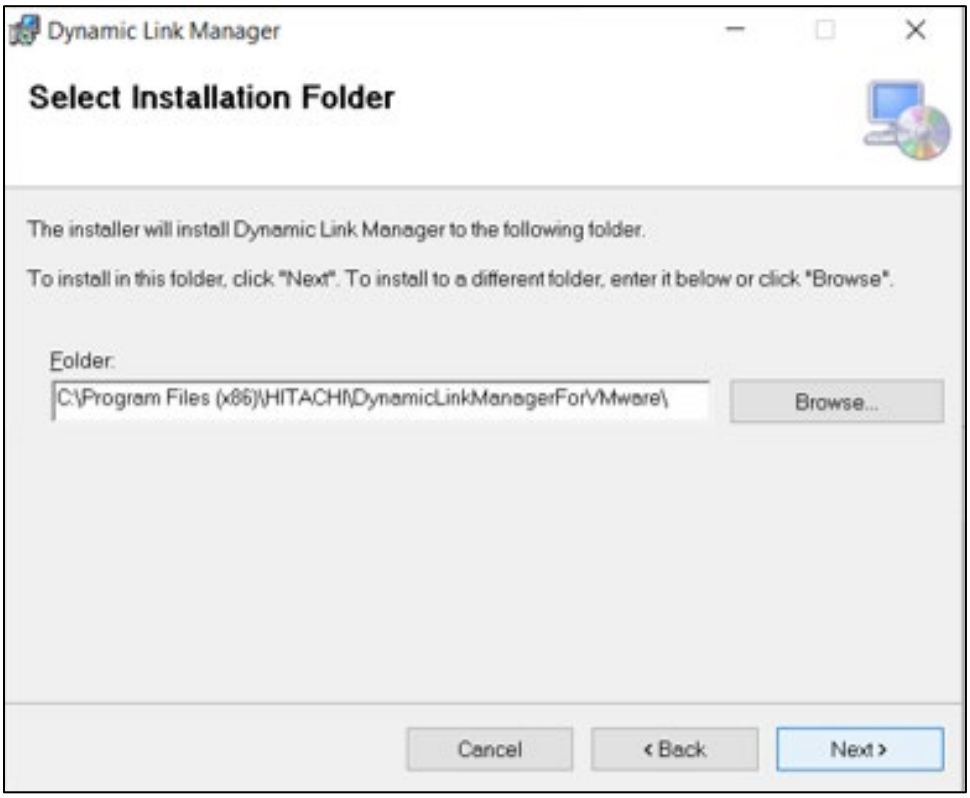
6. Select **Enter the license key characters** and click **Next**.



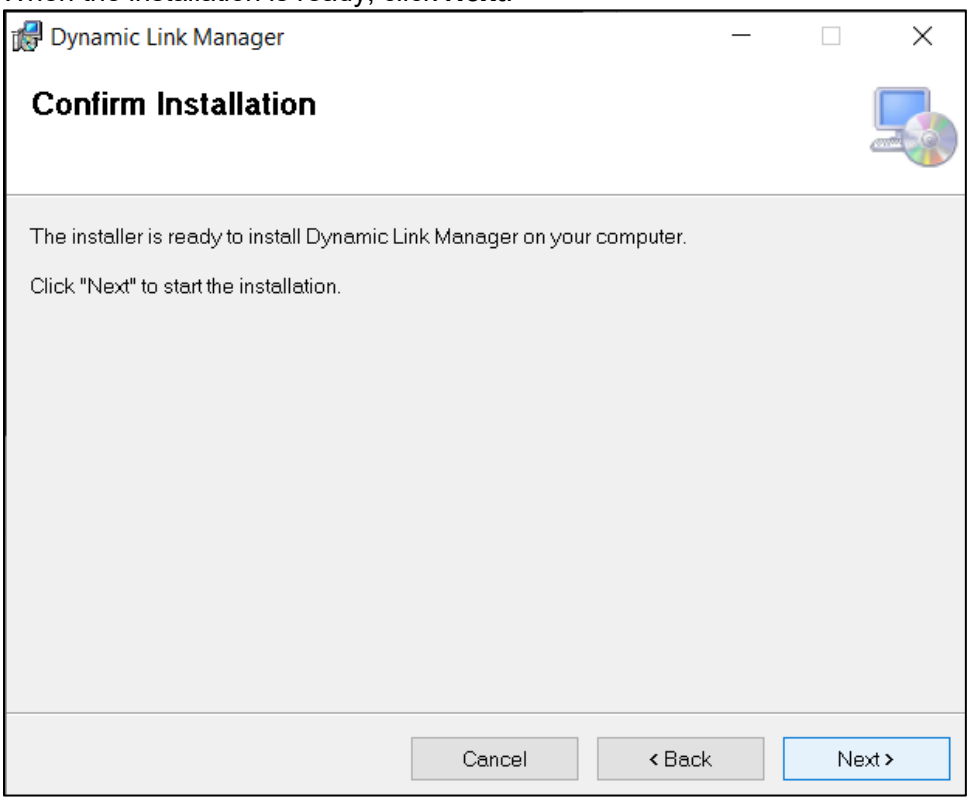
7. Enter the license key and click **Next**.



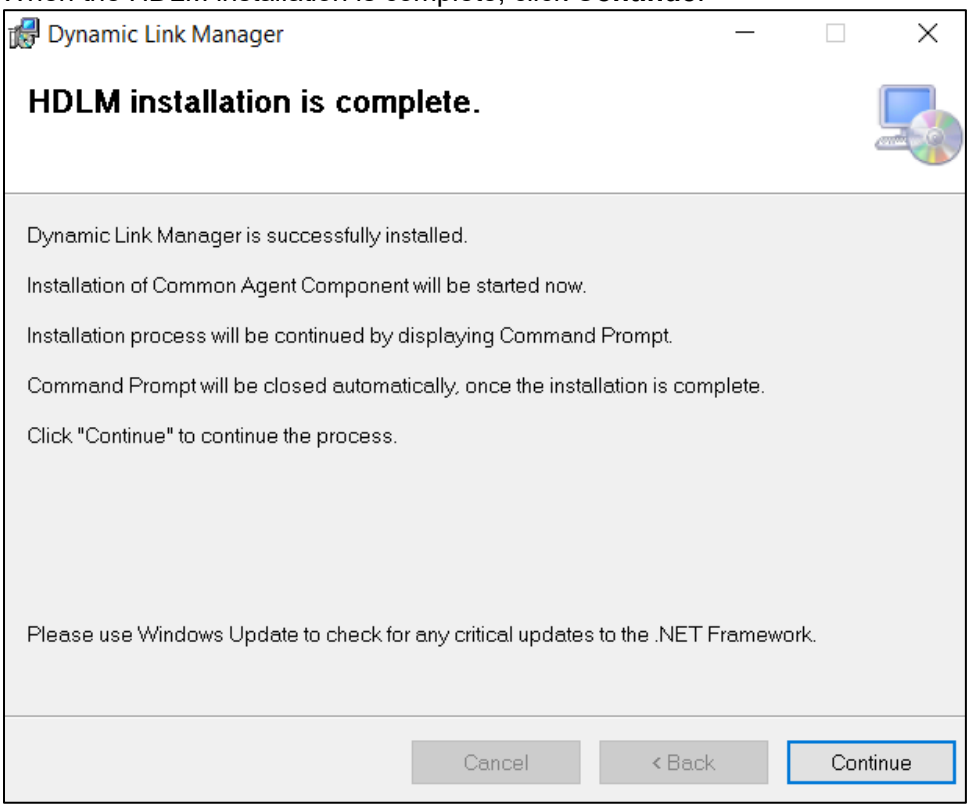
8. Select the installation folder and click **Next**.



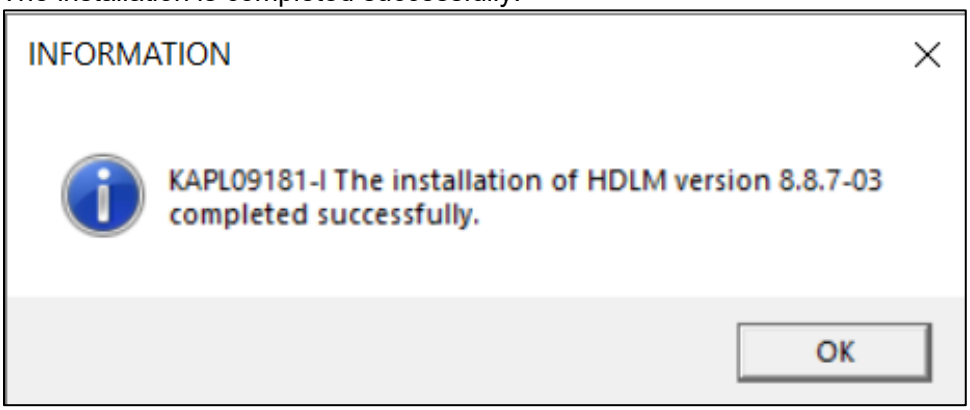
9. When the installation is ready, click **Next**.



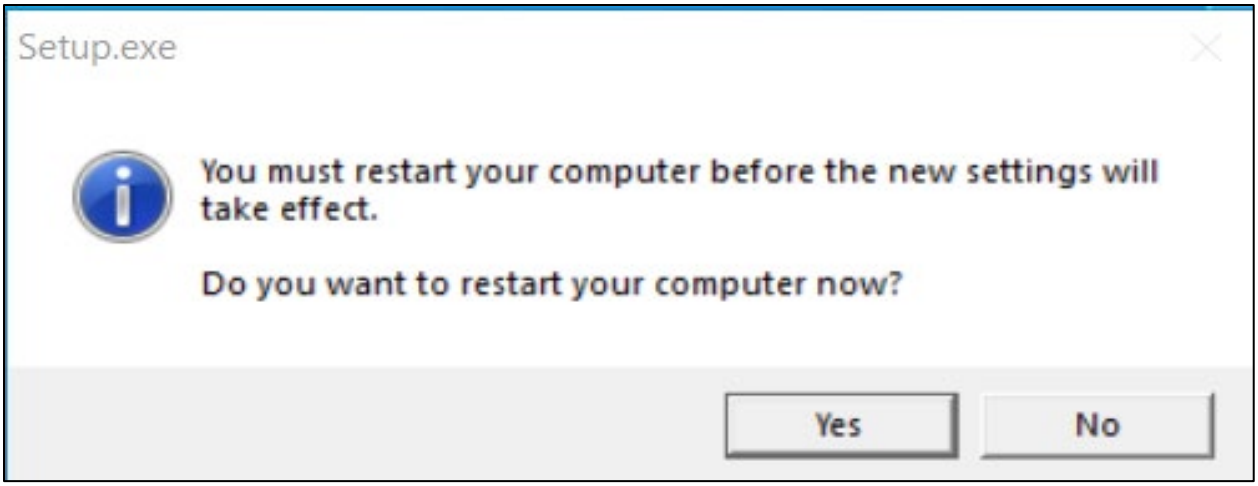
10. When the HDLM installation is complete, click **Continue**.



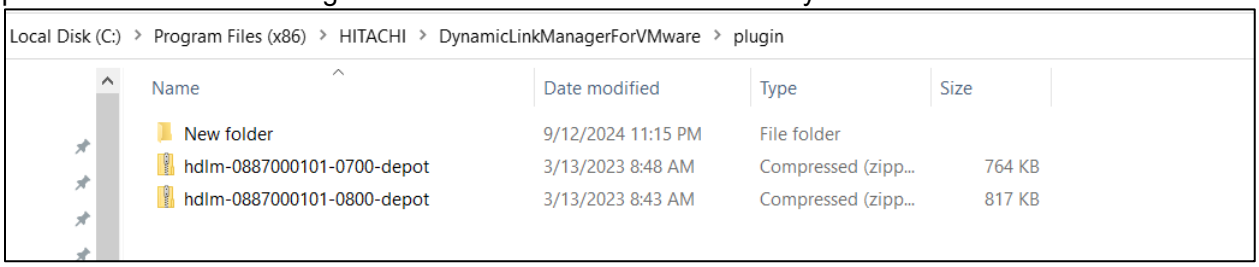
The installation is completed successfully:



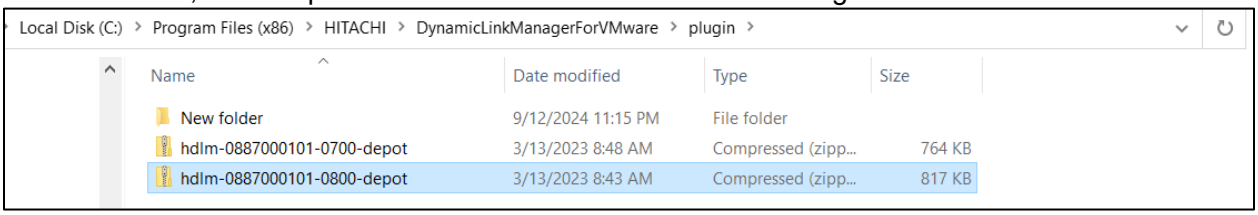
11. To reflect the HDLM version installation on the local system, restart the system.



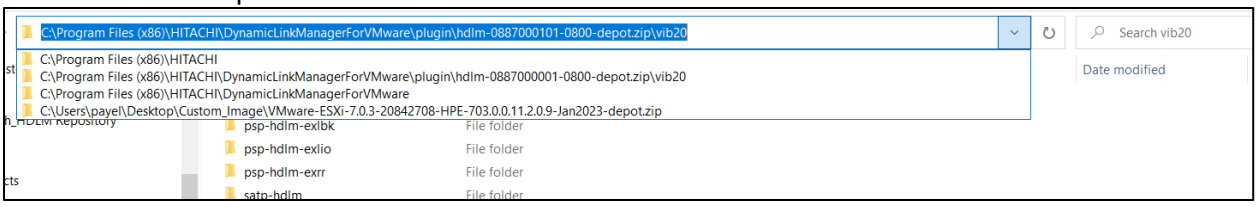
12. To verify the .zip HDLM depot folders to be copied to the testing ESXi server, navigate to the path shown in the following screenshot after the local Windows system is online.



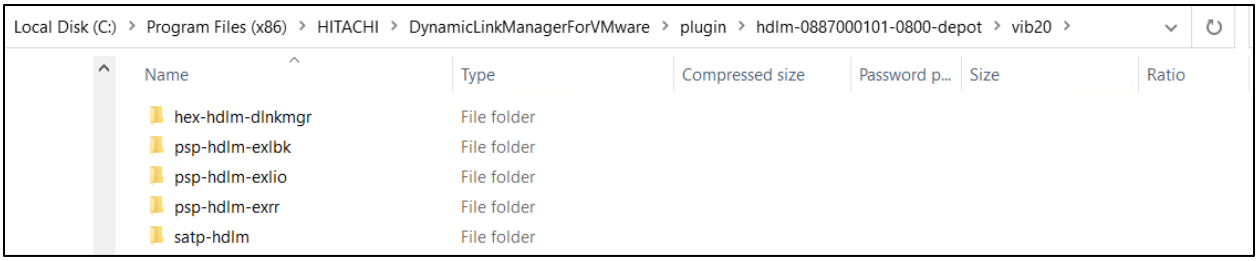
In this scenario, 0800-depot is selected as the host OS of the testing server ESXi 8.0u3:



13. Navigate to the selected depot folder and verify the list of HDLM files located in the \vib20 folder within the depot folder that will be installed on the server.



14. To review the list of HDLM files in the \vib20 directory for installation, copy the depot.zip file to the datastore of the testing server and extract the file.




```
[root@DL380G10-143:/vmfs/volumes/66b35c65-955ae542-b526-0090fa8a65b2/vib20] ls
hex-hdlm-dlnkmgr  psp-hdlm-exlbk    psp-hdlm-exlio    psp-hdlm-exrr     satp-hdlm
[root@DL380G10-143:/vmfs/volumes/66b35c65-955ae542-b526-0090fa8a65b2/vib20]
[root@DL380G10-143:/vmfs/volumes/66b35c65-955ae542-b526-0090fa8a65b2/vib20]
[root@DL380G10-143:/vmfs/volumes/66b35c65-955ae542-b526-0090fa8a65b2/vib20]
[root@DL380G10-143:/vmfs/volumes/66b35c65-955ae542-b526-0090fa8a65b2/vib20]
```

15. Before installing HDLM, verify the path policies of the server by running the following command:

```
esxcli storage nmp device list
```

```
[root@localhost:~]
[root@localhost:~] esxcli storage nmp device list
naa.60060e800877350000507735000000b1a
   Device Display Name: HITACHI Fibre Channel Disk (naa.60060e800877350000507735000000b1a)
   Storage Array Type: VMW_SATP_DEFAULT_AA
   Storage Array Type Device Config: {action_OnRetryErrors=off}
   Path Selection Policy: VMW_PSP_RR
   Path Selection Policy Device Config: {policy=rr,iops=1000,bytes=10485760,useANO=0; lastPathIndex=0: NumIOsPending=0,numBytesPending=0}
   Path Selection Policy Device Custom Config:
   Working Paths: vmhba2:C0:T0:L0
   Is USB: false

naa.60060e800877350000507735000000b1b
   Device Display Name: HITACHI Fibre Channel Disk (naa.60060e800877350000507735000000b1b)
   Storage Array Type: VMW_SATP_DEFAULT_AA
   Storage Array Type Device Config: {action_OnRetryErrors=off}
   Path Selection Policy: VMW_PSP_RR
   Path Selection Policy Device Config: {policy=rr,iops=1000,bytes=10485760,useANO=0; lastPathIndex=0: NumIOsPending=0,numBytesPending=0}
   Path Selection Policy Device Custom Config:
   Working Paths: vmhba2:C0:T0:L1
   Is USB: false

naa.60060e800877350000507735000000b1c
   Device Display Name: HITACHI Fibre Channel Disk (naa.60060e800877350000507735000000b1c)
   Storage Array Type: VMW_SATP_DEFAULT_AA
   Storage Array Type Device Config: {action_OnRetryErrors=off}
   Path Selection Policy: VMW_PSP_RR
   Path Selection Policy Device Config: {policy=rr,iops=1000,bytes=10485760,useANO=0; lastPathIndex=0: NumIOsPending=0,numBytesPending=0}
   Path Selection Policy Device Custom Config:
   Working Paths: vmhba2:C0:T0:L2
   Is USB: false

naa.60060e800877350000507735000000b1d
   Device Display Name: HITACHI Fibre Channel Disk (naa.60060e800877350000507735000000b1d)
   Storage Array Type: VMW_SATP_DEFAULT_AA
   Storage Array Type Device Config: {action_OnRetryErrors=off}
   Path Selection Policy: VMW_PSP_RR
   Path Selection Policy Device Config: {policy=rr,iops=1000,bytes=10485760,useANO=0; lastPathIndex=0: NumIOsPending=0,numBytesPending=0}
   Path Selection Policy Device Custom Config:
   Working Paths: vmhba2:C0:T0:L3
   Is USB: false

naa.60060e800877350000507735000000b1e
   Device Display Name: HITACHI Fibre Channel Disk (naa.60060e800877350000507735000000b1e)
   Storage Array Type: VMW_SATP_DEFAULT_AA
   Storage Array Type Device Config: {action_OnRetryErrors=off}
   Path Selection Policy: VMW_PSP_RR
   Path Selection Policy Device Config: {policy=rr,iops=1000,bytes=10485760,useANO=0; lastPathIndex=0: NumIOsPending=0,numBytesPending=0}
   Path Selection Policy Device Custom Config:
   Working Paths: vmhba2:C0:T0:L4
```

16. Navigate to the hex-hdlm-dlnkmgr directory and locate the .vib file.

```
[root@DL380G10-143:/vmfs/volumes/66b35c65-955ae542-b526-0090fa8a65b2/vib20] ls
hex-hdlm-dlnkmgr  psp-hdlm-exlbk    psp-hdlm-exlio    psp-hdlm-exrr     satp-hdlm
[root@DL380G10-143:/vmfs/volumes/66b35c65-955ae542-b526-0090fa8a65b2/vib20]
[root@DL380G10-143:/vmfs/volumes/66b35c65-955ae542-b526-0090fa8a65b2/vib20] cd hex-hdlm-dlnkmgr
[root@DL380G10-143:/vmfs/volumes/66b35c65-955ae542-b526-0090fa8a65b2/vib20/hex-hdlm-dlnkmgr] ls
HTI_bootbank_hex-hdlm-dlnkmgr_08.8.7-00.0800.vib
[root@DL380G10-143:/vmfs/volumes/66b35c65-955ae542-b526-0090fa8a65b2/vib20/hex-hdlm-dlnkmgr]
```

17. Install the .vib file in the hex-hdlm-dlnkmgr directory.

```
[root@DL380G10-143:/vmfs/volumes/66b35c65-955ae542-b526-0090fa8a65b2/vib20/hex-hdlm-dlnkmgr] esxcli software vib install -v /vmfs/volumes/Boot_57_143_PrimaryHost/vib20/hex-hdlm-dlnkmgr/HTI_
bootbank_hex-hdlm-dlnkmgr_08.8.7-00.0800.vib
Installation Result
   Message: Operation finished successfully.
   VIBs Installed: HTI_bootbank_hex-hdlm-dlnkmgr_08.8.7-00.0800
   VIBs Removed:
   VIBs Skipped:
   Reboot Required: false
   DPU Results:
```

18. Navigate to the psp-hdlm-exlbk directory and locate the .vib file.

```
[root@DL380G10-143:/vmfs/volumes/66b35c65-955ae542-b526-0090fa8a65b2/vib20] cd psp-hdlm-exlbk/
[root@DL380G10-143:/vmfs/volumes/66b35c65-955ae542-b526-0090fa8a65b2/vib20/psp-hdlm-exlbk] ls
HTI_bootbank_psp-hdlm-exlbk_08.8.0-00.0700.vib
[root@DL380G10-143:/vmfs/volumes/66b35c65-955ae542-b526-0090fa8a65b2/vib20/psp-hdlm-exlbk]
[root@DL380G10-143:/vmfs/volumes/66b35c65-955ae542-b526-0090fa8a65b2/vib20/psp-hdlm-exlbk]
```

19. Install the .vib file in the psp-hdlm-exlbk directory.

```
[root@DL380G10-143:/vmfs/volumes/66b35c65-955ae542-b526-0090fa8a65b2/vib20/psp-hdlm-exlbk] esxcli software vib install -v /vmfs/volumes/Boot_57_143_PrimaryHost/vib20/psp-hdlm-exlbk/HTI_boot
bank_psp-hdlm-exlbk_08.8.0-00.0700.vib
Installation Result
   Message: Operation finished successfully.
   VIBs Installed: HTI_bootbank_psp-hdlm-exlbk_08.8.0-00.0700
   VIBs Removed:
   VIBs Skipped:
   Reboot Required: false
   DPU Results:
```

20. Navigate to the psp-hdlm-exlio directory and locate the .vib file.

```
[root@DL380G10-143:/vmfs/volumes/66b35c65-955ae542-b526-0090fa8a65b2/vib20] cd psp-hdlm-exlio/
[root@DL380G10-143:/vmfs/volumes/66b35c65-955ae542-b526-0090fa8a65b2/vib20/psp-hdlm-exlio]
[root@DL380G10-143:/vmfs/volumes/66b35c65-955ae542-b526-0090fa8a65b2/vib20/psp-hdlm-exlio]
[root@DL380G10-143:/vmfs/volumes/66b35c65-955ae542-b526-0090fa8a65b2/vib20/psp-hdlm-exlio]
[root@DL380G10-143:/vmfs/volumes/66b35c65-955ae542-b526-0090fa8a65b2/vib20/psp-hdlm-exlio] ls
HTI_bootbank_psp-hdlm-exlio_08.8.0-00.0700.vib
[root@DL380G10-143:/vmfs/volumes/66b35c65-955ae542-b526-0090fa8a65b2/vib20/psp-hdlm-exlio]
```

21. Install the .vib file in the psp-hdlm-exlio directory.

```
[root@DL380G10-143:/vmfs/volumes/66b35c65-955ae542-b526-0090fa8a65b2/vib20/psp-hdlm-exlio] esxcli software vib install -v /vmfs/volumes/Boot_57_143_PrimaryHost/vib20/psp-hdlm-exlio/HTI_boot
bank_psp-hdlm-exlio_08.8.0-00.0700.vib
Installation Result
   Message: Operation finished successfully.
   VIBs Installed: HTI_bootbank_psp-hdlm-exlio_08.8.0-00.0700
   VIBs Removed:
   VIBs Skipped:
   Reboot Required: false
   DPU Results:
[root@DL380G10-143:/vmfs/volumes/66b35c65-955ae542-b526-0090fa8a65b2/vib20/psp-hdlm-exlio]
```

22. Navigate to the psp-hdlm-exrr directory and locate the .vib file.

```
[root@DL380G10-143:/vmfs/volumes/66b35c65-955ae542-b526-0090fa8a65b2/vib20]
[root@DL380G10-143:/vmfs/volumes/66b35c65-955ae542-b526-0090fa8a65b2/vib20] cd psp-hdlm-exrr/
[root@DL380G10-143:/vmfs/volumes/66b35c65-955ae542-b526-0090fa8a65b2/vib20/psp-hdlm-exrr] ls
HTI_bootbank_psp-hdlm-exrr_08.8.0-00.0700.vib
[root@DL380G10-143:/vmfs/volumes/66b35c65-955ae542-b526-0090fa8a65b2/vib20/psp-hdlm-exrr]
[root@DL380G10-143:/vmfs/volumes/66b35c65-955ae542-b526-0090fa8a65b2/vib20/psp-hdlm-exrr]
```

23. Install the .vib file in the psp-hdlm-exrr directory.

```
[root@DL380G10-143:/vmfs/volumes/66b35c65-955ae542-b526-0090fa8a65b2/vib20/psp-hdlm-exrr] esxcli software vib install -v /vmfs/volumes/Boot_57_143_PrimaryHost/vib20/psp-hdlm-exrr/HTI_bootba
nk_psp-hdlm-exrr_08.8.0-00.0700.vib
Installation Result
   Message: Operation finished successfully.
   VIBs Installed: HTI_bootbank_psp-hdlm-exrr_08.8.0-00.0700
   VIBs Removed:
   VIBs Skipped:
   Reboot Required: false
   DPU Results:
```

24. Navigate to the satp-hdlm directory and locate the .vib file.

```
[root@DL380G10-143:/vmfs/volumes/66b35c65-955ae542-b526-0090fa8a65b2/vib20] cd satp-hdlm/
[root@DL380G10-143:/vmfs/volumes/66b35c65-955ae542-b526-0090fa8a65b2/vib20/satp-hdlm]
[root@DL380G10-143:/vmfs/volumes/66b35c65-955ae542-b526-0090fa8a65b2/vib20/satp-hdlm]
[root@DL380G10-143:/vmfs/volumes/66b35c65-955ae542-b526-0090fa8a65b2/vib20/satp-hdlm] ls
HTI_bootbank_satp-hdlm_08.8.7-01.0700.vib
[root@DL380G10-143:/vmfs/volumes/66b35c65-955ae542-b526-0090fa8a65b2/vib20/satp-hdlm]
```

25. Install the .vib file in the satp-hdlm directory.

```
[root@DL380G10-143:/vmfs/volumes/66b35c65-955ae542-b526-0090fa8a65b2/vib20/satp-hdlm] esxcli software vib install -v /vmfs/volumes/Boot_57_143_PrimaryHost/vib20/satp-hdlm/HTI_bootbank_satp-
hdlm_08.8.7-01.0700.vib
Installation Result
   Message: Operation finished successfully.
   VIBs Installed: HTI_bootbank_satp-hdlm_08.8.7-01.0700
   VIBs Removed:
   VIBs Skipped:
   Reboot Required: false
   DPU Results:
[root@DL380G10-143:/vmfs/volumes/66b35c65-955ae542-b526-0090fa8a65b2/vib20/satp-hdlm]
```

26. After installation, verify that all the required files are installed.

```
[root@DL380G10-143:~] esxcli software vib list
Name                          Version                             Vendor  Acceptance Level  Install Date  Platforms
----------------------------  ----------------------------------  ------  ----------------  ------------  ---------
hex-hdlm-dlnkmgr              08.8.7-00.0800                      HTI     PartnerSupported  2024-09-27    host
psp-hdlm-exlbk                08.8.0-00.0700                      HTI     VMwareAccepted    2024-09-27    host
psp-hdlm-exlio                08.8.0-00.0700                      HTI     VMwareAccepted    2024-09-27    host
psp-hdlm-exrr                 08.8.0-00.0700                      HTI     VMwareAccepted    2024-09-27    host
satp-hdlm                     08.8.7-01.0700                      HTI     VMwareAccepted    2024-09-27    host
```

27. To apply the multipathing changes, restart the ESXi host and verify the multipathing status. Ensure that the path policy is successfully updated, and that the PSP changed from VMW_PSP_RR to HTI_PSP_HDLM_EXLIO.

```
[root@localhost:~] esxcli storage nmp device list
naa.60060e800877350000050773500000010d
   Device Display Name: HITACHI Fibre Channel Disk (naa.60060e800877350000050773500000010d)
   Storage Array Type: HTI_SATP_HDLM
   Storage Array Type Device Config: {device config options }
   Path Selection Policy: HTI_PSP_HDLM_EXLIO
   Path Selection Policy Device Config:
   Path Selection Policy Device Custom Config:
   Working Paths: vmhba2:C0:T50:L1, vmhba3:C0:T26:L1
   Is USB: false

naa.60060e800877350000050773500000010e
   Device Display Name: HITACHI Fibre Channel Disk (naa.60060e800877350000050773500000010e)
   Storage Array Type: HTI_SATP_HDLM
   Storage Array Type Device Config: {device config options }
   Path Selection Policy: HTI_PSP_HDLM_EXLIO
   Path Selection Policy Device Config:
   Path Selection Policy Device Custom Config:
   Working Paths: vmhba2:C0:T50:L2, vmhba3:C0:T26:L2
   Is USB: false
```

Summary

Configuring HDLM on VMware ESXi optimizes path management and load balancing between Cisco UCS and the storage system. The process includes verifying compatibility, installing the HDLM package using ESXCLI, and configuring load balancing and failover for multiple storage paths. After installation, administrators can verify and monitor performance, ensuring high availability, redundancy, and optimal storage connectivity.

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