Planning to Move a Storage Cluster Between vCenters 15
Moving the Storage Cluster from a Current vCenter Server to a New VCenter Server 16
Unregistering a Storage Cluster from a vCenter Cluster 16
Registering a Storage Cluster with a New vCenter Cluster 18

CHAPTER 3
Monitoring Storage Capacity 21
HX Data Platform Capacity Overview 21
Understanding Capacity Savings 22
Capacity Status Summary 23
Summary Tab Capacity Portlet 24
Cluster Status Pop-up for Space Status 25

CHAPTER 4
Monitoring Cluster Component Status 27
Storage Cluster Physical Components Overview 27
Host Status and Configuration Details 28
Status Portlet for Host Status 28
Converged Nodes Information Pop-up 29
Manage Cluster Host Details 30
Manage Datastores Hosts Tab 31
vCenter Hosts Summary 32
Disk Status and Configuration Details 32
PSU Status and Configuration Details 33
NIC Status and Configuration Details 34

CHAPTER 5
Monitoring Storage Performance 35
Monitoring Storage Performance 35
Performance Portlet 35
Datastore Trends Portlet 36
View Performance Charts 36
Storage Cluster Performance Chart 37
Hosts Performance Chart 37
Datastores Performance Chart 37
Customizing Performance Charts 38
Specify Performance Time Period 38
Specify Custom Range 39
Selecting Performance Charts 39
HTML Performance Charts 40

**CHAPTER 6**

Managing Datastores 43
Managing Datastores Overview 43
Monitoring Datastore Status 43
Datastores Summary List 43
Datastore Summary Tab 44
Datastore Summary Details Portlet 44
Datastore Summary Trends Portlet 45
Datastore Summary Top VMs by Disk Usage Portal 45
Datastore Host Information 46
vSphere Datastore Summary 46
vCenter Datastore HX Data Platform Portlet 47
Managing Datastores 47
Adding Datastores 48
Editing Datastores 48
Mounting Datastores 49
Unmounting Datastores 50
Deleting Datastores 50

**CHAPTER 7**

Expanding the Storage Cluster 53
Expanding the Storage Cluster Overview 53
Storage Cluster Maintenance Operations Overview 53
Serial vs. Parallel Operations 54
Checking Cluster Status 55
Setting a Beacon 55
Verify vMotion Configuration for HX Cluster 56
Maintenance Modes for Storage Cluster Nodes 57
Setting HX Maintenance Mode 58
Logging into a Storage Controller VM 59
Managing Disks in the Cluster 60
Replacing SSDs 60
CHAPTER 8

Using Native Snapshots 65

HX Data Platform Native Snapshots Overview 65
  Benefits of HX Data Platform Native Snapshots 65
  Native Snapshot Considerations 66
  Native Snapshot Best Practices 68
  Understanding SENTINEL Snapshots 69
  Native Snapshot Timezones 69
  Scheduling Snapshots Overview 70

Creating Snapshots 71
Scheduling Snapshots 72
Setting the Frequency of Scheduled Snapshots 72
Deleting Snapshot Schedules 73
Reverting to a Snapshot 73
Deleting Snapshots 74

CHAPTER 9

Using HX Data Platform ReadyClones 75

HX Data Platform ReadyClones Overview 75
  Benefits of HX Data Platform ReadyClones 75
  Supported Base VMs 76
  ReadyClone Requirements 76
  ReadyClone Best Practices 77

Creating HX Data Platform ReadyClones 77
Prepare to Customize HX Data Platform ReadyClones 79
  Creating a Customization Specification for Linux in the vSphere Web Client 79
  Create a Customization Specification for Windows in the vSphere Web Client 79

Configuring ReadyClones Using Customized Specifications 80

CHAPTER 10

HX Data Platform High Availability 81

HX Data Platform High Availability Overview 81
Responses to Storage Cluster Node Failures 81
Data Replication Factor Settings 86
Cluster Access Policy 86
  View the Data Replication Factor and Cluster Access Policy Setting 87
  Changing the Cluster Access Policy Level 87
HX Data Platform Cluster Tolerated Failures 87

CHAPTER 11
Understanding System Events 91
Understanding System Events 91
View HX Data Platform Plug-in Events 92
Disk Events 93
Cluster Events 94
Node Events 97
Rebalancing Events 98
Cluster Access Policy Compliance Events 98
Snapshot Events 99
Space Utilization Events 100
Reclaiming Space Events 103
Upgrade Events 103
Critical Infrastructure Events 104

CHAPTER 12
Troubleshooting 105
Common TAC-Assisted Support Topics 105
Cisco HX Data Platform Support Bundles 106
  Collecting Logs from Controller VMs 106
  Collecting Logs from ESXi Hosts 107
  Collecting Deployment Logs from the Cisco HX Data Platform Installer VM 107
  Collecting Logs from the vCenter Server 108
  Out of Space Error When Generating a Support Bundle 108
  Collecting Logs from vSphere Web Client 108
  Collecting Logs from the Cisco HX Data Platform Plug-in 109
  Downloading an Existing Support Bundle 110
  Uploading Support Bundles 110
  Uploading Support Bundles using ftp or sftp 110
  Uploading Support Bundle using sftp 111
Uploading Support Bundles using https 112

Host Issues 112
   Two Nodes Fail Simultaneously Causes the Storage Cluster to Shutdown 112
   Remove Node Fails when a Node is Down 113
   Rebooting an HA Enabled ESX Host 113
   Node Failure While Simultaneously Adding Another Node to Cluster 113
   Controller VM Did Not Power On When Host Powered On 114

Disk Issues 114
   Cannot Allocate Data when All or Most Disks Fail on a Node in a 3 Node Storage Cluster 114
   Removing Disks Causes Rebooting Storage Controller VM to Fail 115
   Recover Failed SSD on Storage Controller VM 115

VM Issues 116
   Degraded Performance on VM with Disk Limit Shares 116
   DRS Migrates VMs when Storage Cluster in Read Only State 116
   VM Power On Fails Due to Stale EAM Extension 117
   Deleting VM Folder or File Taking Very Long Time 117

Capacity Issues 118
   Cluster Capacity Different Than Provisioned 118
   Capacity Messages Different Between Cluster and Datastore 118

Datastore Issues 119
   NFS All Paths Down with Message File Locked by Consumer on Host 119
   Mounting Datastore Fails After Changing VLAN ID 120
   Datastore fails to mount if data vSwitch has an existing vmkernel port configured with an IP address 120
   Changing Datastore Name Through vSphere Web Client 120
   Remounting Datastore after Cluster Restart 121
   Datastore Does Not Unmount When Storage I/O RM Daemon Running 122

ReadyClone and Snapshot Issues 123
   Deleting Desktop Pool Leaves Orphaned VM Folder 123
   Storage Cluster Missing from vCenter Cluster after Cluster Node Powered Off 123
Using Cisco HyperFlex Systems Plug-in

Cisco HyperFlex Systems Plug-in Overview

One of the interfaces you can use to monitor and manage the HX Data Platform storage cluster is the HX Data Platform plug-in.

The HX Data Platform plug-in is seamlessly integrated with the vSphere Web Client. All of the HX Data Platform post-installation management and monitoring functions are available through the HX Data Platform plug-in. Direct access to the HX Data Platform plug-in is through the vSphere Web Client Navigator. HX Data Platform monitoring and managing tasks are performed through the HX Data Platform plug-in.

Some functions and pages, related to vCenter Server management, are accessed in the vSphere Web Client interface, separate from the HX Data Platform plug-in portion of the vSphere Web Client. For HX Data Platform command line interface (HX Data Platform CLI) options see the Cisco HX Data Platform Command Line Interface Reference.

For the purposes of this guide, the pages and actions described are through the HX Data Platform plug-in. When an action or page is not through the HX Data Platform plug-in, for example for a vCenter Server function, a vSphere Web Client page, or an HX Data Platform CL1 command, that reference is listed.

Accessing the Cisco HyperFlex Systems Plug-in

Access the HX Data Platform plug-in through the vSphere Web Client Navigator.

HX Data Platform Plug-in works with vCenter supported non-English locale languages.
Procedure

Step 1  From anywhere in the vSphere Web Client, click the Home icon (house) located at the topo of the vCenter panel.

Step 2  From the Navigator Home page, select **vCenter Inventory Lists**.

Step 3  Scroll through the vCenter Inventory List to access the HX Data Platform plug-in.

Step 4  Expand the Cisco HyperFlex Systems and click **Cisco HX Data Platform** to display the HX storage clusters available through the HX Data Platform plug-in.

Notice that the Cisco HXDP object lists the number of HX storage clusters.

From storage cluster Objects tab you can:

- Edit the storage cluster name. Click the edit icon (pencil) or select **Rename Cluster** from the Actions menu.

- Display the storage cluster configuration. Click the summary icon (green paper) or select **Summary** from the Actions menu.

Step 5  Select an HX **storage cluster** from the list in the Navigator pane.

Step 6  Click tabs in the center pane to access the HX Data Platform plug-in information and various actions.

<table>
<thead>
<tr>
<th>Option</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Getting Started</td>
<td>Read introductory information and access basic actions.</td>
</tr>
<tr>
<td>Summary</td>
<td>Monitor basic status and configuration for HX Data Platform storage objects.</td>
</tr>
<tr>
<td>Monitor</td>
<td>Monitor HX storage cluster, host, and datastore performance and events.</td>
</tr>
<tr>
<td>Manage</td>
<td>Monitor HX storage cluster details, create and manage datastores, copy and export information.</td>
</tr>
</tbody>
</table>

**Cisco HX Data Platform Plug-in Integration with vSphere Web Client**

The HX Data Platform plug-in is tightly integrated with the VMware vSphere vCenter interface to provide a seamless data management experience. You can use either the vSphere Web Client or the vSphere Client vSphere vCenter interface. Most of the task examples in this guide refer to the vSphere Web Client interface.

You access the HX Data Platform plug-in through the vSphere vCenter Inventory Lists. Select storage clusters to manage from the HX Data Platform plug-in. The HX Data Platform plug-in monitors and manages storage cluster specific objects such as datastores. vSphere monitors and manages objects in the storage cluster, such as ESX servers. Tasks overlap between the HX Data Platform plug-in and vSphere.
Links Between the Cisco HX Data Platform Plug-in and the vSphere Interface

In the vSphere Web Client, both the HX Data Platform plug-in and vCenter provide information on component and cluster status. Selected tabs and panels provide direct links between HX Data Platform plug-in and vCenter information and actions.

Note that following a link from either the HX Data Platform plug-in or vCenter does not mean there is a single-click link to return to your starting location.

Overview of Cisco HyperFlex Systems Plug-in Tabs

The HX Data Platform plug-in monitoring information and managing functions are distributed among three tabs.

- The **Summary** tab contains the Capacity, Performance, and Status widgets.
- The **Monitor** tab is divided into Performance and Events.
  - The Monitor **Performance tab** displays the read and write performance of the HX storage cluster, hosts, and datastores.
  - The Monitor **Events tab** displays information about the state changes of the HX storage cluster due to user actions and system actions that occur on the HX storage cluster, hosts, or datastores.
- The **Manage** tab is divided into Cluster and Datastores.
  - The **Cluster tab** provides description regarding the Hosts, Disks, and PSUs in the cluster.
  - The **Datastore tab** has a table that lists all the datastores in the HX storage cluster.
Overview of Cisco HyperFlex Systems Plug-in Tabs
Managing the Storage Cluster

- Monitoring the Storage Cluster, on page 5
- Managing Storage Clusters, on page 13

Monitoring the Storage Cluster

This section describes the methods for monitoring storage cluster status.

About Monitoring Cluster Status

HX Data Platform storage cluster information is available through a the HX Data Platform plug-in the Manage tab. The following topics describe the storage cluster views.

Understanding Cluster Status Values

The storage cluster status is displayed in the storage cluster Summary tab both in the top left of the page and in the Cluster widget. The storage cluster status states describe the following conditions.

<table>
<thead>
<tr>
<th>Cluster Status</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Online</td>
<td>The storage cluster is connected to vCenter and is operational.</td>
</tr>
<tr>
<td>Offline</td>
<td>The storage cluster is not operational.</td>
</tr>
<tr>
<td>Degraded</td>
<td>vCenter cluster state is Offline or the Platform health state is Average. There is at least one failure (such as disk, node, or network) in the storage cluster. You must replace one or more disks to rebalance the storage cluster. Data is still available. If the storage controller VM is not operational, the status of the storage cluster changes to Degraded and the node is listed as Missing.</td>
</tr>
</tbody>
</table>
### Description

<table>
<thead>
<tr>
<th>Cluster Status</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Warning</td>
<td>Either the storage cluster resource management server is not operational, or the storage cluster health is marginal. You must replace one or more disks to rebalance the storage cluster to avoid data loss. Platform Health state is Marginal.</td>
</tr>
<tr>
<td>Failed</td>
<td>Cluster creation failed (or) Platform health state is Critical.</td>
</tr>
<tr>
<td>In Progress</td>
<td>Cluster creation is in progress.</td>
</tr>
<tr>
<td>Out of Space</td>
<td>The system is out of storage space. You must add storage or delete data to release storage space.</td>
</tr>
<tr>
<td>Read Only</td>
<td>The storage cluster is read-only mode. You cannot write data to the storage cluster.</td>
</tr>
</tbody>
</table>

### HX Data Platform Objects

To view the list of storage clusters in the vCenter inventory, from the vSphere Web Client Navigator, select **Home > vCenter Inventory Lists > Cisco HyperFlex Systems > Cisco HX Data Platform**. The Objects tab lists all the configured storage clusters.

<table>
<thead>
<tr>
<th>Field</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Name</td>
<td>Name of the selected storage cluster.</td>
</tr>
<tr>
<td>Status</td>
<td>Status of the storage cluster.</td>
</tr>
<tr>
<td>Free</td>
<td>Same as available capacity. For the storage cluster, this is the difference between the amount available to the storage cluster and the amount used on the storage the amount available to the storage cluster and the amount used on the storage cluster.</td>
</tr>
<tr>
<td>Used</td>
<td>Amount of storage consumed.</td>
</tr>
<tr>
<td>Total</td>
<td>Same as capacity. Amount of storage provisioned to all the storage cluster datastores.</td>
</tr>
<tr>
<td>Nodes</td>
<td>Number of converged and compute nodes in the storage cluster.</td>
</tr>
</tbody>
</table>

### HX Data Platform Summary Tab

Access summary tab from the vSphere Web Client Navigator, select **Home > vCenter Inventory Lists > Cisco HyperFlex Systems > Cisco HX Data Platform > cluster > Summary**. You can view information about the storage clusters, hosts, and datastores on the Summary tab.

<table>
<thead>
<tr>
<th>Item</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Summary tab top panel.</td>
<td>Displays storage cluster status and capacity status summaries.</td>
</tr>
</tbody>
</table>
Summary Tab Top Panel

Monitor summary information about the storage cluster, hosts, disks, and datastores on the Summary tab. The Summary tab also displays a graphical representation of the storage cluster and host capacity and performance. From the vSphere Web Client Navigator, select Home > vCenter Inventory Lists > Cisco HyperFlex Systems > Cisco HX Data Platform > cluster > Summary.

<table>
<thead>
<tr>
<th>Field</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Information icon</td>
<td>Displays the Cluster Summary Information Pop-up.</td>
</tr>
<tr>
<td>Total Nodes</td>
<td>Number of hosts in the storage cluster.</td>
</tr>
<tr>
<td>Datastores</td>
<td>Number of datastores in the storage cluster.</td>
</tr>
<tr>
<td>Version</td>
<td>HX Data Platform software version number.</td>
</tr>
<tr>
<td>Model</td>
<td>HX-Series Server model number (such as HX220c or HX240c).</td>
</tr>
<tr>
<td>VC Cluster</td>
<td>A live link to the vCenter compute cluster. Click the link to access the vCenter cluster itself.</td>
</tr>
<tr>
<td>Storage bar</td>
<td>The Storage bar displays storage summary information.</td>
</tr>
<tr>
<td></td>
<td>• <strong>Used</strong>. Amount of storage consumed.</td>
</tr>
<tr>
<td></td>
<td>• <strong>Free</strong>. Same as available capacity. For the storage cluster, this is the difference between the amount available to the storage cluster and the amount used on the storage cluster.</td>
</tr>
<tr>
<td></td>
<td>• <strong>Capacity</strong>. Amount of storage provisioned to all the storage cluster datastores.</td>
</tr>
<tr>
<td>Cluster Status bar</td>
<td>The Cluster Status bar displays the overall storage cluster status.</td>
</tr>
<tr>
<td></td>
<td>Summary of storage cluster status includes:</td>
</tr>
<tr>
<td></td>
<td>• <strong>Converged Nodes</strong>. Number of storage nodes in the storage cluster.</td>
</tr>
<tr>
<td></td>
<td>• <strong>Controllers</strong>. Number of storage controller VMs in the storage cluster.</td>
</tr>
</tbody>
</table>
### Cluster Summary Information Pop-up

From the vSphere Web Client Navigator, select **Home > vCenter Inventory Lists > Cisco HyperFlex Systems > Cisco HX Data Platform > cluster > Summary**. Click the information icon to view the following:

<table>
<thead>
<tr>
<th>Field</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cluster UUID</td>
<td>UUID assigned to the selected storage cluster.</td>
</tr>
<tr>
<td>node1, node2, ...</td>
<td>ID for each node in the selected storage cluster.</td>
</tr>
<tr>
<td>Cluster Uptime</td>
<td>Total time since the storage cluster was created.</td>
</tr>
<tr>
<td>Copy to Clipboard</td>
<td>Button to copy the contents of this information pop-up to the clipboard.</td>
</tr>
</tbody>
</table>

### Status Portlet

The Status portlet displays the status of the storage cluster, hosts, and storage controller VMs. From the vSphere Web Client Navigator, select **Home > vCenter Inventory Lists > Cisco HyperFlex Systems > Cisco HX Data Platform > cluster > Summary > Status**.

<table>
<thead>
<tr>
<th>Field</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cluster Status</td>
<td>Status of the storage cluster. See Understanding Cluster Status Values.</td>
</tr>
<tr>
<td>Health State</td>
<td>Status of the platform. Options include: Healthy, Average, Marginal, Critical</td>
</tr>
<tr>
<td>Resiliency Status</td>
<td>Number of tolerated nodes failures.</td>
</tr>
<tr>
<td>Last Updated</td>
<td>Date and timestamp when the information in widget was updated.</td>
</tr>
<tr>
<td>Replication Factor</td>
<td>Value selected for number of duplicate replicas of data stored.</td>
</tr>
<tr>
<td>Converged Nodes</td>
<td>Lists the number of storage cluster hosts and storage controller VMs that are online.</td>
</tr>
<tr>
<td></td>
<td>Displays a list of all converged only hosts in the storage cluster.</td>
</tr>
<tr>
<td></td>
<td>Expand to view list of hosts.</td>
</tr>
<tr>
<td>Compute Nodes</td>
<td>Displays a list of all compute only nodes in the storage cluster.</td>
</tr>
<tr>
<td></td>
<td>Expand to view list of hosts.</td>
</tr>
<tr>
<td>host</td>
<td>Name of host. Links to the vSphere Web Client host Summary page.</td>
</tr>
<tr>
<td>Field</td>
<td>Description</td>
</tr>
<tr>
<td>-----------------------</td>
<td>-----------------------------------------------------------------------------</td>
</tr>
<tr>
<td>Controller Status</td>
<td>Status of the storage controller VM on the converged node.</td>
</tr>
<tr>
<td>Host IP</td>
<td>IP address for the host on the network.</td>
</tr>
<tr>
<td>Information icon</td>
<td>The Summary tab Status portlet has two information pop-ups that display additional details about the storage cluster and converged nodes in the storage cluster.</td>
</tr>
</tbody>
</table>

### Cluster Status Information Pop-up

From the vSphere Web Client Navigator, select **Home > vCenter Inventory Lists > Cisco HyperFlex Systems > Cisco HX Data Platform > cluster > Summary > Status**. Click the information icon.

<table>
<thead>
<tr>
<th>Field</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Status</td>
<td>Status of the storage cluster.</td>
</tr>
<tr>
<td>Health State</td>
<td>Status of the platform. Options include: Healthy, Average, Marginal, Critical</td>
</tr>
<tr>
<td>Resiliency Status</td>
<td>Number of tolerated nodes failures.</td>
</tr>
<tr>
<td>Policy Compliance</td>
<td>Degree of compliance with the configured Cluster Access Policy.</td>
</tr>
<tr>
<td>Space Status</td>
<td>Status of the storage capacity.</td>
</tr>
<tr>
<td></td>
<td>- Normal. Your system is below the alert threshold.</td>
</tr>
<tr>
<td></td>
<td>- Warning. If your system has consumed 76% of the allocated capacity.</td>
</tr>
<tr>
<td></td>
<td>- Critical. If your system has consumed 92% of the allocated capacity.</td>
</tr>
<tr>
<td></td>
<td>- Offline (Read-Only). If your system has consumed 100% of the allocated capacity.</td>
</tr>
<tr>
<td></td>
<td>The percent values might vary by 1-2%, depending upon if the cleaner has completed.</td>
</tr>
<tr>
<td>Replication Factor</td>
<td>Value selected for number of duplicate replicas of data stored.</td>
</tr>
<tr>
<td>Access Policy</td>
<td>Configured value for Cluster Access Policy.</td>
</tr>
<tr>
<td>Reason</td>
<td>Brief message describing storage cluster Status.</td>
</tr>
<tr>
<td></td>
<td>The icon for the Cluster Status Information pop-up does not display if there is no Reason field content to display.</td>
</tr>
</tbody>
</table>
Cluster Configuration Summary

A single document lists a comprehensive collection of storage cluster configuration information. From the vSphere Web Client Navigator, select vCenter Inventory Lists > Cisco HyperFlex Systems > Cisco HX Data Platform > cluster > Actions > Summary.

Expandable Cluster Summary includes the following:

<table>
<thead>
<tr>
<th>Field</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Cisco HX cluster</strong></td>
<td></td>
</tr>
<tr>
<td>Cluster Name</td>
<td>Name of the selected storage cluster.</td>
</tr>
<tr>
<td>Cluster Management IP Address</td>
<td>IP address for the management network to the storage cluster</td>
</tr>
<tr>
<td>Cluster Data IP Address</td>
<td>IP address for the data network to the storage cluster</td>
</tr>
<tr>
<td>Replication Factor</td>
<td>Value selected for number of duplicate replicas of data stored.</td>
</tr>
<tr>
<td><strong>Status</strong></td>
<td></td>
</tr>
<tr>
<td>Operational Status</td>
<td>Status of the storage cluster. Options include: Online, Offline, ReadOnly, Unknown.</td>
</tr>
<tr>
<td>Resiliency Status</td>
<td>Status of the platform. Options include: Healthy, Warning, Unknown.</td>
</tr>
<tr>
<td><strong>Nodes</strong></td>
<td></td>
</tr>
<tr>
<td>Converged Nodes</td>
<td>Displays a list of all converged nodes in the storage cluster.</td>
</tr>
<tr>
<td>Compute Nodes</td>
<td>Displays a list of all compute only nodes in the storage cluster.</td>
</tr>
<tr>
<td>Model</td>
<td>Physical hardware model number of the node.</td>
</tr>
<tr>
<td>Serial Number</td>
<td>Physical serial number for the node.</td>
</tr>
<tr>
<td>Node Name</td>
<td>Name of the node used in the network</td>
</tr>
<tr>
<td>Hypervisor</td>
<td>IP address for the management network to the storage cluster.</td>
</tr>
<tr>
<td>Storage Controller</td>
<td>IP address for the storage controller VM.</td>
</tr>
<tr>
<td><strong>Management Network</strong></td>
<td>Network information for the management network. Expands to list VLAN Tag, Subnet Mask, Default Gateway.</td>
</tr>
<tr>
<td><strong>Data Network</strong></td>
<td>Network information for the data network. Expands to list VLAN Tag, Subnet Mask, Default Gateway.</td>
</tr>
<tr>
<td>VLAN Tag</td>
<td>VLAN tag specified when the storage cluster was created.</td>
</tr>
<tr>
<td>Subnet Mask</td>
<td>Subnet mask specified when the storage cluster was created.</td>
</tr>
<tr>
<td>Default Gateway</td>
<td>Default gateway specified when the storage cluster was created.</td>
</tr>
</tbody>
</table>
### Field Description

<table>
<thead>
<tr>
<th>vCenter Server</th>
<th>Name for the vCenter server that hosts the storage cluster.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Datacenter Name</td>
<td>Name for the vCenter datacenter shared by the storage cluster</td>
</tr>
<tr>
<td>Cluster Name</td>
<td>Name for the vCenter cluster that hosts the storage cluster.</td>
</tr>
</tbody>
</table>

#### Network Services

<table>
<thead>
<tr>
<th>DNS Servers</th>
<th>IP addresses of any DNS servers configured that provide the reverse name lookup for storage cluster access.</th>
</tr>
</thead>
<tbody>
<tr>
<td>NTP Servers</td>
<td>IP addresses or names for the NTP servers that provide time synchronization for the HX Data Platform plug-in.</td>
</tr>
<tr>
<td>AutoSupport Enabled</td>
<td>Whether the HX Data Platform AutoSupport feature is enabled or not. Contact Technical Assistance Center (TAC).</td>
</tr>
<tr>
<td>Available Capacity</td>
<td>Same as free capacity. For the storage cluster, this is the difference between the amount available to the storage cluster and the amount used on the storage cluster.</td>
</tr>
</tbody>
</table>

### Cluster Summary Pane

The Manage tab displays alerts if there are hardware issues with the HX Data Platform storage cluster or disks and provides troubleshooting information.

---

**Note**

Depending upon your hardware and your HX Data Platform your HX Data Platform plug-in display might include simulated representations of your physical hardware components, including: SSD, HDD, PSU, NIC, and hosts. If you have this option additional tabs, Physical and Table, are displayed. If you do not have this option, the area is blank and the Table tab content is displayed.

You can access the cluster summary pane from the vSphere Web Client Navigator, select [vCenter Inventory Lists] > [Cisco HyperFlex Systems] > [Cisco HX Data Platform] > [cluster] > [Manage] > [Cluster]. Select a cluster.

<table>
<thead>
<tr>
<th>Field</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Model</td>
<td>HX Data Platform storage cluster model number.</td>
</tr>
<tr>
<td>Serial Number</td>
<td>Cluster serial number.</td>
</tr>
<tr>
<td>Converged Nodes</td>
<td>Number of hosts used for storage resource in the storage cluster.</td>
</tr>
<tr>
<td>Hard Disks</td>
<td>Number of hard disks in the storage cluster</td>
</tr>
<tr>
<td>SSDs</td>
<td>Number of Solid State Disks in the storage cluster.</td>
</tr>
<tr>
<td>PSU1 Status and PSU 2 Status</td>
<td>Power and connection status of PSUs in the storage cluster.</td>
</tr>
</tbody>
</table>
vCenter Cluster Summary

The HX Data Platform plug-in includes links to the vSphere Web Client storage cluster Summary tab.

You can access the vCluster summary from the vSphere Web Client Navigator, select vCenter Inventory Lists > Cisco HyperFlex Systems > Cisco HX Data Platform > cluster > Summary.

Then click the VC Cluster link. The vSphere Web Client Summary page displays information about the selected storage cluster. This is not a HX Data Platform plug-in page. See your VMware documentation for descriptions of the vSphere fields. Click the cluster Name link in the Cisco HyperFlex Systems widget to return to the storage cluster.

vCenter Cluster HX Data Platform Portlet

The HX Data Platform plug-in includes links to the vSphere Web Client storage cluster Summary tab. From the vSphere Web Client Navigator, select vCenter Inventory Lists > Cisco HyperFlex Systems > Cisco HX Data Platform > cluster > Summary. Click the VC Cluster link to view information about the selected storage cluster and the Cisco HyperFlex Systems portlet.

<table>
<thead>
<tr>
<th>Field</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Name</td>
<td>The storage cluster name. Links to the HX Data Platform plug-in Summary page for the storage cluster.</td>
</tr>
<tr>
<td>Capacity</td>
<td>Amount of storage provisioned to all the storage cluster datastores.</td>
</tr>
<tr>
<td>Free</td>
<td>Same as available capacity. For the storage cluster, this is the difference between the amount available to the storage cluster and the amount used on the storage cluster.</td>
</tr>
<tr>
<td>Savings</td>
<td>Capacity saved by the HX Data Platform system.</td>
</tr>
<tr>
<td>Total Savings</td>
<td>Total capacity saved by the HX Data Platform system.</td>
</tr>
<tr>
<td>Compression</td>
<td>How much of the data is compressed.</td>
</tr>
<tr>
<td>Deduplication</td>
<td>How much data is deduplicated. Deduplication is a method of reducing storage space by eliminating redundant data. It stores only one unique instance of the data.</td>
</tr>
<tr>
<td>Datastore Capacity</td>
<td>A collected number, not an actual capacity. When provisioned does not have a quota enforcement, the total provisioned datastore capacity does not necessarily match, nor is it reflective of the actual storage cluster capacity.</td>
</tr>
<tr>
<td>Provisioned Capacity</td>
<td>Amount of capacity allocated to all the storage cluster datastores.</td>
</tr>
<tr>
<td>Used Capacity</td>
<td>Amount of capacity consumed by all the storage cluster datastores.</td>
</tr>
<tr>
<td>Available Capacity</td>
<td>Same as free capacity. For the storage cluster, this is the difference between the amount available to the storage cluster and the amount used on the storage cluster.</td>
</tr>
</tbody>
</table>
Managing Storage Clusters

Selected activities can be performed at the storage cluster level.

Rebalancing the Cluster

The storage cluster is rebalanced on a regular schedule. It is used to realign the distribution of stored data across changes in available storage and to restore storage cluster health. If you add or remove a node in the storage cluster, you can manually initiate a storage cluster rebalance using the `stcli rebalance` command.

---

Note

Rebalancing might take some time depending on the disk capacity used on the failed node or disk.

---

Procedure

Step 1
Start rebalancing the storage cluster.

a) Login to a controller VM in the storage cluster.
b) From the controller VM command line, run the command:

```
# stcli rebalance start --force
```

Step 2
Verify rebalancing status from the storage controller VM.

a) Enter the following on the command line:

```
# stcli rebalance status
rebalanceStatus:
rebalanceState:
cluster_rebalance_ongoing
percentComplete: 10
rebalanceEnabled: True
```

b) Reenter the command to monitor progress:

```
# stcli rebalance status
rebalanceStatus:
percentComplete: 0
rebalanceState: cluster_rebalance_not_running
rebalanceEnabled: True
```

c) Reenter the command line to confirm the process completes:

```
# stcli rebalance status
rebalanceStatus:
rebalanceState: cluster_rebalance_not_running
rebalanceEnabled: True
```

This sample indicates that rebalance is enabled, and ready to perform a rebalance, but is not currently rebalancing the storage cluster.
Checking Cluster Rebalance and Self Healing Status

The storage cluster is rebalanced on a regular schedule and when the amount of available storage in the cluster changes. A rebalance is also triggered when there is a change in the amount of available storage. This is an automatic self healing function.

You can check rebalance status through the HX Data Platform plug-in or through the storage controller VM command line.

Procedure

Step 1
Checking rebalance status through HX Data Platform plug-in.

a) From the vSphere Web Client Navigator, select vCenter Inventory Lists > Cisco HyperFlex Systems > Cisco HX Data Platform > cluster > Summary.

   The Status portlet lists the Self healing status.

   The Self healing status field lists the rebalance activity or N/A, when rebalance is not currently active.

Step 2
Checking rebalance status through the storage controller VM command line.

a) Login to a controller VM using ssh.
b) From the controller VM command line, run the command.

   # stcli rebalance status

   The following output indicates that rebalance is not currently running on the storage cluster.

   rebalanceStatus:
   percentComplete: 0
   rebalanceState: cluster_rebalance_not_running
   rebalanceEnabled: True

   The Recent Tasks tab in the HX Data Platform plug-in displays a status message.

Handling Out of Space Errors

If your system displays an Out of Space error, you can either add a node to increase free capacity or delete existing unused VMs to release space.

When there is an Out of Space condition, the VMs are unresponsive.

Note

Do not delete storage controller VMs. Storage controller VM names have the prefix stCtlVM.

Procedure

Step 1
To add a node, use the Expand Cluster feature of the HX Data Platform Installer.

Step 2
To delete unused VMs, complete the following:
a) Determine which guest VMs you can delete. You can consider factors such as disk space used by the VM or naming conventions.

b) Go to vCenter > Virtual Machines to display the virtual machines in the inventory.

c) Double-click a VM that you want to delete.

d) Select the Summary > Answer Questions to display a dialog box.

e) Click the Cancel radio button and click OK.

f) Power off the VM.

g) Delete the VM.

### Step 3

After the Out of Space condition is cleared, complete the following:

a) Go to vCenter > Virtual Machines to display the VM in the inventory.

b) Double-click a VM that you want to use.

c) Select the Summary > Answer Questions to display a dialog box.

d) Click the Retry radio button and click OK.

---

### Checking Cleaner Schedule

The stcli cleaner command typically runs in the background continuously. The cleaner goes into sleep mode when it is not needed and wakes when policy defined conditions are met. For example, if your storage cluster is experiencing ENOSPC condition, the cleaner automatically runs at High Priority.

Do not expand the cluster while the cleaner is running. Check the cleaner schedule or adjust the schedule, as needed.

#### Procedure

**Step 1**

Login to any controller VM in the storage cluster. Run the listed commands from the controller VM command line.

**Step 2**

View the cleaner schedule.

```
# stcli cleaner get-schedule --id ID | --ip NAME
```

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>--id ID</td>
<td>ID of storage cluster node</td>
</tr>
<tr>
<td>--ip NAME</td>
<td>IP address of storage cluster node</td>
</tr>
</tbody>
</table>

---

### Planning to Move a Storage Cluster Between vCenters

When you rename the vCenter datacenter or vCenter cluster, you must re-register the HX storage cluster.

Moving a storage cluster from one vCenter cluster to another requires the listed steps. See the following topics for detailed information.

1. Meet the prerequisites to this task. See Moving the Storage Cluster from a Current vCenter Server to a New VCenter Server, on page 16.
2. Delete the cluster from the old vCenter, create a new cluster on the new vCenter. Use the same cluster name. See Moving the Storage Cluster from a Current vCenter Server to a New VCenter Server, on page 16.

3. Unregister HX Data Platform using the vCenter Extension Manager. See Unregistering a Storage Cluster from a vCenter Cluster, on page 16

4. Use the `stcli cluster reregister` command to associate the HX Storage Cluster with a new vCenter. See Registering a Storage Cluster with a New vCenter Cluster, on page 18.

Moving the Storage Cluster from a Current vCenter Server to a New VCenter Server

**Before you begin**

- If your HX Cluster is running HX Data Platform version older than 1.8(1c), upgrade before attempting to reregister to a new vCenter.
- Perform this task during a maintenance window.
- Ensure the cluster is healthy and upgrade state is OK and Healthy. You can view the state using the `stcli` command from the controller VM command line.

```shell
# stcli cluster info
```

Check response for:

```
upgradeState: ok
healthState: healthy
```

- Ensure vCenter must be up and running.
- Snapshot schedules are not moved with the storage cluster when you move the storage cluster between vCenter clusters.

**Procedure**

---

**Step 1**

From the current vCenter, delete the cluster.
This is the vCenter cluster specified when the HX storage cluster was created.

**Step 2**

On the new vCenter, create a new cluster using the same cluster name.

**Step 3**

Add ESX hosts to new vCenter in the newly created cluster.

---

**What to do next**

Proceed to Unregistering a Storage Cluster from a vCenter Cluster, on page 16.

Unregistering a Storage Cluster from a vCenter Cluster

This step is optional and not required. It is recommended to leave the HX Data Platform Plug-in registration alone in the old vCenter.
Before you begin

As part of the task to move a storage cluster from one vCenter server to another vCenter server, complete the steps in Moving the Storage Cluster from a Current vCenter Server to a New vCenter Server, on page 16.

Note

If multiple HX clusters are registered to the same vCenter, do not attempt this procedure until all HX clusters have been fully migrated to different vCenter. Running this procedure is disruptive to any existing HX clusters registered to the vCenter.

Procedure

Step 1 Login to the old vCenter server MOB extension manager.
   a) In a browser, enter the path and command.

   https://vcenter_server/mob/moid=ExtensionManager&doPath=extensionList

   vcenter_server is the IP address of the vCenter where the storage cluster is currently registered.

   b) Enter administrator login credentials.

Step 2 Scroll through the list to locate the HX Data Platform extensions,
   com.springpath.sysmgmt and com.springpath.sysmgmt.uuid.
   
   Note If you have multiple HyperFlex clusters, ensure that you select the correct cluster ID to unregister. To view the cluster ID, login to a controller VM and run the command.

   # show cluster info

Step 3 Copy each of these strings into your clipboard.

   Exclude the double quotes (") on either end of string, if there are any.

Step 4 Unregister each extension string.
   a) Scroll down the page and click UnregisterExtension.
   b) Paste one extension string into the field and click Invoke Method.
   c) Repeat for the other string.

Step 5 Restart the vSphere Client services.

   The HX Data Platform extensions are removed when the vSphere Client services are restarted. Restarting the vSphere client service temporarily disables access to vCenter through the browser.

   For additional information, see the VMware KB, Stopping, starting, or restarting VMware vCenter Server Appliance 6.0 services (2109887).

Step 6 Remove the HX Data Platform files from the vSphere Client. Select a method.

   Linux vCenter
   a) Login to the Linux vCenter server using ssh as a root user.
   b) Change to the folder containing the HX Data Platform Plug-in folder.

   For vCenter 6.0
Step 7
Verify the HX cluster is no longer on the old vCenter.

a) Logout out of the old vCenter.
b) Login in again to the old vCenter and verify the HX Data Platform Plug-in has been removed.

What to do next
Proceed to Registering a Storage Cluster with a New vCenter Cluster, on page 18.

Registering a Storage Cluster with a New vCenter Cluster

Before you begin
As part of the task to move a storage cluster from one vCenter server to another vCenter server, complete the steps in Unregistering a Storage Cluster from a vCenter Cluster, on page 16.

Procedure

Step 1
Login to a controller VM.

Step 2
Run the `stcli cluster reregister` command.

```
```
Apply additional listed options as needed.

<table>
<thead>
<tr>
<th>Syntax Description</th>
<th>Option</th>
<th>Required or Optional</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>--vcenter-url</td>
<td>Required.</td>
<td>URL of the new vCenter, <code>&lt;vcentername&gt;</code>. Where <code>&lt;vcentername&gt;</code> can be FQDN or IP.</td>
<td></td>
</tr>
<tr>
<td>--vcenter-user</td>
<td>Required.</td>
<td>User name of the new vCenter administrator.</td>
<td></td>
</tr>
<tr>
<td>--vcenter-cluster</td>
<td>Required.</td>
<td>Name of the new vCenter cluster.</td>
<td></td>
</tr>
<tr>
<td>--vcenter-datacenter</td>
<td>Required.</td>
<td>Name of the new vCenter datacenter.</td>
<td></td>
</tr>
<tr>
<td>--vcenter-password</td>
<td>Optional.</td>
<td>Password of the new vCenter administrator.</td>
<td></td>
</tr>
<tr>
<td>--vcenter-sso-url</td>
<td>Optional.</td>
<td>URL of the new vCenter SSO server. This is inferred from --vcenter-url, if not specified.</td>
<td></td>
</tr>
</tbody>
</table>

Example response:

```
Reregister StorFS cluster with a new vCenter ...
Enter NEW vCenter Administrator password: Waiting for Cluster creation to finish ...
```

If, after your storage cluster is re-registered, your compute only nodes fail to register with EAM, or are not present in the EAM client, and not under the resource pool, then contact TAC to complete the compute node reregister.

**Step 3**

Re-enter your snapshot schedules.

Snapshot schedules are not moved with the storage cluster when you move the storage cluster between vCenter clusters.
Monitoring Storage Capacity

- HX Data Platform Capacity Overview, on page 21
- Understanding Capacity Savings, on page 22
- Capacity Status Summary, on page 23
- Summary Tab Capacity Portlet, on page 24
- Cluster Status Pop-up for Space Status, on page 25

HX Data Platform Capacity Overview

In the HX Data Platform the concept of capacity is applied to both datastores and storage clusters. Values are in GB or TB, as labeled.

- **Cluster capacity** - All the storage from all the disks on all the nodes in the storage cluster. This includes uncleaned data and the metadata overhead for each disk.
  The total/used/free capacity of cluster is based on overall storage capacity and how much storage is used.

- **Datastore capacity** - The amount of storage available for provisioning to datastores without over-provisioning. Generally, this is similar to the cleaned storage cluster capacity, but it is not an exact match. It does not include metadata or uncleaned data.
  The provisioned/used/free capacity of each datastore is based on datastore (thin) provisioned capacity. Because the datastore is thin provisioned, the provisioned capacity (specified by the administrator when creating the datastore) can be well above the actual storage.

- **Provisioned** - Amount of capacity allowed to be used by, allocated to, the storage cluster datastores.
  The provisioned amount is not set aside for the sole use of the storage cluster datastores. Multiple datastores can be provisioned storage from the same storage capacity.

- **Over-provisioning** - Occurs when the amount of storage capacity allocated to all the datastores exceeds the amount available to the storage cluster.
  It is a common practice to initially over-provision. It allows administrators to allocate the capacity now and backfill the actual storage later.
  The value is the difference between the usable capacity and provisioned capacity.
  It displays zero (0) value, unless more space has been allocated than the maximum physical amount possible.
Review the over provisioned capacity and ensure that your system does not reach an out-of-space condition.

• **Used** - Amount of storage capacity consumed by the listed storage cluster or datastore.

HX Data Platform internal meta-data uses 0.5% to 1% space. This might cause the HX Data Platform Plug-in HX Connect to display a Used Storage value even if you have no data in your datastore.

Storage Used shows how much datastore space is occupied by virtual machine files, including configuration and log files, snapshots, and clones. When the virtual machine is running, the used storage space also includes swap files.

• **Free Capacity, storage cluster** - Same as available capacity. For the storage cluster, this is the difference between the amount available to the storage cluster and the amount used in the storage cluster.

• **Free capacity, datastore** - Same as available capacity. For all the storage cluster datastores, this is the difference between the amount provisioned to all the storage cluster datastores and the amount used on all the storage cluster datastores.

The amount used on the whole storage cluster is not included in this datastore calculation. Because datastores are frequently over provisioned, the free capacity can indicate a large availability on all the storage cluster datastores, while the storage cluster capacity can indicate a much lower availability.

• **Usable Capacity** - Amount of storage in the storage cluster available for use to store data.

• **Used capacity** - Amount of capacity consumed by the storage cluster datastore.

• **Multiple users** - Can have different datastores with different provisioned capacities. At any point in time, users do not fully utilize their allocated datastore capacity. When allocating datastore capacity to multiple users, it is up to the administrator to ensure that each user’s provisioned capacity is honored at all time.

• **Cleaner** - A process run on all the storage cluster datastores. After it completes, all the storage cluster datastores total capacity should be in a similar range to the total storage cluster capacity, excluding the metadata. Datastore capacity listed typically will not match the HX storage cluster capacity. See the *Cisco HX Data Platform Command Line Interface Reference* guide for information on the cleaner command.

### Understanding Capacity Savings

The Capacity portlet on the Summary tab displays the deduplication and compression savings provided by the storage cluster. For example, with 50% overall savings, a 6TB capacity storage cluster can actually store 9 TB of data.

The total storage capacity saved by the HX Data Platform system is a calculation of two elements:

- **Compression** - How much of the data is compressed.

- **Deduplication** - How much data is deduplicated. Deduplication is a method of reducing storage space by eliminating redundant data. It stores only one unique instance of the data.

Deduplication savings and compression savings are not simply added together. They are not independent operations. They are correlated using the following elements where essentially the amount of unique bytes used for storage is reduced through deduplication. Then the deduplicated storage consumption is compressed to make even more storage available to the storage cluster.
Deduplication and compression savings are applied to and include the storage used by ReadyClones and Snapshots.

If the savings is showing 0%, this indicates the storage cluster is new. The total ingested data to the storage cluster is insufficient to determine meaningful storage savings. Wait until sufficient data is written to the storage cluster.

**For example:**

1. **Initial values**
   
   Given a VM of 100 GB that is cloned 2 times.
   
   - Total Unique Used Space (TUUS) = 100 GB
   - Total Addressable Space (TAS) = 100x2 = 200 GB
   
   Given, for this example:
   
   - Total Unique Bytes (TUB) = 25 GB

2. **Deduplication savings**

   \[
   = (1 - \frac{\text{TUUS}}{\text{TAS}}) \times 100
   \]

   \[
   = (1 - \frac{100 \text{ GB}}{200 \text{ GB}}) \times 100
   \]

   \[
   = 50\%
   \]

3. **Compression Savings**

   \[
   = (1 - \frac{\text{TUB}}{\text{TUUS}}) \times 100
   \]

   \[
   = (1 - \frac{25 \text{ GB}}{100 \text{ GB}}) \times 100
   \]

   \[
   = 75\%
   \]

4. **Total savings calculated**

   \[
   = (1 - \frac{\text{TUB}}{\text{TAS}}) \times 100
   \]

   \[
   = (1 - \frac{25 \text{ GB}}{200 \text{ GB}}) \times 100
   \]

   \[
   = 87.5\%
   \]

### Capacity Status Summary

**Procedure**

From the vSphere Web Client Navigator, select **vCenter Inventory Lists** > **Cisco HyperFlex Systems** > **Cisco HX Data Platform** > **cluster** > **Summary**

The top right section of the Summary tab displays a status bar. There are four bars showing the following:
### Summary Tab Capacity Portlet

The Summary tab also displays a graphical representation of the HX storage cluster and host capacity.

#### Procedure

**Step 1**  
From the vSphere Web Client Navigator, select `vCenter Inventory Lists > Cisco HyperFlex Systems > Cisco HX Data Platform > cluster > Summary`

**Step 2**  
Scroll to the `Capacity` portlet to display the HX storage cluster storage capacity.

It shows the following:

<table>
<thead>
<tr>
<th>Field</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total</td>
<td>The Capacity portlet displays a pie chart that shows the total capacity, free capacity, and used capacity. It also provides the following information.</td>
</tr>
</tbody>
</table>

---

### Field Description

<table>
<thead>
<tr>
<th>Field</th>
<th>Description</th>
</tr>
</thead>
</table>
| **Storage bar** | The Storage bar displays storage summary information.  
- **Used** - Amount of storage consumed.  
- **Free** - Same as available capacity. For the HX storage cluster, this is the difference between the amount available to the HX storage cluster and the amount used on the HX storage cluster.  
- **Capacity** - Amount of storage provisioned to the datastore. |
| **Cluster Status bar** | The Cluster Status bar displays the health status.  
Summary of HX storage cluster status. Includes:  
- **Converged Nodes** - Number of storage nodes in the HX storage cluster.  
- **Controllers** - Number of HX controller VMs in the HX storage cluster. |
| **Health State bar** | The Health State bar displays the overall health of the HX storage cluster.  
Lists the number of tolerated host failures. See HX Data Platform High Availability for information about tolerated host failures. |
<table>
<thead>
<tr>
<th>Field</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Usable Capacity</td>
<td>Amount of storage in the HX storage cluster available to use to store data.</td>
</tr>
<tr>
<td>Used</td>
<td>Amount of capacity consumed by the datastore.</td>
</tr>
<tr>
<td>Free</td>
<td>Same as available capacity. For the HX storage cluster, this is the difference between the amount available to the HX storage cluster and the amount used on the HX storage cluster.</td>
</tr>
<tr>
<td>Provisioned</td>
<td>Sum of the capacity of all provisioned datastores in the HX storage cluster.</td>
</tr>
<tr>
<td>Over Provisioned</td>
<td>Difference between the usable capacity and provisioned capacity. Displays zero (0) value, unless more space has been allocated than the maximum physical amount possible. Review the over provisioned capacity and ensure that your system does not reach an out-of-space condition.</td>
</tr>
<tr>
<td>Total Savings</td>
<td>Total capacity saved by the HX Data Platform system.</td>
</tr>
<tr>
<td>Compression</td>
<td>How much of the data is compressed</td>
</tr>
<tr>
<td>Deduplication</td>
<td>How much data is deduplicated. Deduplication is a method of reducing storage space by eliminating redundant data. It stores only one unique instance of the data.</td>
</tr>
</tbody>
</table>

### Cluster Status Pop-up for Space Status

#### Procedure

**Step 1**  
From the vSphere Web Client Navigator, select vCenter Inventory Lists > Cisco HyperFlex Systems > Cisco HX Data Platform > cluster > Summary > Status

**Step 2**  
Click the Cluster Status field information icon.

It shows the following key performing indicators.

<table>
<thead>
<tr>
<th>Field</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Status</td>
<td>Status of the HX storage cluster. See Understanding Cluster Status Values.</td>
</tr>
</tbody>
</table>
### Cluster Status Pop-up for Space Status

<table>
<thead>
<tr>
<th>Field</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Health State</strong></td>
<td>Status of the platform. Options include: Healthy, Average, Marginal, Critical.</td>
</tr>
<tr>
<td><strong>Resiliency Status</strong></td>
<td>Number of tolerated nodes failures.</td>
</tr>
<tr>
<td><strong>Policy Compliance</strong></td>
<td>Degree of compliance with the configured Cluster Access Policy.</td>
</tr>
</tbody>
</table>
| **Space Status**        | Status of the storage capacity.  
                          • **Normal** - Your system is below the alert threshold.  
                          • **Warning** - If your system has consumed 76% of the allocated capacity.  
                          • **Critical** - If your system has consumed 92% of the allocated capacity.  
                          • **Offline (Read Only)** - If your system has consumed 100% of the allocated capacity.  
                          The percent values might vary by 1-2%, depending upon if the cleaner has completed. |
| **Replication Factor**  | Value selected for number of duplicate copies of data stored. See Data Replication Factor Settings. |
| **Access Policy**       | Configured value for Cluster Access Policy. |
| **Reason**              | Brief message describing HX storage cluster Status.  
                          The icon for the Cluster Status Information pop-up does not display if there is no Reason field content to display. |
Monitoring Cluster Component Status

- Storage Cluster Physical Components Overview, on page 27
- Host Status and Configuration Details, on page 28
- Disk Status and Configuration Details, on page 32
- PSU Status and Configuration Details, on page 33
- NIC Status and Configuration Details, on page 34

Storage Cluster Physical Components Overview

Cisco HX Data Platform storage clusters contain the following objects. These objects are monitored by the HX Data Platform for the storage cluster. They can be added and removed from the storage cluster.

- **Converged nodes.** Converged nodes are the physical hardware on which the VM runs. They provide computing and storage resources such as disk space, memory, processing, power, and network I/O.

  When a converged node is added to the storage cluster, a storage controller VM is installed. The HX Data Platform services are handled through the storage controller VM. Converged nodes add storage resources to your storage cluster through their associated drives.

  Adding converged nodes to your storage cluster is performed using the Expand Cluster feature of the HX Data Platform Installer. Removing converged nodes is a command line task.

- **Compute nodes.** Compute nodes add compute resource but not storage capacity to the storage cluster. They are used as means to add compute resources, including CPU and memory. They do not need to have any caching (SSD) or storage (HDD) drives. Compute nodes are optional to the storage cluster.

  When a compute node is added to the storage cluster, an agent controller VM is installed. The HX Data Platform services are handled through the agent controller VM. Compute nodes do not add storage resources to your storage cluster.

  Adding compute nodes to your storage cluster is performed using the Expand Cluster feature of the HX Data Platform Installer. Removing compute nodes is a command line task.

- **Drives.** There are two types of drives required for any node in the storage cluster: Solid State Drive (SSD) and Hard Disk Driver (HDD). HDD typically provide the physical storage units associated with converged nodes. SSD typically support management.

  Adding HDD to existing converged nodes, also adds storage capacity to the storage cluster. When storage is added to any node in the storage cluster, an equal amount of storage must be added to every node in the storage cluster.
When disks are added or removed, the HX Data Platform rebalances the storage cluster to adjust for the change in storage resource.

Adding or removing disks on your converged nodes is not performed through the HX Data Platform. Prior to adding or removing disks, review the best practices. See the server hardware guides for specific instructions to add or remove disks in nodes.

- **Datastores.** Storage capacity and datastore capacity. This is the combined consumable physical storage available to the storage cluster through datastores, and managed by the HX Data Platform.
  
  Datastore are logical containers used by the HX Data Platform to manage your storage use and storage resources.
  
  Datastores are where the host places virtual disk files and other VM files. Datastores hide the specifics of physical storage devices and provide a uniform model for storing VM files.

Additional objects that can be monitored from a storage cluster point of view and are treated as field replaceable unites (FRUs), include the following. See the server hardware guides for information about replacing these objects.

- Power Supply Units (PSUs)
- Network Interface Cards (NICs)

### Host Status and Configuration Details

This section describes the methods for monitoring storage cluster host status and configuration.

#### Status Portlet for Host Status

The Status portlet on the Summary tab displays the status of the storage cluster, hosts, and storage controller VMs.

**Procedure**

<table>
<thead>
<tr>
<th>Step 1</th>
<th>From the vSphere Web Client Navigator, select <strong>vCenter Inventory Lists &gt; Cisco HyperFlex &gt; Systems &gt; Cisco HX Data Platform &gt; cluster &gt; Summary &gt; Status</strong> to display the storage cluster Status portal.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Step 2</td>
<td>The Status pane gives you the following information.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cluster Status</td>
<td>Status of the storage cluster. See Understanding Cluster Status Values.</td>
</tr>
<tr>
<td>Health State</td>
<td>Status of the platform. Options include: Healthy, Average, Marginal, Critical</td>
</tr>
<tr>
<td>Resiliency Status</td>
<td>Number of tolerated nodes failures.</td>
</tr>
<tr>
<td>Last Updated</td>
<td>Date and timestamp when the information in portlet was updated.</td>
</tr>
</tbody>
</table>
### Parameter | Description
--- | ---
Replication Factor | Value selected for number of duplicate replicas of data stored. See Data Replication Factor Settings.
Converged Nodes | Lists the number of storage cluster hosts and storage controller VMs that are online.
 | Displays a list of all converged only hosts in the storage cluster. Expand to view list of hosts.
Compute Nodes | Displays a list of all compute only nodes in the storage cluster.
 | Expand to view list of hosts.
host | Name of host. Links to the vSphere Web Client host Summary page.
Controller Status | Status of the storage controller VM on the converged node.
Host IP | IP address for the host on the network.
Information icon | The Summary tab Status portlet has two information pop-ups that display additional details about the storage cluster and converged nodes in the storage cluster.
 | Cluster Status Information pop-up.
 | Converged Nodes Information pop-up.

## Converged Nodes Information Pop-up

### Procedure

**Step 1**

From the vSphere Web Client Navigator, select **vCenter Inventory Lists > Cisco HyperFlex Systems> Cisco HX Data Platform > cluster > Summary > Status** to display the storage cluster Status widget.

**Step 2**

Click the Converged Nodes field information (i) icon. The information box provides the following details:

### Field | Description
--- | ---
Status | Number of converged hosts and number of storage controller VMs in the storage cluster.
Host | Host name.
Host IP | IP address for the host on the network.
Manage Cluster Host Details

The host detail information displayed corresponds to the specific storage cluster selected in the HX Data Platform plug-in Manage tab.

Procedure

**Step 1**  From the vSphere Web Client Navigator, select vCenter Inventory Lists > Cisco HyperFlex Systems > Cisco HX Data Platform > cluster > Manage > Cluster > cluster.

**Step 2**  Select a host.

<table>
<thead>
<tr>
<th>Field</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Host Status</td>
<td>Status of the converged node.</td>
</tr>
<tr>
<td>Controller</td>
<td>Name of the storage controller VM on this host.</td>
</tr>
<tr>
<td>Controller IP</td>
<td>IP address for the storage controller VM on this host.</td>
</tr>
<tr>
<td>Controller Status</td>
<td>Status of the storage controller VM on the converged node.</td>
</tr>
<tr>
<td>Name</td>
<td>Host name</td>
</tr>
<tr>
<td>Model</td>
<td>Physical hardware model number of the node.</td>
</tr>
<tr>
<td>Cluster id</td>
<td>Unique identifier for the storage cluster</td>
</tr>
<tr>
<td>Identifier</td>
<td>Unique identifier for the host</td>
</tr>
<tr>
<td>Serial Number</td>
<td>Physical serial number for the node.</td>
</tr>
<tr>
<td>IPMI Address</td>
<td>IP address for IPMI access to the host.</td>
</tr>
<tr>
<td>SCVM Address</td>
<td>IP address of the storage controller VM on the host.</td>
</tr>
<tr>
<td>ESX Address</td>
<td>IP address of the ESXi Server management network (Service Console) of the host.</td>
</tr>
<tr>
<td>State</td>
<td>Connection status of the host. Options include: Connected,Disconnected.</td>
</tr>
<tr>
<td>Temperature</td>
<td>Physical temperature of the host.</td>
</tr>
<tr>
<td>Fan Speed</td>
<td>Information about the hardware fan and fan speed (in RPM) of the host.</td>
</tr>
</tbody>
</table>
Manage Datastores Hosts Tab

The Manage > Datastores tab lists the hosts associated with datastores. The Hosts tab lists the hosts on which a datastore is mounted.

Procedure

**Step 1**
From the vSphere Web Client Navigator, select vCenter Inventory Lists > Cisco HyperFlex Systems > Cisco HX Data Platform > cluster > Manage > Datastores.

**Step 2**
Click datastore > Host. The Hosts table lists all the hosts in the storage cluster. When you select a datastore, the host relationships to that datastore are updated.

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Name</td>
<td>Host name. It links to the vSphere Web Client Datastores Summary tab.</td>
</tr>
<tr>
<td>Mount Status</td>
<td>Whether the host is mounted to the datastore.</td>
</tr>
<tr>
<td>Accessible</td>
<td>Whether the host is accessible by the datastore.</td>
</tr>
</tbody>
</table>
**vCenter Hosts Summary**

The HX Data Platform plug-in includes links to the vSphere Web Client host Summary tab.

**Procedure**

**Step 1**
From the vSphere Web Client Navigator, select **vCenter Inventory Lists > Cisco HyperFlex Systems > Cisco HX Data Platform > cluster > Manage > Summary > Status > Converged Nodes | Compute Nodes.**

**Step 2**
Click a host link under Converged Nodes or Compute Nodes.

The vSphere Web Client Hosts Summary page displays information about the selected host. This is not a HX Data Platform plug-in page. See your VMware documentation for descriptions of these vSphere fields.

<table>
<thead>
<tr>
<th>Field</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hardware</td>
<td>Provides information on manufacturer, model, total amount of CPU, total amount of Memory, Virtual Flash Resource, Networking, Storage - number of datastores</td>
</tr>
<tr>
<td>Related Objects</td>
<td>The Cluster to which the host is related to.</td>
</tr>
</tbody>
</table>

**Disk Status and Configuration Details**

The disk detail information displayed corresponds to the specific node and disk type selected in the HX Data Platform plug-in Manage tab.

**Procedure**

**Step 1**
From the vSphere Web Client Navigator, select **vCenter Inventory Lists > Cisco HyperFlex Systems > Cisco HX Data Platform > cluster > Manage > Manage > Cluster.**

**Step 2**
Select **cluster > Disks OR host > Disks.**

When you select an individual host, the Disks tab lists only disks on the selected host.
<table>
<thead>
<tr>
<th>Field</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Slot</td>
<td>Position of the disk on the storage cluster (such as Node A Slot 1).</td>
</tr>
<tr>
<td>Disk Type</td>
<td>Type of disk: SSD or HDD</td>
</tr>
<tr>
<td>Serial Number</td>
<td>Serial number of the disk.</td>
</tr>
<tr>
<td>Raw Capacity</td>
<td>Disk capacity in GB.</td>
</tr>
<tr>
<td>Firmware</td>
<td>Firmware product installed on the disk.</td>
</tr>
<tr>
<td>State</td>
<td>Status of the disk.</td>
</tr>
<tr>
<td>Usage</td>
<td>Task that the disk is used to perform. Such as caching for SSD and persistent for HDD.</td>
</tr>
<tr>
<td>Version</td>
<td>Firmware version on the disk.</td>
</tr>
<tr>
<td>Vendor</td>
<td>Name of the disk manufacturer.</td>
</tr>
</tbody>
</table>

### PSU Status and Configuration Details

The PSU detail information displayed corresponds to the specific storage cluster selected in the HX Data Platform plug-in Manage tab.

**Procedure**

**Step 1**
From the vSphere Web Client Navigator, select **vCenter Inventory Lists > Cisco HyperFlex Systems > Cisco HX Data Platform > cluster > Manage > Manage > Cluster.**

**Step 2**
Select **cluster > PSUs.**

<table>
<thead>
<tr>
<th>Field</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Status</td>
<td>Health status of the PSU. If the Power Supply is not green, the Issues tab in the Cluster view tab displays more information.</td>
</tr>
<tr>
<td>Name</td>
<td>PSU name in the storage cluster and brief status message.</td>
</tr>
</tbody>
</table>
NIC Status and Configuration Details

The NIC detail information displayed corresponds to the specific host selected in the HX Data Platform plug-in Manage tab.

Procedure

Step 1
From the vSphere Web Client Navigator, select vCenter Inventory Lists > Cisco HyperFlex Systems > Cisco HX Data Platform > cluster > Manage > Cluster tab.

Step 2
Expand Cluster, select a host on the left, and select NICs tab in the right pane. It provides the following details:

<table>
<thead>
<tr>
<th>Option</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>MAC Address</td>
<td>MAC address of the NIC.</td>
</tr>
<tr>
<td>Device</td>
<td>VMware NIC device identification.</td>
</tr>
<tr>
<td>Link Speed</td>
<td>Link speed of the NIC. The link speed indicates the bit rate in MBps.</td>
</tr>
</tbody>
</table>
CHAPTER 5

Monitoring Storage Performance

- Monitoring Storage Performance, on page 35
- Performance Portlet, on page 35
- Datastore Trends Portlet, on page 36
- View Performance Charts, on page 36
- Customizing Performance Charts, on page 38
- HTML Performance Charts, on page 40

Monitoring Storage Performance

This section describes the performance monitoring options.

Performance Portlet

The Performance portlet provides details about the HX Data Platform storage cluster performance. It displays the past one hour of performance data plotted in 20 second intervals. The Performance portlet charts show data for the entire storage cluster.

For details on storage cluster, datastore, and host-level performance reports, select the Monitor tab.

Procedure

<table>
<thead>
<tr>
<th>Step 1</th>
<th>From the vSphere Web Client Navigator, select vCenter Inventory Lists &gt; Cisco HyperFlex Systems &gt; Cisco HX Data Platform &gt; cluster &gt; Summary.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Step 2</td>
<td>Scroll to the Performance portlet.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Option</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>IOPS</td>
<td>Input/Output Operations per Second.</td>
</tr>
<tr>
<td>Throughput</td>
<td>The rate of data transfer in the storage cluster. Measured in MBps.</td>
</tr>
<tr>
<td>Latency</td>
<td>Latency is a measure of how long it takes for a single I/O request to complete. It is the duration between issuing a request and receiving a response. Measured in msec.</td>
</tr>
</tbody>
</table>
## Datastore Trends Portlet

The Datastore Trends portlet is a chart of the IO performance of the selected datastore.

### Procedure

**Step 1** From the vSphere Web Client Navigator, select **vCenter Inventory Lists > Cisco HyperFlex Systems > Cisco HX Data Platform > cluster > Manage**.

**Step 2** Select a **datastore** from the table list. The **Summary** tab updates to display the information for the selected datastore.

**Step 3** Scrolls to view the **Trends** portlet.

The tab displays IOPS plotted every 20 minutes.

Hover your mouse over the peak values to obtain color-coded read IOPS and write IOPS.

---

## View Performance Charts

The Monitor Performance tab displays the read and write performance of the storage cluster, hosts, and datastores.

- Performance charts display a pictorial representation of the storage cluster, host, and datastore performance.
- The system updates the performance charts every 20 seconds.
- Hover your mouse over individual data points to view peak performance information and time-stamp.
- Light blue indicates write operations and dark blue indicates read operations.
- Gaps in the performance charts indicate time periods when data was not available. Gaps do not necessarily indicate a drop in performance.
**Storage Cluster Performance Chart**

**Procedure**

**Step 1** From the vSphere Web Client Navigator, select vCenter Inventory Lists > Cisco HyperFlex Systems > Cisco HX Data Platform > cluster > Monitor > Performance.

On the left there are three options you can choose to Monitor: Storage Cluster, Hosts, and Datastores.

**Step 2** Click Storage Cluster to view the storage cluster performance tab.

**Step 3** Click Hour, Day, Week, Month, Max, or Custom option, to specify the time period in which you want to view storage cluster performance.

**Step 4** Click IOPS, Throughput, Latency, and Show check boxes to display selected performance and objects.

**Hosts Performance Chart**

**Procedure**

**Step 1** From the vSphere Web Client Navigator, select vCenter Inventory Lists > Cisco HyperFlex Systems > Cisco HX Data Platform > cluster > Monitor > Performance.

On the left there are three options you can choose to Monitor: Storage Cluster, Hosts, and/or Datastores.

**Step 2** Click Hosts to view the hosts performance tab.

**Step 3** Click Hour, Day, Week, Month, Max, or Custom option, to specify the time period in which you want to view the host performance.

**Step 4** Click IOPS, Throughput, Latency, and Show check boxes to display selected performance and objects.

**Step 5** Click host to exclude or view individual hosts. Compute nodes do not have storage cluster performance values.

**Datastores Performance Chart**

**Procedure**

**Step 1** From the vSphere Web Client Navigator, select vCenter Inventory Lists > Cisco HyperFlex Systems > Cisco HX Data Platform > cluster > Monitor > Performance.

On the left there are three options you can choose to Monitor: Storage Cluster, Hosts, and Datastores.

**Step 2** Click Datastores to view the datastores performance tab.

**Step 3** Click Hour, Day, Week, Month, Max, or Custom option, to specify the time period in which you want to view the datastore performance.
Step 4  Click IOPS, Throughput, Latency, and Show check boxes to display selected performance and objects.

Customizing Performance Charts

Modify the performance charts to display all or some of the listed options.

<table>
<thead>
<tr>
<th>Customize Item</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Time period</td>
<td>Choose from hour, days, week, month, all, or custom. See Specifying Performance Time Period section in this chapter.</td>
</tr>
<tr>
<td>Cluster objects</td>
<td>Choose from a list of storage clusters, hosts, or datastores.</td>
</tr>
<tr>
<td>Chart type</td>
<td>Choose from IOPS, Throughput, or Latency.</td>
</tr>
<tr>
<td>Show objects</td>
<td>Choose which listed object’s data to display. See Selecting Performance Charts section in this chapter.</td>
</tr>
</tbody>
</table>

Specify Performance Time Period

Procedure

Step 1  From the vSphere Web Client Navigator, select vCenter Inventory Lists > Cisco HyperFlex Systems > Cisco HX Data Platform > cluster > Monitor > Performance

Step 2  Click one of the following tabs to specify the time period in which you want to view performance of the storage cluster, host, or datastore.

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hour</td>
<td>Displays performance in the past hour</td>
</tr>
<tr>
<td>Day</td>
<td>Displays performance in the past day</td>
</tr>
<tr>
<td>Week</td>
<td>Displays performance in the past week</td>
</tr>
<tr>
<td>Month</td>
<td>Displays performance in the past month</td>
</tr>
<tr>
<td>All</td>
<td>Displays the performance of the storage cluster since it was created</td>
</tr>
<tr>
<td>Custom</td>
<td>Select this tab and specify a custom range as described in Specifying Custom Range</td>
</tr>
</tbody>
</table>
Specify Custom Range

Procedure

Step 1  From the vSphere Web Client Navigator, select vCenter Inventory Lists > Cisco HyperFlex Systems > Cisco HX Data Platform > cluster > Monitor > Performance

Step 2  Click the Custom tab to display the Custom Range dialog box.

Step 3  Choose a method, for the Custom Range dialog box:
   a)  Click Last, type the number of minutes, hours, days, or months. Optionally, use the up or down arrow to increase or decrease the number.
   b)  Click the drop-down list to specify the minutes, hours, days, weeks, or months.
   c)  Click From, click the calendar icon, and select a date from which you want to start measuring the performance. Click the drop-down list to select a time.
   d)  Click To, click the calendar icon, and select a date up to which you want to start measuring the performance. Click the drop-down list to select a time.

Step 4  Click Apply and then click OK to apply your configuration.

Selecting Performance Charts

You can select the performance charts to display for storage clusters, hosts, and datastores.

Procedure

Select or deselect the check box corresponding to IOPS, Throughput, and Latency at the bottom of the tab to view specific information.

For example, to view only storage cluster IOPS performance:

a)  From the vSphere Web Client Navigator, select vCenter Inventory Lists > Cisco HyperFlex Systems > Cisco HX Data Platform > cluster > Monitor > Performance.

b)  Click either Storage Cluster, Hosts, or Datastores chart set. In a Hosts table, compute nodes do not display IOPS, Throughput, or Latency values, as they do not provide storage to the storage cluster.

c)  Deselect chart options.

<table>
<thead>
<tr>
<th>Field</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Chart types</td>
<td>Click the check box to select which charts and table columns to view or hide. Options are:</td>
</tr>
<tr>
<td></td>
<td>• IOPS</td>
</tr>
<tr>
<td></td>
<td>• Throughput</td>
</tr>
<tr>
<td></td>
<td>• Latency</td>
</tr>
</tbody>
</table>
Foreach storage cluster, hosts, and datastores, click the checkboxes to select the specific object to include or exclude from the charts.

**Show** Indicates the color representation in the chart for the read and write values of each object.

**Storage Cluster** Names of the storage clusters in the charts.

**Hosts** Names of the hosts in the charts. This includes both converged nodes and compute nodes.

**Datastores** Names of the datastores in the charts.

**IOPS Read/Write** Latest data point for Input/Output Operations per Second.

**Throughput Read/Write (Mbps)** Latest data point for the rate of data transfer in the storage cluster. Measured in Mbps.

**Latency Read/Write (msec)** Latest data point for the Latency that is a measure of how long it takes for a single I/O request to complete. It is the duration between issuing a request and receiving a response. Measured in msec.

---

**HTML Performance Charts**

In addition to viewing the storage cluster performance charts through the HX Data Platform plug-in in vSphere, you can open a browser pointing to the storage controller VM. The information is the same as that displayed through the vSphere interface.

**Procedure**

---

**Step 1** Enter the HTML performance chart web page. Choose a method.

- From the vSphere Web Client Navigator. Then select **vCenter Inventory Lists > Cisco HyperFlex Systems > Cisco HX Data Platform > cluster > Monitor > Performance** page, click the Preview interactive performance charts link.
- From a browser, enter the IP address or DNS of the storage controller VM and include the `perf` directory. Format example `https://my_storage_controller/perf/`

To find the storage controller VM IP address.
Login to the vSphere Web Client Navigator. Then select **vCenter Inventory Lists > Cisco HyperFlex Systems > Cisco HX Data Platform > cluster > Summary > Status**. Click the **Converged Nodes** field information (i) icon. Scan the table for the **Controller IP** for any of the listed hosts.

**Step 2** Enter the storage controller VM or vCenter cluster administrator login credentials. The HTML performance charts are displayed.

<table>
<thead>
<tr>
<th>Chart</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>IOPS</td>
<td>Input/Output Operations per Second.</td>
</tr>
<tr>
<td>Throughput</td>
<td>The rate of data transfer in the storage cluster. Measured in MBps.</td>
</tr>
<tr>
<td>Latency</td>
<td>Latency is a measure of how long it takes for a single I/O request to complete. It is the duration between issuing a request and receiving a response. Measured in msec.</td>
</tr>
</tbody>
</table>

**Step 3** Click the storage cluster object to view performance for that object. The selected object is red. Object options are:

- Cluster overall
- Specific hosts
- Specific datastores

**Step 4** Adjust the viewing parameters, as needed.

- Click the time buttons to specify the time period in which you want to view performance. Time is the most recent unit of time. The options are
  - **hour, day, week, month, 6 months**.
  - **All** is since the object was added to the storage cluster.
  - **Aggregated** icon combines all the collected data in a single display.

- Click **Refresh** icon to update the views after applying changes. The charts update per the Settings.
- Click the **Settings** icon to adjust the auto refresh rate, time range, and performance metrics for each object type. Change settings and click **Save**.

**Step 5** Optionally, view a data point time, reads, and writes by hovering over a point in any chart.
Managing Datastores

- Managing Datastores Overview, on page 43
- Monitoring Datastore Status, on page 43
- Managing Datastores, on page 47

Managing Datastores Overview

This section describes datastore in your HX storage clusters. Datastores are logical containers used by the HX Data Platform plug-in to manage your storage use and storage resources.

Datastores are where the host places virtual disk files and other VM files. Datastores hide the specifics of physical storage devices and provide a uniform model for storing VM files.

Monitoring Datastore Status

HX Data Platform datastore information is available through the HX Data Platform plug-in the Manage tab. The following topics describe the datastore views.

Datastores Summary List

The manage datastore tab has a table that lists all the datastores in the HX storage cluster.

Procedure

From the vSphere Web Client Navigator, select vCenter Inventory Lists > Cisco HyperFlex Systems > Cisco HX Data Platform > cluster > Manage > Datastores

<table>
<thead>
<tr>
<th>Field</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Name</td>
<td>Name of the datastores in the HX storage cluster</td>
</tr>
</tbody>
</table>
### Description Field

**Status of whether the datastore is mounted on the host.**

The status is one of the following:

- **Normal**: The datastores are mounted on all of the nodes in the HX storage cluster.
- **Failed**: The datastore are not mounted on any of the nodes in the HX storage cluster.
- **Partial**: The datastore is mounted only on some of the nodes in the HX storage cluster.

<table>
<thead>
<tr>
<th>Field</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mount Status</td>
<td>Status of whether the datastore is mounted on the host. The status is one of the following:</td>
</tr>
<tr>
<td></td>
<td>• Normal: The datastores are mounted on all of the nodes in the HX storage cluster.</td>
</tr>
<tr>
<td></td>
<td>• Failed: The datastore are not mounted on any of the nodes in the HX storage cluster.</td>
</tr>
<tr>
<td></td>
<td>• Partial: The datastore is mounted only on some of the nodes in the HX storage cluster.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Field</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Provisions</td>
<td>Amount of capacity in (GB) allocated to the datastore</td>
</tr>
<tr>
<td>Used</td>
<td>Amount of capacity consumed by the datastore.</td>
</tr>
<tr>
<td>Free</td>
<td>Same as available capacity. For the datastore, this is the difference between the amount provisioned to the datastore and the amount used on the datastore.</td>
</tr>
</tbody>
</table>

### Datastore Summary Tab

The Manage Datastores Summary tab contains three widgets: Details, Trends, and Top VMs by Disk Usage.

**Procedure**

**Step 1**
From the vSphere Web Client Navigator, select **vCenter Inventory Lists > Cisco HyperFlex Systems > Cisco HX Data Platform > cluster > Manage > Datastores**.

**Step 2**
Select a **datastore** from the table list. The **Summary** tab updates to display the information for the selected datastore.

### Datastore Summary Details Portlet

The Datastore Summary Details portlet lists information similar to the HX storage cluster storage capacity, but specific to the selected datastore.

**Procedure**

**Step 1**
From the vSphere Web Client Navigator, select **vCenter Inventory Lists > Cisco HyperFlex Systems > Cisco HX Data Platform > cluster > Manage**.

**Step 2**
Select a **datastore** from the table list. The **Summary** tab updates to display the information for the selected datastore.
Step 3  Scroll to view the **Datastore Summary Details** portlet.

<table>
<thead>
<tr>
<th>Field</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total</td>
<td>Total capacity allocated to the datastore</td>
</tr>
<tr>
<td>Status</td>
<td>Status of whether the datastore is mounted on the host.</td>
</tr>
<tr>
<td>Provisioned</td>
<td>Amount of capacity allocated to the datastore.</td>
</tr>
<tr>
<td>Used</td>
<td>Amount of capacity used by the datastore</td>
</tr>
<tr>
<td>Free</td>
<td>Same as available capacity. For the datastore, this is the difference between the amount provisioned to the datastore and the amount used on the datastore.</td>
</tr>
<tr>
<td>Hosts</td>
<td>Number of hosts in the datastore</td>
</tr>
<tr>
<td>VMs</td>
<td>Number of VMs in the datastore</td>
</tr>
</tbody>
</table>

**Datastore Summary Trends Portlet**

The Datastore Summary Trends portlet is a chart of the IO performance of the selected datastore.

**Procedure**

**Step 1**  From the vSphere Web Client Navigator, select **vCenter Inventory Lists > Cisco HyperFlex Systems > Cisco HX Data Platform > cluster > Manage**.

**Step 2**  Select a **datastore** from the table list. The **Summary** tab updates to display the information for the selected datastore.

**Step 3**  Scroll to view the **Datastore Summary Trends** portlet.

The tab displays IOPS plotted every 20 minutes. Hover your mouse over the peak values to obtain color-coded read IOPS and write IOPS.

**Datastore Summary Top VMs by Disk Usage Portal**

The datastore Top VMs by Disk Usage portal lists the datastore usage in a list of VM names and sizes. The list is specific to the selected datastore.

**Procedure**

**Step 1**  From the vSphere Web Client Navigator, select **vCenter Inventory Lists > Cisco HyperFlex Systems > Cisco HX Data Platform > cluster > Manage**.
Step 2 Select a datastore from the table list. The Summary tab updates to display the information for the selected datastore.

Step 3 Scroll to view the datastore Summary Top VMs by Disk Usage portal.

<table>
<thead>
<tr>
<th>Field</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Name</td>
<td>Name of the VM using this datastore.</td>
</tr>
<tr>
<td>Size</td>
<td>The amount of storage being used by this VM in this datastore.</td>
</tr>
</tbody>
</table>

**Datastore Host Information**

Select this tab to view a list of hosts in the datastore.

**Procedure**

From the vSphere Web Client Navigator, select vCenter Inventory Lists > Cisco HyperFlex Systems > Cisco HX Data Platform > cluster > Manage > Datastores > datastore > Hosts

The Hosts table lists all the hosts in the datastore.

<table>
<thead>
<tr>
<th>Field</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Name</td>
<td>Host name.</td>
</tr>
<tr>
<td>Mount Status</td>
<td>Whether the host is mounted to the datastore.</td>
</tr>
<tr>
<td>Accessible</td>
<td>Whether the host is accessible by the datastore.</td>
</tr>
<tr>
<td>Reason Inaccessible</td>
<td>Information message about error with the host mounted to the datastore.</td>
</tr>
</tbody>
</table>

**vSphere Datastore Summary**

The HX Data Platform plug-in includes links to the vSphere Web Client datastore Summary tab.

**Procedure**

**Step 1** From the vSphere Web Client Navigator, select vCenter Inventory Lists > Cisco HyperFlex Systems > Cisco HX Data Platform > cluster > Manage > Datastores > datastore

**Step 2** In the list of datastores table at the top of the page, select a datastore to view in vSphere. Hover over the datastore name and click link. The vSphere Web Client datastore Summary tab is displayed
The vSphere Web Client Summary page displays information about the selected datastore. This is not an HX Data Platform plug-in page. See your VMware documentation for descriptions of the vSphere fields. See vCenter Datastore HX Data Platform Widget for descriptions of the HX Data Platform plug-in fields.

Click the HX storage cluster Name link in the HX Data Platform widget to return to the HX storage cluster.

---

**vCenter Datastore HX Data Platform Portlet**

The HX Data Platform plug-in includes links to the vSphere Web Client datastore Summary tab.

**Procedure**

**Step 1**
From the vSphere Web Client Navigator, select vCenter Inventory Lists > Cisco HyperFlex Systems > Cisco HX Data Platform > cluster > Manage > Datastores > datastore.

**Step 2**
In the list of datastores table at the top of the page, select a datastore to view in vSphere. Hover over the datastore name and click link. The vSphere Web Client datastore Summary tab is displayed.

**Step 3**
The vSphere Web Client datastore Summary page displays information about the selected datastore and the HX Data Platform portlet.

<table>
<thead>
<tr>
<th>Field</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Name</td>
<td>HX storage cluster name.</td>
</tr>
<tr>
<td>Capacity</td>
<td>Amount of storage provisioned to the datastore.</td>
</tr>
<tr>
<td>Free</td>
<td>Same as available capacity. For the datastore, this is the difference between the amount provisioned to the datastore and the amount used on the datastore.</td>
</tr>
</tbody>
</table>

---

**Managing Datastores**

Datastores are logical containers used by the HX Data Platform to manage your storage use and storage resources. Datastores are where the host places virtual disk files and other VM files. Datastores hide the specifics of physical storage devices and provide a uniform model for storing VM files.

You can add, refresh the list, edit name and size, delete, mount, and unmount datastores from either the HX Connect or HX Data Platform Plug-in UIs.

**Procedure**

**Step 1**
Choose an interface.

- From the vSphere Web Client Navigator, select vCenter Inventory Lists > Cisco HyperFlex Systems > Cisco HX Data Platform > cluster > Manage > Datastores.
Adding Datastores

Datastores are logical containers, similar to file systems, that hide specifics of physical storage and provide a uniform model for storing VM files. You can also use datastores to store ISO images and VM templates.

Procedure

Step 1 Choose an interface.
   • From the vSphere Web Client Navigator, select vCenter Inventory Lists > Cisco HyperFlex Systems > Cisco HX Data Platform > cluster > Manage > Datastores.
   • From HX Connect, select Datastores.

Step 2 Select the created datastore.

Step 3 Enter a name for the datastore. vSphere Web Client enforces a 42 character limit for the datastore name. Assign each datastore a unique name.

Step 4 Specify the datastore size. Choose GB or TB from the drop-down list.

Step 5 Click OK to accept your changes or Cancel to cancel all changes.

Step 6 Verify the datastore. Click the Refresh icon if needed to display your new datastore.

From HX Data Platform Plug-in, Click the Manage > Datastores > Hosts tab to see the mount status of the new datastore.

If you check the datastore through the vSphere Client application, host > Configuration > Datastores, the Drive Type is listed as Unknown. This is expected vSphere behavior, to list NFS datastores as Unknown.

Editing Datastores

A HX Data Platform plug-in datastore can be renamed and the storage allocation can be modified using the edit (pencil) option.
Do not rename datastores with controller VMs.

**Procedure**

**Step 1** Choose an interface.
- From the vSphere Web Client Navigator, select **vCenter Inventory Lists > Cisco HyperFlex Systems > Cisco HX Data Platform > cluster > Manage > Datastores.**
- From HX Connect, select **Datastores.**

**Step 2** Select a **datastore.**

**Step 3** Unmount the datastore.
If you are only resizing the datastore, you do not need to unmount the datastore. Skip this step.

**Step 4** Click the **Edit** datastore.

**Step 5** Change the datastore name and apply other edits as needed. Click **OK.**

**Step 6** Remount the datastore, if you previously unmounted it.

---

**Mounting Datastores**

**Prepare to mount a datastore.**
- No VM, template, snapshot, or CD/DVD image resides on the datastore. This is the most common error while unmounting.
- Storage I/O Control is disabled for the datastore.
- The datastore is not used for vSphere HA heartbeat.
- The datastore is not used to host RDM metadata files. RDM is not supported.
- The datastore is not used as a scratch location.

**Mount a datastore.**

**Procedure**

**Step 1** Choose an interface.
- From the vSphere Web Client Navigator, select **vCenter Inventory Lists > Cisco HyperFlex Systems > Cisco HX Data Platform > cluster > Manage > Datastores.**
- From HX Connect, select **Datastores.**

**Step 2** Select a **datastore.**
Unmounting Datastores

Prepare to unmount a datastore.

- No VM, template, snapshot, or CD/DVD image resides on the datastore. This is the most common error while unmounting.
- Storage I/O Control is disabled for the datastore.
- The datastore is not used for vSphere HA heartbeat.
- The datastore is not used to host RDM metadata files. RDM is not supported.
- The datastore is not used as a scratch location.

Unmount a datastore.

Procedure

Step 1 Choose an interface.

- From the vSphere Web Client Navigator, select vCenter Inventory Lists > Cisco HyperFlex Systems > Cisco HX Data Platform > cluster > Manage > Datastores.
- From HX Connect, select Datastores.

Step 2 Select a datastore.

Step 3 Click the Unmount.

Step 4 Confirm to unmount the datastore, click OK.

Step 5 If needed, recover from partial unmounts.

a) Go through the above checklist and unmount or delete through one of the UIs or CLI again.
b) Use the UI or CLI to re-mount the datastore.

Deleting Datastores

Prepare to delete the datastores.

- Power off all VMs.
- Close all open shells on the datastore mount point.
- Disable HA on the datastore.
- Close all applications that use the datastore.
Delete datastores.

Procedure

**Step 1** Choose an interface.

- From the vSphere Web Client Navigator, select **vCenter Inventory Lists > Cisco HyperFlex Systems > Cisco HX Data Platform > cluster > Manage > Datastores**.
- From HX Connect, select **Datastores**.

**Step 2** Select a **datastore**.

**Step 3** Click the **Delete**.

**Step 4** Confirm to delete the datastore, click **OK**.
Expanding the Storage Cluster

Expanding the Storage Cluster Overview

Expanding the storage cluster means to add nodes to your storage cluster. Adding nodes to the storage cluster is performed through the HX Data Platform installer. You can add or remove converged nodes and compute nodes in the storage cluster. Adding converged nodes, and adding hard disk drives (HDDs) to the converged nodes in your storage cluster, increases the datastore capacity of storage cluster. Adding compute nodes adds compute resources only and does not add to the storage capacity of the storage cluster.

Storage Cluster Maintenance Operations Overview

Maintaining the HX Data Platform storage cluster tasks affect both hardware and software components of the storage cluster. Storage cluster maintenance operations include adding or removing nodes and disks, and network maintenance.

Some steps in maintenance tasks are performed from the storage controller VM of a node in the storage cluster. Some commands issued on a storage controller VM affect all the nodes in the storage cluster.

Three node storage clusters. Contact Technical Assistance Center (TAC) for any task that requires removing or shutting down a node in a three node cluster. With any 3 node storage cluster, if one node fails or is removed, the cluster remains in an unhealthy state until a third node is added and joins the storage cluster.

Upgrading from vSphere 5.5 to 6.0. Before you upgrade either your ESX server or your vCenter server from 5.5 to 6.0, contact Technical Assistance Center (TAC).

Adding nodes. Nodes are added to the storage cluster through the Expand Cluster feature of the HX Data Platform Installer. All new nodes must meet the same system requirements as when you installed the HX Data Platform and created the initial storage cluster. See the Cisco HX Data Platform Getting Started Guide for a complete list of requirements and steps for using the Expand Cluster feature.
Online vs Offline Maintenance

Depending upon the task, the storage cluster might need to be either online or offline. Typically maintenance tasks requires that all nodes in the storage cluster are online.

When storage cluster maintenance is performed in an offline mode, this means the Cisco HX Data Platform is offline, however the storage controller VMs are up and Cisco HX Data Platform management is viewable through the stcli command line, HX Connect, and HX Data Platform Plug-in. The vSphere Web Client can report on the storage I/O layer. The stcli cluster info command returns that the overall storage cluster status is offline.

Pre-Maintenance Tasks

Before you perform maintenance on the storage cluster, ensure the following.

• Identify the maintenance task to be performed.
  See

• All maintenance operations such as remove/replace resources are done during maintenance windows when the load on the system is low.

• The storage cluster is healthy and operational before the maintenance tasks.

• Identify disks using the HX Connect or HX Data Platform Plug-in Beacon options.
  The HX Beacon option is not available for housekeeping 120GB SSDs. Physically check the server for the location of the housekeeping SSD.

• Check the list of maintenance tasks that cannot be performed in parallel. Some tasks can only be performed serially to each other.

• Ensure that SSH is enabled on all the ESX hosts.

• Put the ESX host into HX maintenance mode prior to performing a maintenance task on the host. The HX maintenance mode performs additional storage cluster specific steps compared to the vSphere provided ESX maintenance mode.

Post Maintenance Tasks

After the maintenance task is completed, the nodes need to exit Maintenance Mode and the storage cluster needs to be restarted. In addition, some changes to the HX storage cluster require additional post maintenance tasks. For example, if you changes the vNICs or vHBAs, the PCI Passthrough needs to be reconfigured.

Ensure the following:

• The ESX host is exited from HX maintenance mode after performing maintenance tasks on the host.

• The storage cluster is healthy and operational after any remove or replace tasks are completed.

• If vNICs or vHBAs have been added, removed, or replace on any ESX host in the HX storage cluster, reconfigure the PCI Passthrough.

Serial vs. Parallel Operations

Certain operations cannot be performed simultaneously. Ensure that you perform the following operations serially (not in parallel).
• Upgrade a storage cluster or a node.
• Create, re-create, or configure a storage cluster.
• Add or remove a node.
• Any node maintenance that requires a node be shutdown. This includes adding or removing disks or network interface cards (NICs).
• Start or shut down a storage cluster.
• Re-register a storage cluster with vCenter.

Checking Cluster Status

Procedure

Step 1  Login to any controller VM in the storage cluster. Run the listed commands from the controller VM command line.
Step 2  Verify the storage cluster is healthy.

    # stcli cluster info

Example response that indicates the storage cluster is online and healthy:

locale: English (United States)
state: online
upgradeState: ok
healthState: healthy
state: online
state: online

Step 3  Verify the number of node failures.

    # stcli cluster storage-summary

Example response:

# of node failures tolerable to be > 0

Setting a Beacon

Beaconing is a method of turning on an LED to assist in locating and identifying a node (host) and a disk. Nodes have the beacon LED in the front near the power button and in the back. Disks have the beacon LED on the front face.

You set a node beacon through Cisco UCS Manager. You set a disk beacon through the HX Data Platform Plug-in or HX Connect user interface.
Procedure

**Step 1**

Turn on and off a node beacon using UCS Manager.

a) From the UCS Manager left panel, select **Equipment > Servers > server.**

b) From the UCS Manager central panel, select **General > Turn on Locator LED.**

c) After you locate the server, turn off the locator LED.

From the UCS Manager central panel, select **General > Turn off Locator LED.**

**Step 2**

Turn on and off a disk beacon using the HX Data Platform Plug-in.

a) From the vSphere Web Client Navigator, select **vCenter Inventory Lists > Cisco HyperFlex Systems > Cisco HX Data Platform > cluster > Manage.**

b) From **Manage**, select **Cluster > cluster > host > Disks > disk.**

c) Locate the physical location of the object and turn on the beacon.

From **Actions** drop-down list, select **Beacon ON.**

d) After you locate the disk, turn off the beacon.

From **Actions** drop-down list, select **Beacon OFF.**

**Step 3**

Turn on and off a disk beacon using HX Connect.

a) Log in to HX Connect.

b) Select **System Information > Disks.**

c) Select a node, and then click **Turn On Locator LED or Turn Off Locator LED.**

The beacon LED for all the disks on the selected node are toggled, except Housekeeping SSDs and cache NVMe SSDs. Housekeeping SSDs or cache NVMe SSDs do not have functioning LED beacons.

---

**Verify vMotion Configuration for HX Cluster**

Before you perform maintenance operations on the HX cluster, verify all nodes in the HX cluster are configured for vMotion. Confirm the following from your vSphere Web Client:

1. Verify that the vMotion port group is configured with vmnic6 and vmnic7 in an active/standby configuration across all of the ESXi hosts in the cluster.

2. Verify that a port group is configured for vMotion, and that the naming convention is **EXACTLY** the same across all ESXi hosts in the cluster.

**Note**

The name is case-sensitive.

3. Verify that you have assigned a static IP to each vMotion port group, and that the static IPs for each vMotion port group are in the same subnet.

4. Verify that the vMotion port group has the vMotion option checked in the properties, and that no other port groups (such as management) have this option checked, on each ESXi host in the cluster.

5. Verify in the settings that the vMotion port group is set to 9000 MTU and the VLAN ID is set to 0.

6. Verify you can ping from the vMotion port group on one ESXi host to the vMotion IP on the other host.
Type `vmkping -I vmk2 10.104.0.20`

7. Verify that the right VLAN is assigned from the Fabric Interconnect by viewing the CDP information associated with the vmotion vNICS.

**Maintenance Modes for Storage Cluster Nodes**

Maintenance mode is applied to nodes in a cluster. It prepares the node for assorted maintenance tasks by migrating all VMs to other nodes before you decommission or shut the node down.

There are two types of maintenance modes.

- Cisco HX maintenance mode
- VMware ESX maintenance mode

**Cisco HX Maintenance Mode**

Cisco HX maintenance mode performs HX Data Platform specific functions in addition to the ESX maintenance mode. Be sure to select Cisco HX maintenance mode and not ESX maintenance mode for maintenance tasks performed on storage cluster nodes after initial storage cluster creation.

This mode is the preferred maintenance mode for performing selected tasks on individual nodes in the cluster. Including:

- Shutting down an individual host for maintenance, such as disk replacement.
- Upgrading selected software on a host, such as ESX Server version.

**Cisco HX Maintenance Mode Considerations**

- Ensure that SSH is enabled in ESX on all the nodes in the storage cluster prior to using HX Maintenance Mode.
- When HX Maintenance Mode is entered to enable performing tasks on an ESX host, be sure to exit HX Maintenance Mode after the tasks on the ESX host are completed.
- Cisco HX Maintenance Mode is applied to nodes in a healthy cluster only. If the cluster is unhealthy, for example too many nodes are down, or you are shutting down the cluster, use ESX Maintenance Mode.
- See *Entering Cisco HyperFlex Maintenance Mode* and *Exiting Cisco HyperFlex Maintenance Mode* for steps.

**VMware ESX Maintenance Mode**

This mode is used when you are installing HX Data Platform or applying cluster wide changes.

To enter or exit vSphere maintenance mode:

- Through the vCenter GUI, select the *host*, then from the right-click menu select *maintenance mode*.
- Through the ESX command line, use the `esx maintenance mode` command.
Setting HX Maintenance Mode

When HX Maintenance Mode is entered to enable performing tasks on an ESX host, it must also be exited after the tasks on the ESX host are completed.

**Note**

HX Maintenance Mode is applied to nodes in a healthy cluster only. If the cluster is unhealthy, for example too many nodes are down, or you are shutting down the cluster, use vSphere Maintenance Mode.

**Before you begin**

Ensure that SSH is enabled in ESX on all the nodes in the storage cluster prior to using HX Maintenance Mode.
If the HX Cluster is offline, use the VMware Maintenance Mode.

**Procedure**

**Step 1**
Determine the method to use for entering and exiting HX Maintenance Mode.
- GUI, using HX Data Platform plug-in to vSphere client.
- CLI, using the command line of the controller VM on the ESX host in the storage cluster.

All HX Data Platform `stcli` commands are run from a controller VM command line.

**Step 2**
Put the node in Cisco HX Maintenance mode.

**GUI**
- a) From vSphere web client, select **Home > Hosts and Clusters > Hosts > host**.
- b) Right-click the host, scroll to the bottom of the menu list, and select **Cisco HX Maintenance Mode > Enter HX Maintenance Mode**.

**Note**
The vCenter maintenance mode is at the top of the host right-click menu list. Do not select the vCenter maintenance mode.

**CLI**
- a) On the ESX host, log in to the controller VM as a user with root privileges.
- b) Move the ESX host into Maintenance mode.

```
# stcli node maintenanceMode (--id ID | --ip NAME) --mode enter
```

(see also `stcli node maintenanceMode --help`)

**Step 3**
Complete the maintenance task on the ESX host.

**Step 4**
Power on the ESX host.

**Step 5**
After you power on the node and perform ESX reboot, exit Cisco HX Maintenance mode:

**GUI**
- a) From vSphere, select **Home > Hosts and Clusters > Hosts > host**.
b) Right-click the host, scroll to the bottom of the menu list, and select Cisco HX Maintenance Mode > Exit HX Maintenance Mode.

*Note* The vCenter maintenance mode is at the top of the host right-click menu list. Do not select the vCenter maintenance mode.

**CLI**

a) On the ESX host, log in to the controller VM as a user with root privileges.
b) Move the ESX host out of Maintenance mode.

```
stcli node maintenanceMode (--id ID | --ip NAME) --mode exit
```

(see also `stcli node maintenanceMode --help`)

---

**Logging into a Storage Controller VM**

The HX Data Platform `stcli` commands are run from the storage controller VM. There is a storage controller VM on every converged node in the storage cluster. There are a few methods for logging into the controller VM.

- Use the HX Data Platform CLI web interface.
- Use the vCenter interface.
- Use an ssh command.

**Procedure**

---

**Step 1** Identify the storage controller VM.

a) Login to the vSphere web client and locate the controller VM of a HX Data Platform storage cluster host.

From the vSphere Web Client Navigator, select **VMs and Templates > vCenter server > datacenter > ESX Agents > Virtual Machines > controller_vm**.

b) Locate a storage controller VM DNS name.

Select **VM > Summary > DNS Name**.

c) Locate the storage controller VM IP address for the node.

From the **controller_vm > Summary > IP Addresses**.

If there is more than one IP Address for the VM, use the first IP Address in the list.

**Step 2** Use the HX Data Platform CLI web interface.

a) From a browser, enter the DNS Name and add /cli to the path.

For example:

```
cs002-hxctlvm.company.com/cli
```

b) Enter the login credentials.
Managing Disks in the Cluster

Disks, SSDs or HDDs, might fail. If this occurs, you need to remove the failed disk and replace it. Follow the server hardware instructions for removing and replacing the disks in the host. The HX Data Platform identifies the SSD or HDD and incorporates it into the storage cluster.

To increase the datastore capacity of a storage cluster add the same size and type SSDs or HDDs to each converged node in the storage cluster. For hybrid servers, add hard disk drives (HDDs). For all flash servers, add SSDs.

Replacing SSDs

The procedures for replacing an SSD vary depending upon the type of SSD. Identify the failed SSD and perform the associated steps.

Mixing storage disks type or size on a server or across the storage cluster is not supported.

• Use all HDD, or all 3.8 TB SSD, or all 960 GB SSD
• Use the hybrid cache device on hybrid servers and all flash cache devices on all flash servers.
• When replacing cache or persistent disks, always use the same type and size as the original disk.

Procedure

Step 1

Identify the failed SSD.

• For cache or persistent SSDs, perform a disk beacon check. See Setting a Beacon, on page 55.
Only cache and persistent SSDs respond to the beacon request. NVMe cache SSDs and housekeeping SSDs do not respond to beacon requests.

- For cache NVMe SSDs, perform a physical check. These drives are in Drive Bay 1 of the HX servers.
- For housekeeping SSDs on HXAF240c or HX240c servers, perform a physical check at the back of the server.
- For housekeeping SSDs on HXAF220c or HX220c servers, perform a physical check at Drive Bay 2 of the server.

**Step 2**  
If the failed SSD is a **housekeeping SSD**, proceed based on the type of server.

- For HXAF220c or HX220c servers, proceed to Step 3.
- For HXAF240c or HX240c servers, contact Technical Assistance Center (TAC).

**Step 3**  
If a failed SSD is a **cache or persistent SSD**, follow the instructions for removing and replacing a failed SSD in the host, per the server hardware guide.

After the cache or persistent drive is replaced, the HX Data Platform identifies the SDD and updates the storage cluster.

When disks are added to a node, the disks are immediately available for HX consumption.

**Step 4**  
To enable ESXi to discover a replaced NVMe SSD, reboot the ESXi host after replacing the drive.

When an NVMe SSD is removed or replaced:

1. Enter ESXi host into HX Maintenance Mode.
2. Follow the same steps used for replacing any non-housekeeping SSD. See Replacing SSDs, on page 60.
3. Reboot the ESXi host. This enables ESXi to discover the NVMe SSD.
4. Exit ESXi host from HX Maintenance Mode.

**Step 5**  
To enable the Cisco UCS Manager to include new disks in the **UCS Manager Server Inventory Storage** tab, re-acknowledge the server node. This applies to cache and persistent disks.

**Step 6**  
If you replaced an SSD, and see a message *Disk successfully scheduled for repair*, it means that the disk is present, but is still not functioning properly. Check that the disk has been added correctly per the server hardware guide procedures.

---

**Replacing Housekeeping SSDs**

---

**Note**  
This procedure applies to HXAF220c or HX220c servers only. To replace the housekeeping SSD on an HXAF240c or HX240c, contact Cisco TAC.

Identify the failed housekeeping SSD and perform the associated steps.
Procedure

**Step 1**  Identify the failed housekeeping SSD.
Physically check the SSD drives, as housekeeping drives are not listed through a beacon check.

**Step 2**  Remove the SSD and replace with a new SSD of the same kind and size. Follow the steps in the server hardware guide.
The server hardware guide describes the physical steps required to replace the SSD.

**Note**  Before performing the hardware steps, enter the node into Cisco HX Maintenance Mode. After performing the hardware steps, exit the node from Cisco HX Maintenance Mode.

**Step 3**  Using SSH, login into the storage controller VM of the affected node and run the following command.

```
#/usr/share/springpath/storfs-appliance/config-bootdev.sh -r -y
```
This command consumes the new disk, adding it into the storage cluster.

Sample response

```
Creating partition of size 65536 MB for /var/stv ...
Creating ext4 filesystem on /dev/sdg1 ...
Creating partition of size 24576 MB for /var/zookeeper ...
Creating ext4 filesystem on /dev/sdg2 ...
Model: ATA INTEL SSDSC2BB12 (scsi)
Disk /dev/sdg: 120034MB
Sector size (logical/physical): 512B/4096B
Partition Table: gpt ....
discovered. Rebooting in 60 seconds
```

**Step 4**  Wait for the storage controller VM to automatically reboot.

**Step 5**  When the storage controller VM completes its reboot, verify that partitions are created on the newly added SSD. Run the command.

```
# df -ah
```
Sample response

```
............
/dev/sdb1 63G 324M 60G 1%
/var/stv /dev/sdb2 24G 173M 23G 1% /var/zookeeper
```

**Step 6**  Identify the HX Data Platform installer package version installed on the existing storage cluster.

```
# stcli cluster version
```
The same version must be installed on all the storage cluster nodes. Run this command on the controller VM of any node in the storage cluster, but not the node with the new SSD.

**Step 7**  Copy the HX Data Platform installer packages into the storage controller VM in /tmp folder.

```
# scp <hxdp_installer_vm_ip>:/opt/springpath/packages/storfs-packages-<hxdp_installer>.tgz /tmp
```
```
# cd /tmp
```
```
# tar zxvf storfs-packages-<hxdp_installer>.tgz
```

**Step 8**  Run the HX Data Platform installer deployment script.
# ./inst-packages.sh
See the *Cisco HX Data Platform Getting Started Guide* for additional information on installing the HX Data Platform.

**Step 9**  
After the package installation, HX Data Platform starts automatically. Check the status.

```sh
status storfs
```

Sample response

```
storfs running
```

The node with the new SSD re-joins the existing cluster and the cluster returns to a healthy state.

---

## Replacing or Adding Hard Disk Drives

**Note**  
Mixing storage disks type or size on a server or across the storage cluster is not supported.

- Use all HDD, or all 3.8 TB SSD, or all 960 GB SSD
- Use the hybrid cache device on hybrid servers and all flash cache devices on all flash servers.
- When replacing cache or persistent disks, always use the same type and size as the original disk.

**Procedure**

**Step 1**  
Refer to the hardware guide for your server and follow the directions for adding or replacing disks.

**Step 2**  
Add HDDs of the same size to each node in the storage cluster.

**Step 3**  
Add the HDDs to each node within a reasonable amount of time.

The storage starts being consumed by storage cluster immediately.

The vCenter Event log displays messages reflecting the changes to the nodes.

**Note**  
When disks are added to a node, the disks are immediately available for HX consumption although they will not be seen in the UCSM server node inventory. This includes cache and persistent disks. To include the disks in the UCS Manager Server Inventory Storage tab, re-acknowledge the server node.

---

## Configure PCI Passthrough After Changing vNIC or vHBAs

**Description**  
After vNIC or vHBA are manually added to an HX service profile or service profile template, the PCI devices are re-enumerated and the VMware directpath I/O configuration is lost. When the service profile is changed,
the host hardware is updated and the PCI passthrough must be reconfigured. Perform the following steps on each ESX host with a modified service profile.

Perform the following steps on the storage controller VM of the modified ESX host:

**Action:** Update the vSphere Service Profile on the ESX Host

**Procedure**

**Step 1**
Put the ESX host into HX Maintenance mode.

**Step 2**
Make or confirm the changes, such as adding hardware, in the Service Profile.

**Step 3**
Reboot the ESX host.

This host loses the direct path configuration.

**Step 4**
Login to vCenter and select the DirectPath I/O Configuration page.

From vCenter Client: Select the **ESX host > Configuration tab > Hardware pane > Advanced Settings > Edit.**

From vCenter Web Client: From the **vCenter Inventory, select Resources > Hosts > ESX host > Manage > Settings > Hardware > PCI Devices > Edit.**

**Step 5**
Select the LSI card for passthrough.

a) From the DirectPath I/O Configuration page, select **Configure Passthrough.**

b) From the Mark devices for passthrough list, select the LSI card for the pass through.

c) Click **OK.**

**Step 6**
Reboot the ESX host.

**Step 7**
Re-map the PCI device to the HX storage controller VM (StCtlVM), by editing the storage controller VM settings.

a) Locate and remove the unknown PCI Device.

From vCenter Client: Right-click the **HX storage controller VM, select Edit Settings > PCI device 0 > Remove > OK.**

From vCenter Web Client: Right-click the **HX storage controller VM, select Edit Settings > Remove PCI device 0 > OK.**

b) Locate and re-add the LSI Logic PCI device.

From vCenter Client: Right-click the **HX storage controller VM, select Edit Settings > Add > PCI Device > LSI Logic PCI device > OK.**

From vCenter Web Client: Right-click the **HX storage controller VM, select Edit Settings > PCI Device > Add > LSI Logic PCI device > OK.**

**Step 8**
Remove the ESX host from HX Maintenance mode.

When the host is active again, the HX storage controller VM properly boots and rejoins the storage cluster.
CHAPTER 8

Using Native Snapshots

- HX Data Platform Native Snapshots Overview, on page 65
- Creating Snapshots, on page 71
- Scheduling Snapshots, on page 72
- Setting the Frequency of Scheduled Snapshots, on page 72
- Deleting Snapshot Schedules, on page 73
- Reverting to a Snapshot, on page 73
- Deleting Snapshots, on page 74

HX Data Platform Native Snapshots Overview

HX Data Platform Native Snapshots are a backup feature that saves versions (states) of working VMs. VMs can be reverted back to native snapshots.

Use the HX Data Platform plug-in to take native snapshots of your VMs. HX Data Platform native snapshot options include: create a native snapshot, revert to any native snapshot, and delete a native snapshot. Timing options include: Hourly, Daily, and Weekly, all in 15 minute increments.

A native snapshot is a reproduction of a VM that includes the state of the data on all VM disks and the VM power state (on, off, or suspended) at the time the native snapshot is taken. Take a native snapshot to save the current state of the VM, so that you have the option to revert to the saved state.

You can take a native snapshot when a VM is powered on, powered off, or suspended. For additional information about VMware snapshots, see the VMware KB, Understanding virtual machine snapshots in VMware ESXi and ESX (1015180) at, http://kb.vmware.com/selfservice/microsites/search.do?language=en_US&cmd=displayKC&externalId=1015180

Benefits of HX Data Platform Native Snapshots

HX Data Platform native snapshots use native technology. Native snapshots provide the following benefits:

- **Reverting registered VMs** - If a VM is registered, whether powered-on or powered-off, native snapshots, same as VM snapshots, can be used to revert to an earlier point in time at which the snapshot was created.

- **High performance** - The HX Data Platform native snapshot process is fast because it does not incur I/O overhead.

- **VM I/O independent** - The HX Data Platform native snapshot creation time is independent of the I/O on the VM.
- **VM performance** - HX Data Platform native snapshots do not degrade VM performance.

- **Crash-consistent. HX Data Platform native snapshots are crash-consistent by default** - I/O crash consistency is defined as maintaining the correct order of write operations to enable an application to restart properly from a crash.

- **Application-consistent** - You can select the `quiesce` option of the `stcli vm snapshot` command through the HX Data Platform CLI to enable HX Data Platform native snapshots to be application-consistent. The applications in the guest VM run transparently exactly like they do in the host VM. For details, see the Cisco HX Data Platform Command Line Interface Reference CLI Reference.

  Quiescing a file system is a process of bringing the on-disk data of a physical or virtual computer into a state suitable for backups. This process might include operations such as flushing dirty buffers from the operating system's in-memory cache to disk, or other higher-level application-specific tasks.

  If your system displays quiesce errors, see the following VMware KB article *Troubleshooting Volume Shadow Copy (VSS) quiesce related issues (1007696)*, at:

  [http://kb.vmware.com/selfservice/search.do?cmd=displayKC&docType=kc&docTypeID=DT_KB_1_1&externalId=1007696](http://kb.vmware.com/selfservice/search.do?cmd=displayKC&docType=kc&docTypeID=DT_KB_1_1&externalId=1007696)

- **Scheduled snapshots tolerant to node failures** - Scheduled snapshots are tolerant to administrative operations that require a node shutdown, such as HX maintenance mode and HX online upgrade. Scheduled Snapshots are tolerant to failures in other HX clusters in multi cluster environments.

- **Unified interface** - You can manage native snapshots created through the HX Data Platform plug-in using VMware snapshot manager TM.

- **Individual or grouped** - You can take native snapshots on a VM level, VM folder level, or resource pool level.

- **Granular progress and error reporting** - These monitoring tasks performed at Task level for Resource Pool, Folder and VM level snapshot.

- **Instantaneous snapshot delete** - Deletion of a snapshot and consolidation is always instantaneous.

- **Parallel batch snapshots** - Support for up to 255 VMs in a Resource Pool or Folder for parallel batched snapshots.

- **VDI deployment support** - HX scheduled snapshots are supported for desktop VMs on VDI deployments which are using VMware native technology.

- **Recoverable VM** - The VM is always recoverable when there are snapshot failures.

- **Datastore access** - Snapshots work on partially mounted/accessible datastores as long as the VM being snapshotted is on an accessible mountpoint.

---

**Native Snapshot Considerations**

**Snapshots parameters**

- **Native snapshots** - After you create the first native snapshot using the HX Data Platform plug-in, if you create more snapshots in the vSphere Web Client, these are considered to be native as well. However, if you create the first snapshot using the vSphere Web Client and not the HX Data Platform plug-in, then the vSphere Web Client snapshots are considered to be non-native.
• **Maximum number of stored snapshots** - Currently VMware has a limitation of 31 snapshots per VM. This maximum total includes VMware created snapshots, HX Data Platform SENTINEL snapshot, and HX Data Platform native snapshots.

For details, see VMware KB, *Committing snapshots in vSphere when more than 32 levels of snapshots are present fails with the error: Too many levels of redo logs (1004545)*, at: https://kb.vmware.com/selfservice/microsites/search.do?language=en_US&cmd=displayKC&externalId=1004545

• **Scheduled snapshots** - Do not have overlapping snapshots scheduled on VMs and their resource pools.

**VMs**

• **Deleted VMs** - The life cycle of native snapshots, similar to VM snapshots, is tied to the virtual machine. If the VM is deleted, accidentally or intentionally, all associated snapshots are also deleted. Snapshots do not provide a mechanism to recover from a deleted VM. Use a backup solution to protect against VM deletion.

• **HX Data Platform storage controller VMs** - You cannot schedule snapshots for storage controller VMs.

• **Non-HX Data Platform VMs** - Snapshots fail for any VM that is not on a HX Data Platform datastore. This applies to snapshots on a VM level, VM folder level, or resource pool level. To make a snapshot, the VM must reside on a HX Data Platform datastore in a HX Data Platform storage cluster.

• **Suspended VMs** - Creating the first native snapshot, the SENTINEL snapshot, from VMs in suspended state is not supported.

**vCenter**

• **Ready storage cluster** - To allow a native snapshot: The storage cluster must be healthy, including sufficient space and online. The datastores must be accessible. The VMs must be valid and not in a transient state, such as vMotioning.

• **vMotion** - vMotion is supported on VMs with native snapshots.

  **Storage vMotion** - Storage vMotion is not supported on VMs with native snapshots. If the VM needs to be moved to a different datastore, delete the snapshots before running storage vMotion.

**Naming**

• **Duplicate names** - Do not have VMs or Resource Pools with duplicate names within the HX Data Platform vCenter or snapshots fail. This includes parents and children within nested resource pools and resource pools within different vCenter clusters.

• **Characters in names** - Do not use the special characters, dot (.), dollar sign ($), or accent grave (´) in any guest/user VM name for which you want to enable snapshots.

**Disks and datastores**

• **VM datastores** - Ensure that all the VM (VMDK) disks are on the same datastore prior to creating native snapshots. This applies to HX Snapshot now and HX Scheduled Snapshots.

• **Thick disks** - If the source disk is thick, then the snapshot of the VM's disk will also be thick. Increase the datastore size to accommodate the snapshot.

• **Virtual disk types** - VMware supports a variety of virtual disk backing types. The most common is the FlatVer2 format. Native snapshots are supported for this format.
There are other virtual disk formats like Raw Device Mapping (RDM), SeSparse, VmfsSparse (Redlog format). VMs containing virtual disks of these formats are not supported for native snapshots.

Login access

• **SSH** - Ensure that SSH is enabled in ESX on all the nodes in the storage cluster.

Limitations

<table>
<thead>
<tr>
<th>Object</th>
<th>Maximum Number</th>
</tr>
</thead>
<tbody>
<tr>
<td>Snapshots</td>
<td>30 per storage cluster</td>
</tr>
<tr>
<td></td>
<td>VMware limit is 31. One snapshot is consumed by SENTINEL.</td>
</tr>
<tr>
<td>Datastores</td>
<td>8 per storage cluster</td>
</tr>
<tr>
<td>VMs</td>
<td>1024 per host</td>
</tr>
<tr>
<td>Powered on VMs</td>
<td>100 per host</td>
</tr>
<tr>
<td>vDisks per VM</td>
<td>60 per VM</td>
</tr>
</tbody>
</table>

**Native Snapshot Best Practices**

**Important**

Always use the HX Data Platform Snapshot feature to create your first snapshot of a VM. This ensures that all subsequent snapshots are in native format.

- Do not use the VMware Snapshot feature to create your first snapshot.
  
  VMware snapshots use redo log technology that result in degraded performance of the original VM. This performance degrades further with each additional snapshot.
  
  Native format snapshots do not impact VM performance after the initial native snapshot is created.
  
  If you have any redo log snapshots, on the ESXi hosts where the redo log snapshots reside, edit the `/etc/vmware/config file and set snapshot.asyncConsolidate="TRUE"`.  

- Add all the VMDKs to the VM prior to creating the first snapshot.
  
  When VMDKs are added to the VM, additional SENTINEL snapshots are taken. Each additional SENTINEL consumes a space for additional snapshots.
  
  For example, if you have an existing VM and you add 2 new VMDKs, at the next scheduled snapshot, 1 new SENTINEL is created. Check the snapshot schedule retention number to be sure you have sufficient snapshot slots available; one for the new SENTINEL, one for the snapshot.

- When creating large numbers of snapshots consider the following:
  
  - Schedule the snapshots at a time when you expect data traffic might be low.
  
  - Use multiple resource pools or VM folders to group VMs rather than a single resource pool or VM folder. Then stagger the snapshot schedule by group.
Understanding SENTINEL Snapshots

When you create the first snapshot of a VM, through either Snapshot Now or a Scheduled Snapshot, the HX Data Platform plug-in creates a base snapshot called a SENTINEL snapshot. The SENTINEL snapshot ensures follow-on snapshots are all native snapshots.

SENTINEL snapshots prevent reverted VMs from having VMware redo log-based virtual disks. Redo log-based virtual disks occur when an original snapshot is deleted and the VM is reverted to the second oldest snapshot.

SENTINEL snapshots are in addition to the revertible native snapshot. The SENTINEL snapshot consumes one snapshot of the total 31 available per VMware limitation.

Using SENTINEL snapshots

• Do not delete the SENTINEL snapshot.
• Do not revert your VM to the SENTINEL snapshot.

Native Snapshot Timezones

There are three objects that display and affect the timestamp and schedule of snapshots:

• vSphere and vCenter use UTC time.
• vSphere Web client uses the browser timezone.
• HX Data Platform plug-in, storage cluster, and storage controller VM use the same timezone. This is enforced across the storage cluster. The timezone used by these is configurable. The default is UTC.

The storage controller VM time is used to set the schedule. The vSphere UTC time is used to create the snapshots. The logs and timestamps vary depending upon the method used to view them.

When a schedule is created, the scheduled times are converted to UTC. When you view the schedule through the HX Data Platform plug-in, it displays the controller VM time. When you view a completed snapshot in the vCenter events log, it displays the UTC time.

Because it is possible to have different timezones applying to each object, the event messages and schedules that display in the HX Data Platform plug-in and the vCenter logs might not appear in sync. However, this is only an artifact of the timezones assigned to each display option. When converted to the same timezone, they translate to the same time. For example: 5:30pm PST, 8:30PM EST, 1:30AM UTC are all the same time.

To have vSphere Scheduled Task tab display the same time for a Scheduled Snapshot that you create in the HX Data Platform plug-in, set the storage controller VM to UTC.

To have Scheduled Snapshots run based on local time zone settings, set that timezone for the storage cluster. By default, the storage controller VM uses the UTC time zone set during HX Data Platform installation.
vSphere scheduled tasks lists. If the vSphere and the storage controller VM are not using the same timezone, the vSphere Scheduled tasks tab might display a different time than the scheduled in the HX Data Platform Schedule Snapshot dialog.

vSphere task completed lists. When you configure an hourly snapshot, the snapshot schedule runs between a specific start time and end time. The vSphere Task Window might display a status that a scheduled snapshot was completed outside the hourly end time. This message indicates that vSphere confirmed that the sequence of snapshots are complete.

At the designated hour, vSphere checks if a snapshot should be created and if it is outside the end time, vSphere confirms that a snapshot is not needed, and posts a status message that says the larger task (of taking a series of hourly snapshots) is complete.

**Identify and set the timezone used by the storage controller VM**

1. From the storage controller VM command line, view the set timezone.
   
   ```
   $ stcli services timezone show
   ```

2. Change the storage cluster timezone.
   
   ```
   $ stcli services timezone set --timezone timezone_code
   ```

   See a timezone reference for timezone codes, such as
   

**Scheduling Snapshots Overview**

You apply snapshot schedules to storage cluster objects: VMs, VM folders, or resource pools.

---

**Note**

If you re-register the vCenter cluster, your HX Data Platform snapshot schedule is lost. If this happens, reconfigure your snapshot schedule.

You can schedule a snapshot to adjust your backup requirements. For example, you can retain more frequent snapshots of critical data. If there is a disaster, you can restore recent snapshots or create a custom real-time snapshot. For less critical data, you do not need to create frequent snapshots or retain backup copies.

Snapshot scheduling enables you to control the costs of using backup. For each VM in your storage cluster, you can schedule hourly, daily, or weekly snapshots. The maximum frequency for any specific VM is once per hour. Hourly setting is in 15 minute increments.

For example, snapshots are taken each day, given the following settings.

- VM 1 hourly snapshots to run at hour:15 minutes, between 10 PM and 1 AM.
- VM 2 hourly snapshots to run at hour:30 minutes, between 8 PM and 12 AM.
- VM 3 and 4 hourly snapshots to run at hour:45, between 6 AM and 8 AM.
- VM 5 daily snapshot to run at 6:00 AM

Each day these snapshots are taken.

- 6:00 AM — VM 5
- 6:45 AM — VM 3, VM 4
- 7:45 AM — VM 3, VM 4
- 8:30 PM — VM2
9:30 PM — VM2
10:15 PM — VM1
10:30 PM — VM2
11:15 PM — VM1
11:30 PM — VM2
12:15 AM — VM1

Notice that the last snapshot is before the ending hour:00.

To schedule a snapshot every hour over 24 hours, set the start time, then set the end time one hour before. For example, hour:15, start 4 PM, end 3 PM. This takes a snapshot at 4:14 PM, 5:15 PM, ... 12:15 AM, 1:15 AM ... 2:15 PM, 3:15 PM. Then restarts the 24 hour cycle. Note: The maximum number of snapshots per VM is 32. So, you could only take an hourly snapshot up to 32 hours.

The schedule snapshot displays the set time for the snapshot based on the current time zone setting for the storage controller VM. So, if a snapshot was set at 7 pm PST and the storage controller VM time zone is changed to EST. The next time you open the scheduler window, it automatically updates to 10 pm EST.

Creating Snapshots

Before you begin

If you have any redo log snapshots for VMs in the HX storage cluster, edit the ESXi host configuration where the redo log snapshots reside. If this step is not completed, VMs might be stunned during snapshot consolidation.

Redo log snapshots are snapshots that are created through the VMware Snapshot feature and not through the HX Data Platform Snapshot feature.

1. Login to the ESXi host command line
2. Locate and open for editing the file, /etc/vmware/config
3. Set the snapshot.asyncConsolidate parameter to TRUE.

Procedure

Step 1 From the vSphere Web Client Navigator, select the VM level, VM folder level, or resource pool level. For example, vCenter Inventory Lists > Virtual Machines to display the list of VMs in vCenter.

Step 2 Select a storage cluster VM and open the Actions menu. Either right-click the VM or click the Actions menu in the VM information portlet.

Note Ensure there are no non-HX Data Platform datastores on the storage cluster resource pool or the snapshot will fail.

Step 3 Select Cisco HX Data Platform > Snapshot Now to display the Snapshot dialog box.

Step 4 Type a name for the snapshot in the snapshot dialog box.

Step 5 Type a description of the snapshot.

Step 6 Click OK to accept your configuration.
The Recent Tasks tab displays the status message:

Create virtual machine native snapshot.

The first snapshot

---

### Setting the Frequency of Scheduled Snapshots

Create a snapshot every hour at specific times, daily at a specific time, or weekly on selected days and times.

**Before you begin**

Open the Schedule Snapshot dialog box for a VM, VM folder, or resource pool.

**Procedure**

**Step 1**

From the Schedule Snapshot dialog box, select the **Enable Hourly Snapshot**, **Enable Daily Snapshot**, or **Enable Weekly Snapshot** check box.
Step 2  Click the **Start** at drop-down list to select a start time. Select hour, minutes in 15 minute increments, and AM or PM.

Step 3  For an hourly snapshot schedule, click the **Until** drop-down list to select an end time. Select hour, minutes in 15 minute increments, and AM or PM. Set the minute to the same value as the Start at time.

The HX Data Platform plug-in creates a snapshot of the VM every hour between the start and end times.

Step 4  Select the corresponding check box to specify **Days** of the week on which you want to take the snapshots.

Step 5  Under **Retention**, either type a number or use the arrow button to specify the maximum number of copies to retain for each schedule.

---

**Deleting Snapshot Schedules**

**Procedure**

Step 1  From the vSphere Web Client Navigator Home page, select the VM, VM folder, or resource pool list. For example, **vCenter Inventory Lists > Virtual Machines** to display the list of VMs in vCenter.

Step 2  Select a storage cluster VM, VM folder, or resource pool and open the **Actions** menu. Either right-click the object or click the Actions menu.

Step 3  From the Actions menu, select **Cisco HX Data Platform > Schedule Snapshot** to display the Schedule Snapshot dialog box.

Step 4  Unclick the scheduled options you no longer want.

Step 5  Click **OK** to accept the changes, this includes deleting previously configured schedules, and exit the dialog.

Step 6  Confirm the schedule is deleted.

Select a storage cluster VM, VM folder, or resource pool. Click the vCenter tabs, **Manage > Scheduled Tasks**. The previous snapshot schedule should not be listed.

---

**Reverting to a Snapshot**

Reverting a snapshot is returning a VM to a state stored in a snapshot. Reverting to a snapshot is performed on one VM at a time. This is not performed at the resource pool or VM folder level. Reverting snapshots is performed through the vCenter Snapshot Manager and not through the HX Data Platform plug-in.

**Before you begin**

Snapshots of the VM must exist.
**Procedure**

**Step 1**  
From the vSphere Web Client Navigator Home page, select the VM level, VM folder level, or resource pool level. For example, vCenter Inventory Lists > Virtual Machines to display the list of VMs in vCenter.

**Step 2**  
Select a storage cluster VM and open the Actions menu. Either right-click the VM or click the Actions menu in the VM information portlet.

**Step 3**  
Select Snapshots > Manage Snapshots to open the vSphere Snapshot Manager.

**Step 4**  
Select a snapshot to revert to from the hierarchy of snapshots for the selected VM.

**Step 5**  
Click Revert to > Yes > Close.  
The reverted VM is included in the list of VMs and powered off. In selected cases, a VM reverted from a VM snapshot is already powered on.

**Step 6**  
Select the reverted VM and power it on.

**Deleting Snapshots**

Deleting snapshots is managed through the vSphere interface and not through the HX Data Platform plug-in.

**Procedure**

**Step 1**  
From the vSphere Web Client Navigator, select VMs and Templates > vcenter_server > Snapshots > datacenter > vm.

**Step 2**  
Right-click the vm and select Snapshots > Manage Snapshots.

**Step 3**  
Select a snapshot and click Delete.

**Note**  
Delete the SENTINEL snapshot by using Delete All option only. Do not delete the SENTINEL snapshot individually.
Using HX Data Platform ReadyClones

- HX Data Platform ReadyClones Overview, on page 75
- Benefits of HX Data Platform ReadyClones, on page 75
- Supported Base VMs, on page 76
- ReadyClone Requirements, on page 76
- ReadyClone Best Practices, on page 77
- Creating HX Data Platform ReadyClones, on page 77
- Prepare to Customize HX Data Platform ReadyClones, on page 79
- Configuring ReadyClones Using Customized Specifications, on page 80

HX Data Platform ReadyClones Overview

HX Data Platform ReadyClones is a pioneer storage technology that enables you to rapidly create and customize multiple cloned VMs from a host VM. It is an expansion feature that is used for creating multiple copies of VMs that can then be used as standalone VMs.

A ReadyClone, similar to a standard clone, is a copy of an existing VM. The existing VM is called the host VM. When the cloning operation is complete, the ReadyClone is a separate guest VM.

Changes made to a ReadyClone do not affect the host VM. A ReadyClone's MAC address and UUID are different from those of the host VM.

Installing a guest operating system and applications can be time consuming. With ReadyClone, you can make many copies of a VM from a single installation and configuration process.

Clones are useful when you deploy many identical VMs to a group.

Benefits of HX Data Platform ReadyClones

HX Data Platform ReadyClones provide the following benefits:

- **Create multiple clones of a VM at a time** - Simply right-click a VM and create multiple clones of the VM using the ReadyClones feature.

- **Rapid cloning** - HX Data Platform ReadyClones are extremely fast and efficient than legacy cloning operations because they support VMware vSphere® Storage APIs – Array Integration (VAAI) data offloads. VAAI also called hardware acceleration or hardware offload APIs, are a set of APIs to enable
communication between VMware vSphere ESXi hosts and storage devices. Use HX Data Platform ReadyClones to clone VMs in seconds instead of minutes.

• **Batch customization of guest VMs** - Use the HX Data Platform Customization Specification to instantly configure parameters such as IP address, host name, VM name for multiple guest VMs cloned from a host VM.

• **Automation of several steps to a one-click process** - The HX Data Platform ReadyClones feature automates the task to create each guest VM.

• **VDI deployment support** - ReadyClones are supported for desktop VMs on VDI deployments which are using VMware native technology.

• **Datastore access** - ReadyClone work on partially mounted/accessible datastores as long as the VM being cloned is on an accessible mountpoint.

### Supported Base VMs

HX Data Platform supports:

• Base VMs stored on a HX Data Platform datastore

• Base VMs with HX Data Platform Snapshots

• Maximum 2048 ReadyClones from one base VM

• Maximum 256 ReadyClones created in one batch at a time.

HX Data Platform does not support:

• Powered on base VMs with Win2008 and Win2012 server guest

• Powered on base VMs with > 30 snapshots

• Powered on base VMs with Redo log snapshots

### ReadyClone Requirements

• VMs must be within the HX Data Platform storage cluster. Non-HX Data Platform VMs are not supported.

• VMs must reside on a HX Data Platform datastore, VM folder, and resource pool.

  ReadyClones fail for any VM that is not on a HX Data Platform datastore. This applies to ReadyClones on a VM level, VM folder level, or resource pool level.

• VMs can have only native snapshots. ReadyClones cannot be created from VMs with snapshots that have redo logs, (non-native snapshots).

• SSH must be enabled in ESX on all the nodes in the storage cluster.

• Use only the single vNIC customization template for ReadyClones.
ReadyClone Best Practices

- Use the customization specification as a profile or a template.
- Ensure that properties that apply to the entire batch are in the customization specification.
- Obtain user-defined parameters from the HX Data Platform ReadyClone batch cloning workflow.
- Use patterns to derive per-clone identity settings such as the VM guest name.
- Ensure that the network administrator assigns static IP addresses for guest names and verify these addresses before cloning.
- You can create a batch of 1 through 256 at a given time. The HX Data Platform plug-in enables you to verify this.
- Do not create multiple batches of clones simultaneously on the same VM (when it is powered on or powered off) because it causes failures or displays incorrect information on the master task updates in the HX Data Platform plug-in.

Creating HX Data Platform ReadyClones

If you use the VMware cloning operation, you can create only a single clone from a VM. This operation is manual and slower than batch processing multiple clones from a VM. For example, to create 20 clones of a VM, you must manually perform the clone operation over and over again.

---

**Note**

Use HX Data Platform ReadyClones to create multiple clones of a VM in one click!

For example, you can create ten different clones with different static IP addresses from a Windows VM.

---

**Procedure**

**Step 1**  
From the vSphere Web Client Navigator, select vCenter Inventory Lists \> Virtual Machines. This displays the list of VMs in vCenter.

**Step 2**  
Select a storage cluster VM and open the Actions menu. Either right-click the VM or click the Actions menu in the VM information portlet.  
If needed, view the list of clusters and associated VMs to verify the VM is a storage cluster VM.

**Step 3**  
Select Cisco HX Data Platform \> ReadyClones to display the ReadyClones dialog box.

**Step 4**  
Specify the following information in the ReadyClones dialog box:

<table>
<thead>
<tr>
<th>Control</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of clones</td>
<td>Type the number of clones that you want to create. You can create a batch of 1 through 256 clones at a given time.</td>
</tr>
</tbody>
</table>
Click the drop-down list and select a Customization Specification for the clone from the drop-down list (which includes the customization specifications available in vCenter).

The system filters the customization specifications for the selected host VM. For example, if the selected host VM uses Windows OS for guest VMs, the drop-down list displays Windows OS customization specifications.

Type a prefix for the guest VM name.

Type a clone number for the starting clone.

Select this check box to use the vCenter VM inventory name as the guest host VM name. If you uncheck this box, a text box is displayed. Enter the name you want to use for the guest host VM name.

The system displays the guest VM names in the Guest Name column in the dialog box.

There is a similar option in the Customization Specification itself. This HX Data Platform ReadyClone batch customization process overrides the option that you specify in the Customization Specification option.

- If the Customization Specification contains a NIC or network adapter that uses a static gateway and static subnet and the guest name resolves to a static IP address, then the system assigns the network adapter the static IP address associated with the guest name. It also sets the storage cluster name or host name to the guest name specified.

- If the Customization Specification contains a NIC or network adapter that obtains the IP address using DHCP, then the systems sets only the storage cluster name or host name to the guest name specified.

Type a value using which the clone number in the guest VM name must be increased, or leave the default value 1 as is. The system appends a number to the names of the VM clones (such as clone1, clone2, and clone3). By default, the number starts from 1. You can change this value to any number.

Select this check box to turn the guest VMs on after the cloning process completes.

**Step 5**

Click **OK** to apply your configuration changes.

The vSphere Web Client Recent Tasks tab displays the status of the ReadyClones task. The system displays:

- Top-level progress with the initiator as the logged in vCenter user.

- Implementation work flows with the initiator as the logged in vCenter user and a HX Data Platform extension.
• As part of the ReadyClone workflow a temporary snapshot is listed in vCenter and HXConnect. This is listed as an extra powered off VM transiently, only while the ReadyClones are being created.

---

**Prepare to Customize HX Data Platform ReadyClones**

• Create a customization specification per the VMware documentation.
  Apply the customization settings described in the following topics specific to either Linux or Windows VMs.
• Obtain the IP addresses from the administrator. For example, ten IP addresses 10.64.1.0 through 10.64.1.9.
• Gather information specific to your network such as the subnet mask for these IP addresses.
• Ensure that the base VM is valid (not disconnected, undergoing snapshots, or vMotion).
• Ensure that Guest Tools is installed on the base VM. Update it if necessary.
• Go to the VM Summary tab and verify that Guest Tools is working.

**Creating a Customization Specification for Linux in the vSphere Web Client**

Use the vSphere Web Client Guest Customization wizard to save guest operating system settings in a specification that you can apply when cloning virtual machines or deploying from templates.

Complete the wizard with the following considerations.
• You can use the HX Data Platform ReadyClones feature to overwrite the guest name that you specify in when you create the customization specification.
• HX Data Platform ReadyClones enable you to use patterns in the VM name or guest name.
• HX Data Platform supports only one NIC.
• Editing the NIC of a Customized Linux VM
  - You can use a fake IP address because the HX Data Platform ReadyClone customization process overwrites this address.
  - HX Data Platform ReadyClones resolve VM guest names to static IP addresses and sets them for the cloned VMs.

The customization specification you created is listed in the Customization Specification Manager. You can use it to customize virtual machine guest operating systems.

**Create a Customization Specification for Windows in the vSphere Web Client**

Use the vSphere Web Client Guest Customization wizard to save Windows guest operating system settings in a specification that you can apply when cloning virtual machines or deploying from templates.
The default administrator password is not preserved for Windows Server 2008 after customization. During customization, the Windows Sysprep utility deletes and recreates the administrator account on Windows Server 2008. You must reset the administrator password when the virtual machine boots the first time after customization.

Complete the wizard with the following considerations.

- The operating system uses this name to identify itself on the network. On Linux systems, it is called the host name.
- HX Data Platform supports only one NIC.
- Editing the NIC of a Customized Windows VM
  You can use a fake IP address because the HX Data Platform ReadyClone customization process overwrites it.

The customization specification you created is listed in the Customization Specification Manager. You can use it to customize virtual machine guest operating systems.

Configuring ReadyClones Using Customized Specifications

Use a customized specification to ensure IP addresses are applied correctly to the new VMs if you use static IP addresses.

For example, if you create a Windows server VM clone and you use DHCP, the guest VMs are automatically assigned new IP addresses. But, if you use static IP addresses, the IP address is not automatically replicated in the guest VM. To resolve this, configure HX Data Platform ReadyClones using a Customization Specification.

Procedure

Step 1 Obtain the valid DNS names and ensure that they resolve to valid IP addresses.

For example, to provision a batch of 100 Windows VMs where the guest name is userwinvm1 to userwinvm100, check that userwinvm1 through userwinvm100 are valid IP addresses.

Step 2 Install Guest VM tools on the source VM.

Step 3 Clone the source VM using the ReadyClones feature. The cloned guest VMs obtain the identity of the source VM.

Step 4 Use the Customization Specification to change the identity of all cloned VMs. You can configure parameters such as IP address, host name, and VM name.
CHAPTER 10

HX Data Platform High Availability

• HX Data Platform High Availability Overview, on page 81
• Responses to Storage Cluster Node Failures, on page 81
• Data Replication Factor Settings, on page 86
• Cluster Access Policy, on page 86
• HX Data Platform Cluster Tolerated Failures, on page 87

HX Data Platform High Availability Overview

The HX Data Platform High Availability (HA) feature ensures that the storage cluster maintains at least two copies of all your data during normal operation with three or more fully functional nodes.

If nodes or disks in the storage cluster fail, the cluster's ability to function is affected. If more than one node fails or one node and disk(s) on a different node fail, it is called a simultaneous failure.

The number of nodes in the storage cluster, combined with the Data Replication Factor and Access Policy settings, determine the state of the storage cluster that results from node failures.

Note

Before using the HX Data Platform HA feature, enable DRS and vMotion on the vSphere Web Client.

Responses to Storage Cluster Node Failures

A storage cluster healing timeout is the length of time HX Connect or HX Data Platform Plug-in waits before automatically healing the storage cluster. If a disk fails, the healing timeout is 1 minute. If a node fails, the healing timeout is 2 hours. A node failure timeout takes priority if a disk and a node fail at the same time or if a disk fails after node failure, but before the healing is finished.

When the cluster resiliency status is Warning, the HX Data Platform system supports the following storage cluster failures and responses.

Optionally, click the associated Cluster Status/Operational Status or Resiliency Status/Resiliency Health in HX Connect and HX Data Platform Plug-in, to display reason messages that explain what is contributing to the current state.
### Responses to Storage Cluster Node Failures

<table>
<thead>
<tr>
<th>Cluster Size</th>
<th>Number of Simultaneous Failures</th>
<th>Entity Failed</th>
<th>Maintenance Action to Take</th>
</tr>
</thead>
<tbody>
<tr>
<td>3 nodes</td>
<td>1</td>
<td>One node.</td>
<td>The storage cluster does not automatically heal. Replace the failed node to restore storage cluster health.</td>
</tr>
</tbody>
</table>
| 3 nodes      | 2                                | Two or more disks on two nodes are blacklisted or failed. | 1. If one SSD fails, the storage cluster does not automatically heal.  
- Replace the faulty SSD and restore the system by rebalancing the cluster  
2. If one HDD fails or is removed, the disk is blacklisted immediately. The storage cluster automatically begins healing within a minute.  
3. If more than one HDD fails, the system might not automatically restore storage cluster health.  
- If the system is not restored, replace the faulty disks and restore the system by rebalancing the cluster |
<table>
<thead>
<tr>
<th>Cluster Size</th>
<th>Number of Simultaneous Failures</th>
<th>Entity Failed</th>
<th>Maintenance Action to Take</th>
</tr>
</thead>
<tbody>
<tr>
<td>4 nodes</td>
<td>1</td>
<td>One node.</td>
<td>If the node does not recover in two hours, the storage cluster starts healing by rebalancing data on the remaining nodes.</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>To recover the failed node immediately and fully restore the storage cluster:</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>1. Check that the node is powered on and restart it if possible. You might need to replace the node.</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>2. Rebalance the cluster</td>
</tr>
<tr>
<td>4 nodes</td>
<td>2</td>
<td>Two or more disks on two nodes.</td>
<td>If two SSDs fail, the storage cluster does not automatically heal.</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>If the disk does not recover in one minute, the storage cluster starts healing by rebalancing data on the remaining nodes.</td>
</tr>
<tr>
<td>Cluster Size</td>
<td>Number of Simultaneous Failures</td>
<td>Entity Failed</td>
<td>Maintenance Action to Take</td>
</tr>
<tr>
<td>--------------</td>
<td>---------------------------------</td>
<td>---------------</td>
<td>---------------------------</td>
</tr>
<tr>
<td>5+ nodes</td>
<td>2</td>
<td>Up to two nodes</td>
<td>If the node does not recover in two hours, the storage cluster starts healing by rebalancing data on the remaining nodes. To recover the failed node immediately and fully restore the storage cluster: 1. Check that the node is powered on and restart it if possible. You might need to replace the node. 2. Rebalance the cluster. If the storage cluster shuts down, see Troubleshooting, Two Nodes Fail Simultaneously Causes the Storage Cluster to Shutdown section.</td>
</tr>
<tr>
<td>5+ nodes</td>
<td>2</td>
<td>Two nodes with two or more disk failures on each node.</td>
<td>The system automatically triggers a rebalance after a minute to restore storage cluster health.</td>
</tr>
</tbody>
</table>
Maintenance Action to Take

<table>
<thead>
<tr>
<th>Cluster Size</th>
<th>Number of Simultaneous Failures</th>
<th>Entity Failed</th>
<th>Maintenance Action to Take</th>
</tr>
</thead>
<tbody>
<tr>
<td>5+ nodes</td>
<td>2</td>
<td>One node and One or more disks on a different node.</td>
<td>If the disk does not recover in one minute, the storage cluster starts healing by rebalancing data on the remaining nodes. If the node does not recover in two hours, the storage cluster starts healing by rebalancing data on the remaining nodes. If a node in the storage cluster fails and a disk on a different node also fails, the storage cluster starts healing the failed disk (without touching the data on the failed node) in one minute. If the failed node does not come back up after two hours, the storage cluster starts healing the failed node as well. To recover the failed node immediately and fully restore the storage cluster: 1. Check that the node is powered on and restart it if possible. You might need to replace the node. 2. Rebalance the cluster.</td>
</tr>
</tbody>
</table>

Procedure

Review the table above and perform the action listed.
Data Replication Factor Settings

Data Replication Factor is set when you configure the storage cluster. Data Replication Factor defines the number of redundant replicas of your data across the storage cluster. The options are 2 or 3 redundant replicas of your data.

- If you have hybrid servers (servers that contain both SSD and HDDs), then the default is 3.
- If you have all flash servers (servers that contain only SSDs), then you must explicitly select either 2 or 3 during HX Data Platform installation.

Procedure

Choose a Data Replication Factor. The choices are:

- Data Replication Factor 3 — Keep three redundant replicas of the data. This consumes more storage resources, and ensures the maximum protection for your data in the event of node or disk failure.
  - **Attention** Data Replication Factor 3 is the recommended option.

- Data Replication Factor 2 — Keep two redundant replicas of the data. This consumes fewer storage resources, but reduces your data protection in the event of node or disk failure.

Cluster Access Policy

The Cluster Access Policy works with the Data Replication Factor to set levels of data protection and data loss prevention. There are two Cluster Access Policy options. The default is *lenient*. It is not configurable during installation, but can be changed after installation and initial storage cluster configuration.

- **Strict** - Applies policies to protect against data loss.
  - If nodes or disks in the storage cluster fail, the cluster's ability to function is affected. If more than one node fails or one node and disk(s) on a different node fail, it is called a simultaneous failure. The strict setting helps protect the data in event of simultaneous failures.

- **Lenient** - Applies policies to support longer storage cluster availability. This is the default.
**View the Data Replication Factor and Cluster Access Policy Setting**

**Procedure**

<table>
<thead>
<tr>
<th>Step</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Step 1</td>
<td>From the vSphere Web Client Navigator, select vCenter Inventory Lists &gt; Cisco HyperFlex Systems &gt; Cisco HX Data Platform &gt; cluster &gt; Summary &gt; Status. This displays the storage cluster Status portal.</td>
</tr>
<tr>
<td>Step 2</td>
<td>Click the information (i) icon in front of the Cluster Status field.</td>
</tr>
<tr>
<td>Step 3</td>
<td>The Cluster Status popup shows the Replication Factor and the associated Access Policy.</td>
</tr>
</tbody>
</table>

**Changing the Cluster Access Policy Level**

**Procedure**

<table>
<thead>
<tr>
<th>Step 1</th>
<th>The storage cluster must be in a healthy state prior to changing the Cluster Access Policy to strict.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Step 2</td>
<td>From the command line of a storage controller VM in the storage cluster, type:</td>
</tr>
<tr>
<td></td>
<td><code># stcli cluster get-cluster-access-policy</code></td>
</tr>
<tr>
<td></td>
<td><code># stcli cluster set-cluster-access-policy --name {strict,lenient}</code></td>
</tr>
</tbody>
</table>

**HX Data Platform Cluster Tolerated Failures**

If nodes or disks in the storage cluster fail, the cluster's ability to function is affected. If more than one node fails or one node and disk(s) on a different node fail, it is called a *simultaneous failure*.

How the number of node failures affect the storage cluster is dependent upon:

- **Number of nodes in the cluster.** The response by the storage cluster is different for clusters with 3 to 4 nodes and 5 or greater nodes.

- **Data Replication Factor.** This is set during HX Data Platform installation and cannot be changed. The options are 2 or 3 redundant replicas of your data across the storage cluster.

  **Attention** Data Replication Factor 3 is the recommended option.

- **Access Policy.** This can be changed from the default setting after the storage cluster is created. The options are strict, for protecting against data loss, or lenient, to support longer storage cluster availability.
Cluster State with Number of Failed Nodes

The tables below list how the storage cluster functionality changes with the listed number of simultaneous node failures.

Cluster State in 5+ Node Cluster with Number of Failed Nodes

<table>
<thead>
<tr>
<th>Replication Factor</th>
<th>Access Policy</th>
<th>Number of Failed Nodes</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Read/Write</td>
</tr>
<tr>
<td>3</td>
<td>Lenient</td>
<td>2</td>
</tr>
<tr>
<td>3</td>
<td>Strict</td>
<td>1</td>
</tr>
<tr>
<td>2</td>
<td>Lenient</td>
<td>1</td>
</tr>
<tr>
<td>2</td>
<td>Strict</td>
<td>--</td>
</tr>
</tbody>
</table>

Cluster State in 3 - 4 Node Clusters with Number of Failed Nodes

<table>
<thead>
<tr>
<th>Replication Factor</th>
<th>Access Policy</th>
<th>Number of Failed Nodes</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Read/Write</td>
</tr>
<tr>
<td>3</td>
<td>Lenient or Strict</td>
<td>1</td>
</tr>
<tr>
<td>2</td>
<td>Lenient</td>
<td>1</td>
</tr>
<tr>
<td>2</td>
<td>Strict</td>
<td>--</td>
</tr>
</tbody>
</table>

Cluster State with Number of Nodes with Failed Disks

The table below lists how the storage cluster functionality changes with the number of nodes that have one or more failed disks. Note that the node itself has not failed but disk(s) within the node have failed. For example: 2 indicates that there are 2 nodes that each have at least one failed disk.

There are two possible types of disks on the servers: SSDs and HDDs. When we talk about multiple disk failures in the table below, it's referring to the disks used for storage capacity. For example: If a cache SSD fails on one node and a capacity SSD or HDD fails on another node the storage cluster remains highly available, even with an Access Policy strict setting.

The table below lists the worst case scenario with the listed number of failed disks. This applies to any storage cluster 3 or more nodes. For example: A 3 node cluster with Replication Factor 3, while self-healing is in progress, only shuts down if there is a total of 3 simultaneous disk failures on 3 separate nodes.

Note

HX storage clusters are capable of sustaining serial disk failures, (separate disk failures over time). The only requirement is that there is sufficient storage capacity available for support self-healing. The worst-case scenarios listed in this table only apply during the small window while HX is completing the automatic self-healing and rebalancing.

3+ Node Cluster with Number of Nodes with Failed Disks
<table>
<thead>
<tr>
<th>Replication Factor</th>
<th>Access Policy</th>
<th>Failed Disks on Number of Different Nodes</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Read/Write</td>
</tr>
<tr>
<td>3</td>
<td>Lenient</td>
<td>2</td>
</tr>
<tr>
<td>3</td>
<td>Strict</td>
<td>1</td>
</tr>
<tr>
<td>2</td>
<td>Lenient</td>
<td>1</td>
</tr>
<tr>
<td>2</td>
<td>Strict</td>
<td>--</td>
</tr>
</tbody>
</table>
HX Data Platform Cluster Tolerated Failures
Understanding System Events

HX Data Platform messages include the error, warning, and informational messages that the system displays during various events. These include HX storage cluster-wide events and events due to changes in HX storage cluster components.

Messages are initiated by activities in the HX storage cluster. They are distributed to assorted locations, including:

- VMware vCenter Events or Alarms pages—Some messages are directed to the vCenter Events and Alarms pages by the HX Data Platform. Some messages that are stored in HyperFlex log files are queried by vCenter and added to the vCenter Events and Alarm pages.

- HX Data Platform Plug-in Monitor > Events tab. See View HX Data Platform Plug-in Events, on page 92.

- HX Data Platform Auto Support (ASUP) system—Auto Support must be enabled to send email notifications. Typically, Auto Support is configured during HX storage cluster creation by configuring the SMTP mail server and adding email recipients.

- Smart Call Home (SCH) notifications—SCH is an automated support capability that offers around-the-clock device monitoring, proactive diagnostics, real-time email alerts, service ticket notifications, and remediation recommendations for critical system events on your HX storage clusters.
HX Connect user interface—In the header, the bell icon displays an alarm count of your current errors or warnings. If there are both errors and warnings, the count shows the number of errors. For more detailed information, see the Alarms page or the Events page in the HX Connect user interface.

**View HX Data Platform Plug-in Events**

The Monitor Events tab displays information about the state changes of the HX storage cluster. Events include user actions and system actions that occur on the HX storage cluster, hosts, or datastores. For example, adding a node to the HX storage cluster, removing a node from the HX storage cluster, or reconfiguring a VM resource.

You can perform the following tasks in the Events tab:

- Select an event to display the event details at the bottom of the tab.
- Use the filter controls above the list to filter the list. For example, type *memory* to display a subset of events.
- Click a column heading to sort the list.

**Procedure**

From the vSphere Web Client Navigator, select **vCenter Inventory Lists** > **Cisco HyperFlex** > **Systems** > **Cisco HX Data Platform** > **cluster** > **Monitor** > **Events**. You have the following fields:

<table>
<thead>
<tr>
<th>Field</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Description</strong></td>
<td>Event message content. See the section for each event type.</td>
</tr>
<tr>
<td><strong>Type</strong></td>
<td>Type of message.</td>
</tr>
<tr>
<td><strong>Date Time</strong></td>
<td>Timestamp when the event occurred. Time is displayed in local browser time, calculated from UTC.</td>
</tr>
<tr>
<td><strong>Target</strong></td>
<td>Name of the target. Target type options include: storage cluster, host, datastore, or disk.</td>
</tr>
<tr>
<td><strong>User</strong></td>
<td>Consumer of the resource for the event.</td>
</tr>
<tr>
<td><strong>VC Cluster Events</strong></td>
<td>Link to vSphere storage cluster Events.</td>
</tr>
<tr>
<td><strong>Event Detail</strong></td>
<td>Same content for the event as the Event table.</td>
</tr>
<tr>
<td><strong>Target link</strong></td>
<td>The Target object in the Event detail links to the vSphere target Summary page. For example, the HX storage cluster Summary page or node Summary page.</td>
</tr>
</tbody>
</table>
Disk Events

### DiskAddedEvent

<table>
<thead>
<tr>
<th>Description Trigger</th>
<th>Cluster State</th>
<th>Reported vCenter</th>
<th>Reported HXDP Plug-in</th>
<th>Reported ASUP</th>
<th>Reported SCH</th>
<th>Action</th>
</tr>
</thead>
<tbody>
<tr>
<td>You added a new disk.</td>
<td>Event</td>
<td>Yes</td>
<td></td>
<td>None</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### DiskRemovedEvent

<table>
<thead>
<tr>
<th>Description Trigger</th>
<th>Cluster State</th>
<th>Reported vCenter</th>
<th>Reported HXDP Plug-in</th>
<th>Reported ASUP</th>
<th>Reported SCH</th>
<th>Action</th>
</tr>
</thead>
<tbody>
<tr>
<td>You either physically removed a disk or it became offline.</td>
<td>Event and Alarm</td>
<td>Yes</td>
<td></td>
<td>Replace the disk.</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### DiskFailedEvent

<table>
<thead>
<tr>
<th>Description Trigger</th>
<th>Cluster State</th>
<th>Reported vCenter</th>
<th>Reported HXDP Plug-in</th>
<th>Reported ASUP</th>
<th>Reported SCH</th>
<th>Action</th>
</tr>
</thead>
<tbody>
<tr>
<td>A disk failed.</td>
<td>Event and Alarm</td>
<td></td>
<td></td>
<td>Replace the disk.</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### DiskPhysicalAddedEvent

<table>
<thead>
<tr>
<th>Description Trigger</th>
<th>Cluster State</th>
<th>Reported vCenter</th>
<th>Reported HXDP Plug-in</th>
<th>Reported ASUP</th>
<th>Reported SCH</th>
<th>Action</th>
</tr>
</thead>
<tbody>
<tr>
<td>A disk was added to the storage cluster.</td>
<td>Event and Alarm</td>
<td></td>
<td></td>
<td>None.</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### DiskPhysicalRemovedEvent

<table>
<thead>
<tr>
<th>Description Trigger</th>
<th>Cluster State</th>
<th>Reported vCenter</th>
<th>Reported HXDP Plug-in</th>
<th>Reported ASUP</th>
<th>Reported SCH</th>
<th>Action</th>
</tr>
</thead>
<tbody>
<tr>
<td>A disk was removed from the storage cluster.</td>
<td>Event and Alarm</td>
<td></td>
<td></td>
<td>Replace the disk.</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### DiskHardBlacklistedEvent
<table>
<thead>
<tr>
<th>Description Trigger</th>
<th>Cluster State</th>
<th>Reported vCenter</th>
<th>Reported HXDP Plug-in</th>
<th>Reported ASUP</th>
<th>Reported SCH</th>
<th>Action</th>
</tr>
</thead>
<tbody>
<tr>
<td>A disk has failed permanently.</td>
<td>Event and Alarm</td>
<td>Yes</td>
<td>Yes</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**DiskRepairingEvent**

<table>
<thead>
<tr>
<th>Description Trigger</th>
<th>Cluster State</th>
<th>Reported vCenter</th>
<th>Reported HXDP Plug-in</th>
<th>Reported ASUP</th>
<th>Reported SCH</th>
<th>Action</th>
</tr>
</thead>
<tbody>
<tr>
<td>A disk is being repaired.</td>
<td>Event</td>
<td>Yes</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**DiskRepairSucceededEvent**

<table>
<thead>
<tr>
<th>Description Trigger</th>
<th>Cluster State</th>
<th>Reported vCenter</th>
<th>Reported HXDP Plug-in</th>
<th>Reported ASUP</th>
<th>Reported SCH</th>
<th>Action</th>
</tr>
</thead>
<tbody>
<tr>
<td>A disk was successfully repaired.</td>
<td>Event</td>
<td>Yes</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

## Cluster Events

### ClusterAddedEvent

<table>
<thead>
<tr>
<th>Description</th>
<th>Cluster State</th>
<th>Reported vCenter</th>
<th>Reported HXDP Plug-in</th>
<th>Reported ASUP</th>
<th>Reported SCH</th>
<th>Action</th>
</tr>
</thead>
<tbody>
<tr>
<td>New storage cluster has been added.</td>
<td>Online</td>
<td>Event</td>
<td></td>
<td></td>
<td></td>
<td>None.</td>
</tr>
</tbody>
</table>

### ClusterCapacityChangedEvent
<table>
<thead>
<tr>
<th>Description</th>
<th>Cluster State</th>
<th>Reported vCenter</th>
<th>Reported HXDP Plug-in</th>
<th>Reported ASUP</th>
<th>Reported SCH</th>
<th>Action</th>
</tr>
</thead>
<tbody>
<tr>
<td>Effective physical capacity was changed with addition or removal of disks or nodes.</td>
<td>Online</td>
<td>Event</td>
<td></td>
<td>Yes</td>
<td></td>
<td>See Cisco HyperFlex Data Platform Administration Guide for information about managing the HX storage cluster.</td>
</tr>
</tbody>
</table>

**ClusterHealthCriticalEvent**

<table>
<thead>
<tr>
<th>Description</th>
<th>Cluster State</th>
<th>Reported vCenter</th>
<th>Reported HXDP Plug-in</th>
<th>Reported ASUP</th>
<th>Reported SCH</th>
<th>Action</th>
</tr>
</thead>
<tbody>
<tr>
<td>There are three simultaneous non-collocated HDD or SSD, or node failures.</td>
<td>Offline</td>
<td>Event and Alarm</td>
<td></td>
<td></td>
<td></td>
<td>See Cisco HyperFlex Data Platform Administration Guide for information about managing the HX storage cluster.</td>
</tr>
</tbody>
</table>

**ClusterHealthNormalEvent**

<table>
<thead>
<tr>
<th>Description</th>
<th>Cluster State</th>
<th>Reported vCenter</th>
<th>Reported HXDP Plug-in</th>
<th>Reported ASUP</th>
<th>Reported SCH</th>
<th>Action</th>
</tr>
</thead>
<tbody>
<tr>
<td>The system recovers from HDD or SSD, or node failure. Or You replaced failed resources.</td>
<td>Online</td>
<td>Event</td>
<td></td>
<td>Yes</td>
<td></td>
<td>None.</td>
</tr>
</tbody>
</table>

**ClusterOnlineEvent**
### Cluster Events

<table>
<thead>
<tr>
<th>Description</th>
<th>Cluster State</th>
<th>Reported vCenter</th>
<th>Reported HXDP Plug-in</th>
<th>Reported ASUP</th>
<th>Reported SCH</th>
<th>Action</th>
</tr>
</thead>
<tbody>
<tr>
<td>You created the storage cluster successfully.</td>
<td>Online</td>
<td>Event</td>
<td></td>
<td>Yes</td>
<td></td>
<td>See Cisco HyperFlex Data Platform Administration Guide for information about managing the HX storage cluster.</td>
</tr>
</tbody>
</table>

#### ClusterReadOnlyEvent

<table>
<thead>
<tr>
<th>Description</th>
<th>Cluster State</th>
<th>Reported vCenter</th>
<th>Reported HXDP Plug-in</th>
<th>Reported ASUP</th>
<th>Reported SCH</th>
<th>Action</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cluster transitions to ReadOnly mode.</td>
<td>ReadOnly</td>
<td>Event and Alarm</td>
<td></td>
<td>Yes</td>
<td>Yes</td>
<td>See Cisco HyperFlex Data Platform Administration Guide for information about managing the HX storage cluster. If ASUP enabled, TAC ticket created.</td>
</tr>
</tbody>
</table>

#### ClusterReadyEvent

<table>
<thead>
<tr>
<th>Description</th>
<th>Cluster State</th>
<th>Reported vCenter</th>
<th>Reported HXDP Plug-in</th>
<th>Reported ASUP</th>
<th>Reported SCH</th>
<th>Action</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cluster is online and serving I/Os. NFS datastores are reachable.</td>
<td>Online</td>
<td>Event</td>
<td></td>
<td></td>
<td></td>
<td>None</td>
</tr>
</tbody>
</table>

#### ClusterShutdownEvent
### ClusterUnhealthyEvent

<table>
<thead>
<tr>
<th>Description</th>
<th>Cluster State</th>
<th>Reported vCenter</th>
<th>Reported HXDP Plug-in</th>
<th>Reported ASUP</th>
<th>Reported SCH</th>
<th>Action</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cluster is unhealthy.</td>
<td>Online</td>
<td>Event and Alarm</td>
<td></td>
<td>Yes</td>
<td>Yes</td>
<td>See Cisco HyperFlex Data Platform Administration Guide for information about managing the HX storage cluster.</td>
</tr>
</tbody>
</table>

### Node Events

#### NodeJoinedEvent

<table>
<thead>
<tr>
<th>Description</th>
<th>Cluster State</th>
<th>Reported vCenter</th>
<th>Reported HXDP Plug-in</th>
<th>Reported ASUP</th>
<th>Reported SCH</th>
<th>Action</th>
</tr>
</thead>
<tbody>
<tr>
<td>A new node joined the storage cluster.</td>
<td>Event</td>
<td>ASUP</td>
<td></td>
<td>None.</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

#### NodePoweredDownEvent
Rebalancing Events

The following table describes storage cluster events triggered by your actions or the system actions, the storage cluster state during these events, and troubleshooting actions.

<table>
<thead>
<tr>
<th>Event Name</th>
<th>Description</th>
<th>Reported Location</th>
<th>Action</th>
</tr>
</thead>
<tbody>
<tr>
<td>ClusterRebalanceInitiatedEvent</td>
<td>Data rebalancing was initiated.</td>
<td>vCenter Event, ASUP</td>
<td>None</td>
</tr>
<tr>
<td>ClusterRebalanceFailedEvent</td>
<td>A storage cluster rebalance failed.</td>
<td>vCenter Event, ASUP</td>
<td>See Managing Storage Clusters, on page 13</td>
</tr>
<tr>
<td>ClusterRebalanceCompletedEvent</td>
<td>Data rebalancing has completed.</td>
<td>vCenter Event, ASUP</td>
<td>None</td>
</tr>
</tbody>
</table>

Cluster Access Policy Compliance Events

ClusterPolicyComplianceDegradedEvent
<table>
<thead>
<tr>
<th>Description</th>
<th>Cluster State</th>
<th>Reported vCenter</th>
<th>Reported HXDP Plug-in</th>
<th>Reported ASUP</th>
<th>Reported SCH</th>
<th>Action</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cluster access compliance has degraded.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>See Cisco HyperFlex Data Platform Administration Guide for information about managing the HX storage cluster.</td>
</tr>
<tr>
<td>ClusterPolicyComplianceFailedEvent</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>See Cisco HyperFlex Data Platform Administration Guide for information about managing the HX storage cluster.</td>
</tr>
<tr>
<td>Cluster access compliance has failed.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>See Cisco HyperFlex Data Platform Administration Guide for information about managing the HX storage cluster.</td>
</tr>
<tr>
<td>Cluster access compliance has improved.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>None.</td>
</tr>
<tr>
<td>Cluster access compliance is satisfied.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>None.</td>
</tr>
</tbody>
</table>

**Snapshot Events**

**ScheduledSnapshotVMReachedMaxLimitEvent**
### Space Utilization Events

This section describes the messages that appear related to the space used by the storage cluster.

**Note**

When you add more nodes to the storage cluster, the HX Data Platform plug-in does not immediately reflect the storage cluster capacity.
### SpaceAlertEvent

<table>
<thead>
<tr>
<th>Trigger</th>
<th>Cluster State</th>
<th>Reported vCenter</th>
<th>Reported HXDP Plug-in</th>
<th>Reported ASUP</th>
<th>Reported SCH</th>
<th>Action</th>
</tr>
</thead>
<tbody>
<tr>
<td>Space capacity usage remains at error level. This alert is issued after storage capacity has been reduced, but is still above the warning threshold. The overall cluster storage capacity consumed is beyond the healthy threshold. The storage cluster is online and can perform write operations. HX Summary Health bar: Orange</td>
<td>Online</td>
<td>Event and Alarm</td>
<td>Event</td>
<td></td>
<td></td>
<td>Add storage or delete files. Continue to reduce the amount of storage capacity used, until it is below the warning threshold.</td>
</tr>
</tbody>
</table>

### SpaceCriticalEvent

<table>
<thead>
<tr>
<th>Trigger</th>
<th>Cluster State</th>
<th>Reported vCenter</th>
<th>Reported HXDP Plug-in</th>
<th>Reported ASUP</th>
<th>Reported SCH</th>
<th>Action</th>
</tr>
</thead>
<tbody>
<tr>
<td>Space capacity usage is at error level. The cluster storage is full and offline. Your system has exceeded the functional amount of allocated capacity. The storage cluster transitions to read-only mode. It does not accept any write operations. This is a critical threshold. The system triggers a Critical alarm in vCenter. HX Summary Health bar: Red</td>
<td>ReadOnly</td>
<td>Event and Alarm</td>
<td>Event</td>
<td>Yes</td>
<td>Yes</td>
<td>Add storage or delete files. Reduce the amount of storage capacity used to below the warning threshold. Reclaimed space released after deleting files within few hours of deletion, based on system workload. The storage controller VM monitors and reclains space until the system becomes operational (transitions out of read-only state).</td>
</tr>
</tbody>
</table>

### SpaceRecoveredEvent
### Understanding System Events

#### Space Utilization Events

<table>
<thead>
<tr>
<th>Trigger</th>
<th>Cluster State</th>
<th>Reported vCenter</th>
<th>Reported HXDP Plug-in</th>
<th>Reported ASUP</th>
<th>Reported SCH</th>
<th>Action</th>
</tr>
</thead>
<tbody>
<tr>
<td>Used capacity is below the warning threshold. Usage is back to normal.</td>
<td>Online</td>
<td>Event</td>
<td>Yes</td>
<td>None.</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**HX Summary Health bar:** Blue

#### SpaceWarningEvent

<table>
<thead>
<tr>
<th>Trigger</th>
<th>Cluster State</th>
<th>Reported vCenter</th>
<th>Reported HXDP Plug-in</th>
<th>Reported ASUP</th>
<th>Reported SCH</th>
<th>Action</th>
</tr>
</thead>
<tbody>
<tr>
<td>Space capacity usage is at error level. This is the first level warning you are approaching a critical state. The overall cluster storage capacity consumed is beyond the healthy threshold. This is a warning threshold. The system triggers an Error alarm in vCenter. The storage cluster can perform write operations.</td>
<td>Online</td>
<td>Alarm</td>
<td>Event</td>
<td>Yes</td>
<td>Yes</td>
<td>Add storage or delete files. Do not continue the storage cluster operations until you reduce the amount of storage capacity used to below this warning threshold.</td>
</tr>
</tbody>
</table>

**HX Summary Health bar:** Yellow

#### VirtualSpaceWarnEvent

<table>
<thead>
<tr>
<th>Trigger</th>
<th>Cluster State</th>
<th>Reported vCenter</th>
<th>Reported HXDP Plug-in</th>
<th>Reported ASUP</th>
<th>Reported SCH</th>
<th>Action</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cluster virtual usage is above warning threshold.</td>
<td>Event and Alarm</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

#### VirtualSpaceWarnClearEvent

<table>
<thead>
<tr>
<th>Trigger</th>
<th>Cluster State</th>
<th>Reported vCenter</th>
<th>Reported HXDP Plug-in</th>
<th>Reported ASUP</th>
<th>Reported SCH</th>
<th>Action</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cluster virtual space usage is back to normal.</td>
<td>Event</td>
<td>Yes</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Reclaiming Space Events

The HX Data Platform system reclaims space released for storage cluster capacity events as follows.

**SpaceCriticalEvent**

<table>
<thead>
<tr>
<th>Description</th>
<th>Cluster State</th>
<th>Reported vCenter</th>
<th>Reported HXDP Plugin</th>
<th>Reported ASUP</th>
<th>Action</th>
</tr>
</thead>
<tbody>
<tr>
<td>Reclaims space released after deleting files within few hours of deletion, based on system workload. The storage controller VM monitors and reclaims space until the system becomes operational (transitions out of read-only state).</td>
<td>ReadOnly</td>
<td></td>
<td></td>
<td></td>
<td>None.</td>
</tr>
</tbody>
</table>

**Upgrade Events**

**ClusterUpgradeCompletedEvent**

<table>
<thead>
<tr>
<th>Trigger</th>
<th>Cluster State</th>
<th>Reported vCenter</th>
<th>Reported HXDP Plug-in</th>
<th>Reported ASUP</th>
<th>Reported SCH</th>
<th>Action</th>
</tr>
</thead>
<tbody>
<tr>
<td>The storage cluster upgraded successfully.</td>
<td>Online</td>
<td>Event</td>
<td></td>
<td>Yes</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**ClusterUpgradeFailedEvent**

<table>
<thead>
<tr>
<th>Trigger</th>
<th>Cluster State</th>
<th>Reported vCenter</th>
<th>Reported HXDP Plug-in</th>
<th>Reported ASUP</th>
<th>Reported SCH</th>
<th>Action</th>
</tr>
</thead>
<tbody>
<tr>
<td>One or more nodes in the storage cluster failed to upgrade.</td>
<td>Offline</td>
<td>Event</td>
<td></td>
<td>Yes</td>
<td></td>
<td>See TAC</td>
</tr>
</tbody>
</table>

**ClusterUpgradeStartedEvent**

<table>
<thead>
<tr>
<th>Trigger</th>
<th>Cluster State</th>
<th>Reported vCenter</th>
<th>Reported HXDP Plug-in</th>
<th>Reported ASUP</th>
<th>Reported SCH</th>
<th>Action</th>
</tr>
</thead>
<tbody>
<tr>
<td>You started the storage cluster upgrade process from the CLI.</td>
<td>Online</td>
<td>Event</td>
<td></td>
<td>Yes</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
### NodeUpgradeCompletedEvent

<table>
<thead>
<tr>
<th>Trigger</th>
<th>Cluster State</th>
<th>Reported vCenter</th>
<th>Reported HXDP Plug-in</th>
<th>Reported ASUP</th>
<th>Reported SCH</th>
<th>Action</th>
</tr>
</thead>
<tbody>
<tr>
<td>Node upgrade for <em>node_ID</em> completed successfully. <em>node_ID</em> is the ID of the node that appears in the message.</td>
<td>Online</td>
<td>Event</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### NodeUpgradeFailedEvent

<table>
<thead>
<tr>
<th>Trigger</th>
<th>Cluster State</th>
<th>Reported vCenter</th>
<th>Reported HXDP Plug-in</th>
<th>Reported ASUP</th>
<th>Reported SCH</th>
<th>Action</th>
</tr>
</thead>
<tbody>
<tr>
<td>Node upgrade for <em>node_ID</em> failed. <em>node_ID</em> is the ID of the node that appears in the message.</td>
<td>Degraded</td>
<td>Event and Alarm</td>
<td></td>
<td></td>
<td></td>
<td>See TAC.</td>
</tr>
</tbody>
</table>

### NodeUpgradeStartedEvent

<table>
<thead>
<tr>
<th>Trigger</th>
<th>Cluster State</th>
<th>Reported vCenter</th>
<th>Reported HXDP Plug-in</th>
<th>Reported ASUP</th>
<th>Reported SCH</th>
<th>Action</th>
</tr>
</thead>
<tbody>
<tr>
<td>You started the node upgrade process from the CLI.</td>
<td>Degraded</td>
<td>Event</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

## Critical Infrastructure Events

### CriticalInfraComponentEvent

<table>
<thead>
<tr>
<th>Description</th>
<th>Cluster State</th>
<th>Reported vCenter</th>
<th>Reported HXDP Plug-in</th>
<th>Reported ASUP</th>
<th>Reported SCH</th>
<th>Action</th>
</tr>
</thead>
<tbody>
<tr>
<td>Information message when controller VM fails or is shutdown.</td>
<td>Offline</td>
<td>Event and Alarm</td>
<td></td>
<td>Yes</td>
<td>Yes</td>
<td>See TAC.</td>
</tr>
</tbody>
</table>
Chapter 12

Troubleshooting

- Common TAC-Assisted Support Topics, on page 105
- Cisco HX Data Platform Support Bundles, on page 106
- Host Issues, on page 112
- Disk Issues, on page 114
- VM Issues, on page 116
- Capacity Issues, on page 118
- Datastore Issues, on page 119
- ReadyClone and Snapshot Issues, on page 123

Common TAC-Assisted Support Topics

The following is a brief list of support topics that are best handled with Technical Assistance Center (TAC) assistance:

- Adding disks to a node in the HX storage cluster fails to be recognized.
- Adding a node to the HX storage cluster fails.
- Changing the IP address for the HX storage cluster.
- Destroying a cluster, including destroying an encrypted cluster.
- Downgrading the HX Data Platform version.
- Failing HX storage cluster creation.
- Modifying a node rebalance timeout.
- Modifying VDI or VSI optimized deployment for the HX storage cluster.
- Removing a node in a 3-node cluster.
- Replacing a node in a 4-node cluster.
- Replacing a housekeeping SSD on HX240c servers.
- Reusing a removed node in another HX storage cluster.
- Reusing disks from a removed node.
- Setting the cleaner schedule for recovering storage.
• Setting the MTU value to something other than 9000.
• Sizing guidance for using non-default larger capacity SSD or HDD per server is supported.
• Uninstalling the HX Data Platform.
• Uninstalling the HX storage cluster.
• Upgrading the HX Data Platform from a version older than HX Data Platform version 1.7.1.
• Using the stcli commands whitelist or recreate.

Cisco HX Data Platform Support Bundles

You can generate a support bundle through command line interface or the vCenter Web Client. The command line option is much faster than traditional log collection through the vCenter Web Client.

Through the HX Connect user interface, you can also generate a support bundle that collects the logs from every controller VM and ESXi host in the HX storage cluster. The vCenter logs are not collected through HX Connect.

All support bundle timestamps are listed in the UTC timezone regardless of cluster timezone or server timezone settings.

After you generate a support bundle, you can upload it to the HX Data Platform FTP server for use by TAC. You can also download an existing support bundle.

Collecting Logs from Controller VMs

There are two options for collecting controller VM logs.

Procedure

**Step 1**

**Option 1**

a) Log in to each controller VM using ssh.
b) Run the command: stofs-support

Generating the logs takes about 2 minutes.
c) Locate the tar.gz log file in the /var/support directory. For example:

    stofs-support_2016-06-22--06-06-33_ucs--stctlvm-123-1.eng.storvisor.com.tar.gz
d) Upload the tar.gz file from the controller VM to the HX Data Platform FTP server.

**Step 2**

**Option 2**

a) Log in to each controller VM using ssh.
b) Run the command: asupcli post --type asup
c) If Smart Call Home is disabled, the tar.gz file that is generated can be found in the /var/support/asup_default directory.

This file also contains the log from the respective ESXi host.
d) Upload the tar.gz file from the controller VM to the HX Data Platform FTP server.

---

**Collecting Logs from ESXi Hosts**

There are two options for collecting ESXi host logs.

**Procedure**

**Step 1**  
**Option 1**

a) Log in to each ESXi host using ssh.

b) Run the command: `vm-support`

Generating the logs takes about 5 minutes.

c) Locate the .tgz file in the /var/tmp directory. For example:

```
esx-localhost-2016-06-22--06.09.tgz
```

d) Upload the .tgz file from the ESXi host to the HX Data Platform FTP server.

**Step 2**  
**Option 2**

a) Log in to each controller VM using ssh.

b) Run the command: `asupcli collect --type esx --subtype full`

c) Upload the tar.gz file in the /var/support/esx-asup-default directory from each controller VM to the HX Data Platform FTP server.

The tar.gz file contains only ESXi logs. If TAC requested all logs, see Collecting Logs from Controller VMs, on page 106.

---

**Collecting Deployment Logs from the Cisco HX Data Platform Installer VM**

**Procedure**

**Step 1**  
Log in to the HX Data Platform Installer VM using ssh and the following credentials:

- Username: root
- Password: Cisco123

**Step 2**  
Run the command: `deployment-support`

Generating the logs takes less than a minute.

**Step 3**  
Locate the tar.gz logs in the /var/support directory. For example:

```
storfs-support_2016-06-22--06-25-35_Cisco-HX-Data-Platform-Installer.tar.gz
```
Step 4  Upload the .tar.gz file to the Cisco FTP server.

Collecting Logs from the vCenter Server

Procedure

Step 1  Log in to the vCenter server using ssh.
Step 2  Run the command: vc-support -l
        Generating the logs takes about 10-20 minutes depending on the number of nodes that are running in the vCenter server.
Step 3  Locate the logs in the /storage/log directory.
Step 4  Upload the logs to the Cisco FTP server.

Out of Space Error When Generating a Support Bundle

An out of space error occurs when the storage controller VM does not have sufficient space left to generate the support bundle, typically due to the size of the core file or previously-generated log files consuming space.

The following error displays when you are using the `vm-support` command to generate support bundles:

```
error = [Errno 28] No space left
```

To generate a support bundle when you receive this error:

Procedure

Step 1  Delete or move the core file and existing log files to a location outside of the storage controller VM.
Step 2  Log in to the command line of the storage controller VM.
Step 3  Generate a light support bundle.

```
# storfs-support
```

Collecting Logs from vSphere Web Client

You can selectively collect all or some of the logs for the Cisco HX Data Platform storage cluster ESXi hosts, controller VMs, and vCenter server through the vSphere Web Client.
Procedure

Step 1 Log in to the vSphere Web Client. Through the Navigator, select vCenter Inventory Lists > Resources > vCenter Servers > server.

Step 2 Right-click the vCenter server for the HX Data Platform cluster and select Export System Logs.

Step 3 From the Source panel, select the servers from which you want to collect the logs.

Step 4 Optionally, to include the vCenter logs, select Include vCenter Server and vSphere Web Client logs, and click Next.

Step 5 From the Ready to Complete panel, select the system logs to include.

Select Virtual Machines to ensure the logs from the controller VMs for each selected server are included.

Step 6 Click Generate Log Bundle.

Generating the logs takes about 40-50 minutes.

Step 7 When the logs are completed:

a) Click Download Log Bundle.

b) Specify a location to download the support bundle. For example, download the files to your local PC.

c) Click Finish.

d) Upload the files to the Cisco FTP server.

Collecting Logs from the Cisco HX Data Platform Plug-in

You can use the HX Data Platform Plug-in to collect the logs for just the HX storage cluster ESXi hosts and controller VMs.

Procedure

Step 1 Log in to vSphere Web Client. Through the Navigator, select vCenter Inventory Lists > Resources > Clusters > cluster.

Step 2 Right-click an HX Data Platform cluster and select Cisco HX Data Platform > Support.

Step 3 Click Generate Log Bundle.

Generating the logs takes about 40-50 minutes.

Step 4 When the logs are completed:

a) Click Download Log Bundle.

b) Specify a location to download the support bundle. For example, download the files to your local PC.

c) Click Finish.

d) Upload the files to the Cisco FTP server.
Downloading an Existing Support Bundle

Note
You can download a support bundle you generate up to midnight (12:00 a.m.) of the local controller VM time. After midnight, the system deletes the support bundle.

Procedure

Step 1
Log in to vSphere Web Client. Through the Navigator, select vCenter Inventory Lists > Resources > Clusters.

Step 2
Right-click the cluster and select HX Data Platform Plug-in > Support to display the Support dialog box.

Note: Select the cluster from the vSphere Web Client, not the HX Data Platform Plug-in.

Step 3
Click Download Support Bundle (enabled).

Step 4
Specify a download location (such as your local computer) to save the support bundle. You can then upload the file to the HX Data Platform FTP server.

Uploading Support Bundles

After you generate a support bundle, you can upload it to the HX Data Platform FTP server using one of the following methods:

- ftp—Use port 21.
- sftp—Use port 22.
- https—Use port 443.

Uploading Support Bundles using ftp or sftp

Before you begin
Generate a support bundle.

Procedure

Step 1
Open your FTP Client (such as Filezilla) and connect to the HX Data Platform FTP server using the following information:

<table>
<thead>
<tr>
<th>Option</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Host</td>
<td><a href="https://ftp.springpathinc.com">https://ftp.springpathinc.com</a></td>
</tr>
<tr>
<td>Port</td>
<td>ftp = 21</td>
</tr>
</tbody>
</table>
### Uploading Support Bundle using sftp

**Before you begin**
Create the support bundle.

**Procedure**

**Step 1** Open Your FTP Client (such as Filezilla) and connect to HX Data Platform FTP server using the following information
- **host**: https://ftp.springpathinc.com
- **port**: 22
- **username**: cisco
- **password**: cisco

**Step 2** After you connect to HX Data Platform FTP server, create a folder with the Support case number.

**Step 3** Change directory to the new folder.

**Step 4** Upload the support bundle log files to this folder.

**Step 5** When the uploads are complete, contact Cisco Technical Assistance Center (TAC) and tell them the upload directory name.

**Step 6** Free up space in your HX storage cluster by deleting the content in /var/support/.
Uploading Support Bundles using https

Before you begin
Generate a support bundle.

Procedure

---

**Step 1**
Open a browser window, navigate to the HX Data Platform FTP server URL hosted by Springpath, and log in using the following information:

<table>
<thead>
<tr>
<th>Option</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Username</td>
<td>cisco</td>
</tr>
<tr>
<td>Password</td>
<td>cisco</td>
</tr>
</tbody>
</table>

**Step 2**
After you connect to the HX Data Platform FTP server, create a folder with the Support case number.

**Step 3**
Change directory to the new folder.

**Step 4**
Upload the support bundle log files to this folder.

**Step 5**
When the uploads are complete, contact Cisco Technical Assistance Center (TAC) and tell them the upload directory name.

**Step 6**
Free up space in your HX storage cluster by deleting the content in /var/support/.

---

Host Issues

Two Nodes Fail Simultaneously Causes the Storage Cluster to Shutdown

**Description**
In a 5+ node cluster, if two nodes are down, for example, one host is in maintenance mode and another host has the storage controller VM shutdown, the storage cluster might shutdown. This might result in an all paths down (APD) state.

**Workaround**

**Procedure**

---

**Step 1**
Restart the storage cluster. From the command line of any storage controller VM in the storage cluster.

```
stcli cluster start
```

**Step 2**
Wait for the cluster to restart and rebalance.
**Step 3**
The storage cluster becomes healthy automatically.

---

**Remove Node Fails when a Node is Down.**

**Description**
Remove node is not allowed if only 3 nodes are up.

**Action: Add a replacement node first**
Replacing a node in a 3 node cluster requires TAC assistance. If failed nodes reduce the cluster to 3 nodes, replacing the node requires TAC assistance.

---

**Rebooting an HA Enabled ESX Host**

**Description**
If you enable HA on a host in the storage cluster that the system cannot access, then when you reboot the ESX host, the storage controller VM is powered off.

This is an artifact of interactions between how VMware handles HA failures and ESX Agent Manager (EAM) configurations. It might cause storage controller VMs to not power on after recovery.

**Action: Power on the storage controller VM on an HA enabled ESX host**

**Procedure**

**Step 1**
Reconfigure HA on the host on which it initially failed.

**Step 2**
Manually power on the storage controller VM.

---

**Node Failure While Simultaneously Adding Another Node to Cluster**

**Description**
When you add a node to an existing storage cluster, the storage cluster continues to have the same HA resiliency as the originating storage cluster until a rebalance completes.

For example, if you have a 3 node storage cluster and you add 2 converged nodes to the storage cluster. Until rebalance completes, the storage cluster behaves as a 3 node storage cluster and not a 5 node storage cluster. So, if a node fails before rebalance completes, the storage cluster status is degraded.

Rebalances typically occur per the 24 hour rebalance schedule, two hours after a node fails, or if the storage cluster is out of space.

**Action: Manually initiate storage cluster rebalance**

**Procedure**

**Step 1**
From a storage controller VM command line.
Controller VM Did Not Power On When Host Powered On

Description
When a host in a storage cluster is powered off, the storage controller VM is also powered off. When the host is powered on again, the storage controller VM sometimes does not automatically power back on.

Action: Manually power on the storage controller VM from the host command line
1. Identify the controller VM. Login to the ESX host and run the command.
   \[
   \# \text{vim-cmd vmsvc/getallvms}
   \]
2. Power on the controller VM
   \[
   \# \text{vim-cmd vmsvc/power.on <vmid_of_controller_vm>}
   \]

Disk Issues

Cannot Allocate Data when All or Most Disks Fail on a Node in a 3 Node Storage Cluster

Description
If all the hard disks on a node fail, HX Data Platform cannot allocate data to the node. If this occurs in a 3 node storage cluster, HX Data Platform cannot maintain the three minimum copies of data required to maintain data integrity. The result is a virtual ENOSPC state.

If up to a few hard disks on a node fail, the storage cluster becomes imbalanced as it attempts to write to the node and consumes the space on the remaining disks. For example, if there were 10 HDDs on all three nodes, and 9 of the HDDs fail on the third node, the imbalance results as the disk on the third node restricts the cluster size to 10% of the actual cluster size. This is a physical ENOSPC state. This might also cause an all paths down (APD) state.

Action: Physically balance the storage on all the nodes in the storage cluster

Procedure

Step 1 Replace the damaged disks with good disks.
Step 2 Add another node to the storage cluster.
Step 3 Adjust the storage capacity of the nodes to ensure they match.
Step 4 If the storage cluster does not automatically recover, you might need to restart the storage cluster.
Removing Disks Causes Rebooting Storage Controller VM to Fail

Description
If you removed disks, then rebooted the storage controller VM host before an automatic rescan could complete, the storage controller VM might not power on.

Action: Power on the storage controller VM after removing disks

Procedure

Step 1  Ensure storage controller VM is powered off.
Step 2  Run the script.
        /opt/springpath/support/rescanLuns.sh
Step 3  Power on the storage controller VM.

Recover Failed SSD on Storage Controller VM

Description
If the SSD hosting the storage controller VM fails, it must be recovered.

Action: Recover the failed SSD

Procedure

Step 1  Log in to the command line of the host with the failed SSD.
Step 2  Verify the status of the SSD is dead timeout.
        esxcli storage core device list -d SSD_ID | grep 'Status:'
        Status: dead timeout
Step 3  Kill the vmx of the storage controller VM.
        ps | grep vmx | grep -i stCtlvm
        kill -9 process_id_of_controller_vm
### Troubleshooting

#### VM Issues

**Degraded Performance on VM with Disk Limit Shares**

**Description**
Powered on VM with disk limit shares set, degrades the performance on the respective datastore.

**Action:** Per VMware expected behavior.

**Procedure**

<table>
<thead>
<tr>
<th>Step 1</th>
<th>Disable the mclock scheduler.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Step 2</td>
<td>Move to the default scheduler.</td>
</tr>
</tbody>
</table>

**DRS Migrates VMs when Storage Cluster in Read Only State**

**Description**
When a storage cluster is in Read Only state, the VMware DRS process migrates VMs to datastores even though they are also in the Read Only storage cluster. The result is the VMs do not start.

**Action:** Manually disable DRS when storage cluster in Read Only state.

**Procedure**

<table>
<thead>
<tr>
<th>Step 1</th>
<th>Select the HX Data Platform storage cluster.</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>From the vSphere Web Client Navigator, select <strong>vCenter Inventory Lists &gt; vCenter Inventory Lists &gt; Cisco HyperFlex Systems &gt; Cisco HX Data Platform &gt; cluster.</strong></td>
</tr>
<tr>
<td>Step 2</td>
<td>Select Summary tab, then click the VC Cluster link to toggle to the <strong>vCenter Summary</strong> tab. Click <strong>Manage &gt; Services &gt; vSphere DRS</strong>. Click <strong>Edit</strong>, then uncheck <strong>Turn ON vSphere DRS</strong> and click <strong>OK</strong>.</td>
</tr>
</tbody>
</table>
VM Power On Fails Due to Stale EAM Extension

Description
If you have partially installed or uninstalled HX Data Platform, sometimes a stale ESX Agent Manager (EAM) for the HX Data Platform extension remains. This can prevent virtual machines from powering on after a completed HX Data Platform installation. Remove stale extensions using the Managed Object Browser (MOB) extension manager.

Action: Remove stale EAM HX Data Platform extension

Procedure

Step 1 Download the vSphere ESX Agent Manager SDK, if you have not already done so.
Step 2 Remove the datacenter from your vSphere cluster.
Step 3 Login to the vCenter server MOB extension manager.
   a) In a browser, enter the path and command.
      https://vcenter_server/mob/moid=ExtensionManager&doPath=extensionList
   b) Enter the login credentials.
Step 4 Locate the stale storage cluster extension. Scroll through the list to locate the storage cluster extension.
   com.springpath.sysgmt.cluster_uuid
Step 5 Unregister the storage cluster extension.
   a) In a browser, enter the path and command.
      https://vcenter_server/mob/moid=ExtensionManager&method=unregisterExtension
   b) Enter the extension key value, com.springpath.sysgmt.cluster_uuid, and click Invoke Method.
Step 6 Refresh the ExtensionManager tab and verify that the extensionList entry does not include com.springpath.sysgmt.cluster_uuid.
Step 7 Run and complete the HX Data Platform installation.
   For additional options on removing stale EAM extensions, see Technical Assistance Center (TAC).

Deleting VM Folder or File Taking Very Long Time

Description
If user VMs become inaccessible to vSphere and the ESX *.lck files created for those user VMs remain in the file system, then deleting the VM files and/or folders might take a very long time.

Action: Clear ESX server VM lock files

Procedure

Step 1 Locate all the VM lock files in the storage cluster.
# cd /vmfs/volumes/my_datastore
# find . -name .lck* | xargs -n1 rm

**Step 2**
Retry deleting the VM file or folder.

---

## Capacity Issues

### Cluster Capacity Different Than Provisioned

**Description**

Sometimes in the HX Data Platform plug-in, Cluster Capacity in the Summary tab and Provisioned in the Manage tab show a different amount of storage allocated to the storage cluster. This occurs under the following conditions.

- **Cleaner not completed yet.** VMs have been removed, but the cleaner has not been run. The cleaner is an automatic process, after it completes the Cluster Capacity and Provisioned amounts should match. See the Cisco HX Data Platform Command Line Interface Reference guide for information on the cleaner command.

- **Thick provisioning or Thick clones.** If thick disks or clones are created, then HX Data Platform does not reserve the space. A soft reservation is used and datastores show space used, but the space is not used in the storage cluster. This is by design to help administrators with not over-provisioning their datastore.

**Action:** None.

### Capacity Messages Different Between Cluster and Datastore

**Description**

Three scenarios display what appears to be conflicting information.

- vCenter shows the datastore is full, but the HX Data Platform plug-in shows storage cluster capacity is available.

- vCenter shows the datastore has availability, but the HX Data Platform plug-in shows the storage cluster has no space available.

- vCenter and HX Data Platform plug-in show storage cluster usage alerts, but do not show datastore alerts for same amount of usage.

**Background**

Capacity for the storage cluster and for datastores are defined separately. So, messaging relative to each entity is expected to be different.

- **Cluster capacity.** All the storage from all the disks on all the nodes in the storage cluster. This includes uncleaned data and the meta data overhead for each disk.
- **Datastore capacity.** The amount of storage available for provisioning to datastores without over-provisioning. Generally, this is similar to the cleaned storage cluster capacity, but it is not an exact match. It does not include meta data or uncleaned data.

**Action: datastore is full**

If the datastore is full, vCenter can refuse to provision new VMs, clone VMs, or power on VMs. To correct this, choose an option:

1. Increase the size of the datastore using either the HX Data Platform plug-in or the HX Data Platform stcli command line.

2. Reduce the usage:
   1. Delete extra VMs.
   2. Wait for HX Data Platform to cleanup the storage, then check the datastore capacity. This might take some amount of time after you delete the VMs.

**Action: storage cluster has no space**

Datastore availability is tracked by current activity. Cluster availability includes current activity and pending cleanup. This situation typically corrects itself automatically, with the cleanup process. If the storage cluster is out of space and no cleanup is pending, you will need to either add storage or reduce usage by deleting VMs.

**Action: usage alerts different**

No action required. This is expected behavior. Messages are frequently triggered based on a percentage of usage.

For example. If a datastore is allocated 100 TB of storage, the storage cluster has 10 TB of storage, and event message are set for 80% usage. Cluster message will be issued when 8TB of storage are used. Datastore messages would only be issued if 80TB of storage were used.

---

**Datastore Issues**

**NFS All Paths Down with Message File Locked by Consumer on Host**

**Description**

This is a VMware issue related to SIOC. Message similar to the following in the vmkernel.log.

```
2016-02-19T02:03:04.336Z cpu14:34605 opID=c93c14c5)WARNING: NFSLock: 2210: File is being
locked by a consumer on host c220one.ppt.lab.cisco.com with exclusive lock."
```

**Action: Enable/disable or disable/enable "Storage I/O control" on your datastore.**

Procedure

**Step 1**  
From vCenter Datastore view, select *datastore > Configuration > Properties*.

**Step 2**  
Toggle the Storage I/O Control setting.

- a) If the option is unclicked, then click it. If the option is clicked, then unclick it. Click **Close**.
- b) Return the setting to the original state. If the option is now clicked, then unclick it. If the option is now unclicked, then click it. Click **Close**.

This should release the lock.

---

**Mounting Datastore Fails After Changing VLAN ID**

**Description**  
If you change the VLAN ID after you created the storage cluster, mounting a datastore to the storage cluster fails. Also existing datastores can become unmounted from the storage cluster.

**Action:** Reload the ESX server firewall.

See your VMware ESX documentation for directions on reloading an ESX server firewall.

**Datastore fails to mount if data vSwitch has an existing vmkernel port configured with an IP address**

**Description**  
Per VMware configuration requirements, duplicate IP addresses or duplicate rules result in loss of connectivity.

**Action:** Ensure that your traffic is utilizing the intended VMkernel interface.

Configure the following:

- Only one VMkernel port per IP subnet.
  
  If you are using vSphere 5.x, then this does not apply for iSCSI multi-pathing, or multi-NIC vMotion.
- A dedicated non-routable VLAN or dedicated physical switch for vMotion purposes.
- A dedicated non-routable VLAN or dedicated physical switch for IP Storage purposes.
- A dedicated non-routable VLAN or dedicated physical switch for Fault Tolerance purposes.

---

**Changing Datastore Name Through vSphere Web Client**

**Description**  
Changing a datastore name through the vSphere Web Client, changes the host related share name, but does not update the name displayed in the HX Data Platform plug-in.
This is expected behavior. The vSphere name is a label only for the datastore mount point. It does not affect the storage cluster datastore functionality. The name listed through the HX Data Platform plug-in is the datastore name, not the mount point name.

**Action:** Change datastore name in HX Data Platform plug-in

If you want to change the datastore name to have it sync with the datastore mount point name.

**Procedure**

<table>
<thead>
<tr>
<th>Step 1</th>
<th>From the HX Data Platform plug-in, unmount the datastore.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Step 2</td>
<td>Change the datastore name.</td>
</tr>
<tr>
<td>Step 3</td>
<td>Remount the datastore.</td>
</tr>
</tbody>
</table>

The name displayed in the HX Data Platform plug-in and in the vSphere Web Client will match.

---

**Remounting Datastore after Cluster Restart**

**Description**

Sometimes after a storage cluster returns to a healthy state, existing datastores might not be automatically remounted. This could happen when the storage cluster is rebooted while one or more nodes are down, or when it takes a long time for the storage cluster to reboot.

**Action:** Mount the datastore.

Choose a method:

- Using the HX Data Platform plug-in.
- Using the command line.

**Procedure**

<table>
<thead>
<tr>
<th>Step 1</th>
<th>Using the HX Data Platform plug-in.</th>
</tr>
</thead>
<tbody>
<tr>
<td>a)</td>
<td>Select From the vSphere Web Client Navigator, select <strong>vCenter Inventory Lists &gt; Cisco HyperFlex Systems &gt; Cisco HX Data Platform &gt; cluster &gt; Manage &gt; Datastores</strong>.</td>
</tr>
<tr>
<td>b)</td>
<td>Select a <strong>datastore</strong>.</td>
</tr>
<tr>
<td>c)</td>
<td>Click the mount datastore icon or select from the Actions menu.</td>
</tr>
<tr>
<td>d)</td>
<td>Confirm to mount the datastore, click <strong>OK</strong>.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Step 2</th>
<th>Using the command line.</th>
</tr>
</thead>
<tbody>
<tr>
<td>a)</td>
<td>Login to a storage controller VM of a node in the storage cluster.</td>
</tr>
<tr>
<td>b)</td>
<td>Run the command.</td>
</tr>
</tbody>
</table>

```bash
# stcli datastore mount datastore_name
```
Datastore Does Not Unmount When Storage I/O RM Daemon Running

Description
If the VMware Storage I/O RM feature is enabled, there is a VMware bug where-in Storage I/O RM writes tracking files even on datastores on which Storage I/O RM is not enabled. These tracking files prevent HX Data Platform datastores from being unmounted.

Action: Retry unmount.

Procedure

1. Retry unmount datastore.
2. Stop the Storage I/O RM daemon on every ESX host on which the HX Data Platform datastore is mounted.
3. Unmount the datastore.
4. Restart the Storage I/O RM daemon, if needed.

Datastore Delete Fails with error: com.vmware.vim25.PlatformConfigFault

Description
There is a known VMware issue where vSphere selects random datastores and uses it for heartbeating. This blocks HX Data Platform attempts to delete the datastore. See VMware KB, Unmounting or removing a datastore in a HA cluster fails with the error: The vSphere HA agent on host failed to quiesce file activity on datastore (2055137).

Action: Check the ESXi host and vCenter, then retry deleting the datastore.

Procedure

1. Ensure VMs are not running on the datastore.
2. From ESX host, check to see if the HX Data Platform datastore is being used by VMware service, storageRM.
   `# ls -ltra /vmfs/volumes/stfs-ds1/ | grep -i iorm`
   `-rwxr-xr-x 1 root root 16511 Jan 20 20:05 .iormstats.sf`
   `drwxr-xr-x 1 root root 1125 Jan 20 20:06 .iorm.sf`
3. Check the storagerm status.
   `# /etc/init.d/storagerm status`
   `storageRM is running`
4. Stop the storagerm service.
   `# /etc/init.d/storagerm stop`
   `watchdog-storagerm: Terminating watchdog process with PID 34096`
   `storageRM stopped`
5. Alternatively, disable vSphere HA.
a) From vSphere client Home, select vCenter Inventory Lists > Resources > Clusters > storage cluster > Manage > Settings > > Services.
b) Click vSphere HA. Click Edit.
c) Unselect Turn on vSphere HA, if it is selected.

Step 6 Try to delete the datastore again.
Step 7 If you disabled vSphere HA, re-enable it.
Step 8 This is one possible solution, if this doesn't resolve the issue, contact Technical Assistance Center (TAC).

ReadyClone and Snapshot Issues

Deleting Desktop Pool Leaves Orphaned VM Folder

Description
After deleting snapshots of VMs in a desktop pool, then deleting desktop pool, found the snapshot VM folder and digest files remained.

Action: Manually remove the files and folder.
Follow the steps in VMware KB, Pool deletion operation does not remove digest vmdk files (2109563), http://kb.vmware.com/selfservice/microsites/search.do?language=en_US&cmd=displayKC&externalId=2109563.

Storage Cluster Missing from vCenter Cluster after Cluster Node Powered Off

Description
A node in the vCenter cluster was powered off. The storage cluster is fine within number of tolerated down nodes. However, the storage cluster cannot be managed through vSphere.

Known VMware vSphere 6.0 bug. See https://communities.vmware.com/thread/514117?start=0&tstart=0.

Action: Reset the node.
Power on the node or disconnect the powered off node from the vCenter cluster.