



Hewlett Packard
Enterprise

NimbleOS 5.0.10.0 Release Notes

Version 5.0.10.0

Published June, 2020

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Email: <https://infosight.hpe.com>

For all other general support contact information, go to <https://www.hpe.com/us/en/services/nimble-storage.html>.

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NimbleOS 5.0.10.0

Version:	5.0.10.0
Revision:	Wednesday June 3, 2020 13:46:47

The release notes describe the major changes, fixes, and known issues for this release of the NimbleOS. They do not include all individual fixes and internal changes.

For technical support, contact HPE Nimble Storage Support at:

<mailto:support@nimblestorage.com>

877-3-NIMBLE (877-364-6253), option 2.

Important Update Note

Updating NimbleOS can involve an update to component firmware on the standby controller. This can cause an email alert and automated case indicating "Standby Controller Not Available" when the firmware update process takes longer than five minutes. This is expected behavior and does not affect data services. At the end of the software update, you can check the status of both controllers in the Web UI under **Manage > Hardware**. One controller will be ACTIVE and the other STANDBY, under normal operating conditions following a successful software update.

All third-party software notices can be found on HPE InfoSight (<https://infosight.hpe.com>) from the **Resources > Documentation** page:

<https://infosight.hpe.com/resources/nimble/docs>

The Documentation page also includes the *General Terms and Conditions* document. You can display this document by performing the following steps:

- 1 In the navigation pane on the HPE InfoSight Documentation page, scroll through the Document Type list and select Support Policy.
- 2 In the list that appears, select General Terms and Conditions. This document opens in a new browser tab.

Special Notes

Note	Description
CRITICAL	HPE Nimble Storage continues to qualify configurations between releases. The Validated Configuration Matrix provides information about validated configurations and is updated frequently. It is a good practice to check your system configuration against this online tool. The Validated Configuration Matrix tool is available on HPE InfoSight: https://infosight.hpe.com/resources/nimble/validated-configuration-matrix
CRITICAL	Arrays must be running NimbleOS 3.1.0.0 or later to upgrade to NimbleOS 5.0.10.0.
CRITICAL	Internet Explorer 10 and earlier versions are not supported in NimbleOS 4.x and later.

Note	Description
CRITICAL	<p>An extended data services outage may occur with MS iSCSI initiator and Intel NICs using the built-in Windows driver e1q60x64.sys (version 11.0.5.21/11.0.5.22).</p> <p>If you encounter this problem, please update your system to use the latest Windows driver.</p>
CRITICAL	<p>A service outage may occur on Windows 2012 R2 hosts using Emulex or Broadcom Fibre Channel HBAs with firmware/driver prior to 11.2. Update the Emulex or Broadcom firmware/driver to 11.2 or later</p>
CRITICAL	<p>Due to a known Red Hat Enterprise Linux bug 1002727, while running virtualized in VMware ESX, manually rebooting the active controller in presence of heavy IOs using the reboot --controller command on a Fibre Channel array may trigger an incorrect retry initiated by RHEL guests running the following kernel versions:</p> <ul style="list-style-type: none"> • 6.4 and earlier • 6.5 without the patch • 7.0 without the patch <p>This incorrect retry logic may lead to unexpected application behavior. In these environments, we recommend the failover command instead.</p>
CRITICAL	<p>Due to a known Red Hat Enterprise Linux bug 3550561, unexpected application behavior may occur on RHEL 7.5 hosts with kernel-3.10.0-862.3.2.el7 or derivatives using Emulex FC FCoE HBAs (lpfc driver) and raw devices. To avoid this issue:</p> <ul style="list-style-type: none"> • If running RHEL 7.6, update to kernel-3.10.0-957.el7 or later. • If running RHEL 7.5z, update to kernel-3.10.0-862.25.3.el7 or later.
CRITICAL	<p>As outlined in the current Validated Configuration Matrix, HPE Nimble Storage fully supports Windows guest operating systems on Microsoft Hyper-V, including Virtual Fibre Channel (VFC) connectivity and multi-pathing with HPE Nimble Storage DSM and VSS support. However, Linux guest operating systems running in Hyper-V VFC configurations are not qualified. Running Red Hat Linux guest operating systems with the "Linux Integration Services" kit installed, or with hv_storvsc drivers in such configurations can lead to Red Hat bug 1364282, which can cause an unexpected service outage.</p>
Important	<p>NimbleOS 5.0.9.100 and later contains fixes for critical security vulnerabilities that may allow remote code execution and unauthorized data access. The associated HPE Nimble Storage Security Bulletin numbers are: HPESBST03991 (HPE Nimble Storage, Remote Access to Sensitive Information) and HPESBST03992 (HPE Nimble Storage, Remote Code Execution).</p> <p>Refer to the following bulletins for more information: https://infosight.hpe.com/user/bulletins</p>

Note	Description																						
Important	<p>Starting with NimbleOS version 5.0.8.0, the array group now uses Java Development Kit (JDK) version 1.8.0.212. The new JDK addresses several security vulnerabilities identified in the previous version of the JDK listed here:</p> <p>https://infosight.hpe.com/user/bulletins</p>																						
Important	<p>Starting with NimbleOS version 5.0.7.0, the Fibre Channel HBAs will use an updated firmware (11.4.204). The new firmware addresses an issue in which some 16Gb Fibre Channel HBAs might not auto-negotiate to 16Gb on all ports due to a timing issue within the code of the previous version of the firmware.</p>																						
Important	<p>As of vSphere 6.5, VMware is discontinuing the Thick Client (also known as the desktop or C# Client). As a result, the HPE Nimble Storage vCenter Plugin is deprecating the Thick Client and future releases of NimbleOS will not support it.</p>																						
Important	<p>Starting with version 5.0.3.0, NimbleOS includes a restriction that prevents you from enabling deduplication when you are using a CS3000, CS5000, CS7000, HF20, HF40, or HF60 array that have fewer than six SSDs. This restriction is necessary to prevent the possibility of significant performance issues.</p> <p>Because NimbleOS 5.0.2.0 and 5.0.1.0 did not enforce this restriction, arrays upgrading from those releases may already have volumes with deduplication enabled. Any array upgrading to NimbleOS 5.0.3.0 or later with deduplicated volumes will continue to operate as a dedupe capable array, regardless of the number of installed SSDs. Such configurations are <i>not</i> recommended by HPE Nimble Storage.</p> <p>The following table lists the number of SSDs required for the different arrays:</p> <table border="1" data-bbox="643 1199 1463 1787"> <thead> <tr> <th data-bbox="643 1199 1052 1249">Array Model</th> <th data-bbox="1052 1199 1463 1249">Required Number of SSDs</th> </tr> </thead> <tbody> <tr> <td data-bbox="643 1249 1052 1299">HF20H</td> <td data-bbox="1052 1249 1463 1299">2 SSDs</td> </tr> <tr> <td data-bbox="643 1299 1052 1350">HF20H upgraded to full population</td> <td data-bbox="1052 1299 1463 1350">4 SSDs</td> </tr> <tr> <td data-bbox="643 1350 1052 1430">HF20H fully populated and upgraded to HF40H</td> <td data-bbox="1052 1350 1463 1430">4 SSDs</td> </tr> <tr> <td data-bbox="643 1430 1052 1480">HF20, HF40, HF60</td> <td data-bbox="1052 1430 1463 1480">6 SSDs</td> </tr> <tr> <td data-bbox="643 1480 1052 1530">CS500</td> <td data-bbox="1052 1480 1463 1530">4 SSDs</td> </tr> <tr> <td data-bbox="643 1530 1052 1581">CS700</td> <td data-bbox="1052 1530 1463 1581">4 SSDs</td> </tr> <tr> <td data-bbox="643 1581 1052 1631">CS1000</td> <td data-bbox="1052 1581 1463 1631">3 SSDs</td> </tr> <tr> <td data-bbox="643 1631 1052 1682">CS3000</td> <td data-bbox="1052 1631 1463 1682">6 SSDs</td> </tr> <tr> <td data-bbox="643 1682 1052 1732">CS5000</td> <td data-bbox="1052 1682 1463 1732">6 SSDs</td> </tr> <tr> <td data-bbox="643 1732 1052 1787">CS7000</td> <td data-bbox="1052 1732 1463 1787">6 SSDs</td> </tr> </tbody> </table>	Array Model	Required Number of SSDs	HF20H	2 SSDs	HF20H upgraded to full population	4 SSDs	HF20H fully populated and upgraded to HF40H	4 SSDs	HF20, HF40, HF60	6 SSDs	CS500	4 SSDs	CS700	4 SSDs	CS1000	3 SSDs	CS3000	6 SSDs	CS5000	6 SSDs	CS7000	6 SSDs
Array Model	Required Number of SSDs																						
HF20H	2 SSDs																						
HF20H upgraded to full population	4 SSDs																						
HF20H fully populated and upgraded to HF40H	4 SSDs																						
HF20, HF40, HF60	6 SSDs																						
CS500	4 SSDs																						
CS700	4 SSDs																						
CS1000	3 SSDs																						
CS3000	6 SSDs																						
CS5000	6 SSDs																						
CS7000	6 SSDs																						

Note	Description
Important	<p>You can enable deduplication for CS1000, CS3000, CS5000, CS7000, CS700, CS500, and CS700 arrays on a volume only if the corresponding storage pool has a Flash to Disk Ratio (FDR) greater than 4%. To calculate the FDR, obtain the "Total array capacity (MiB)" and "Total array cache capacity (MiB)" values by using the HPE Nimble Storage CLI command pool --info pool_name. This command returns the Pool capacity (MiB), which is the "Total array capacity (MiB)", and the Pool cache capacity (MiB), which is the "Total array cache capacity (MiB)".</p> <p>Then perform the following calculation:</p> <p>FDR = "Total array cache capacity (MiB)"/"Total array capacity (MiB)" * 100</p> <p>If the array has sufficient capability for deduplication, the pool --info command will also show a value for dedupe capacity (MiB).</p> <p>Note On the HF20H, HF20, HF40, and HF60 platforms, pool --info displays "N/A" as the value for dedupe capacity (MiB). This because you can enable deduplication for the entire array.</p>
Important	<p>For connections to the NimbleOS GUI, you must have port 5392 open for the Group Management IP address and both diagnostic IP addresses.</p>
Important	<p>VMware has announced End of General Support for vSphere 5.0, 5.1, 5.5 and 6.0, which includes vSphere Hypervisor ESXi 5.0, 5.1, 5.5, and 6.0, and vCenter Server 5.0, 5.1, 5.5, and 6.0. To maintain your full level of support and subscription from VMware, you should upgrade to a supported version of vSphere. Refer to the VMware Knowledge Base article: Refer to the VMware Knowledge Base article KB66977.</p>
Important	<p>During deployment of a desktop using VMware Horizon View, a VVol (mapping to a disposable disk) is created. A clone of this VVol is also created and placed within a directory under the virtual machine directory named <code>sdd</code>.</p> <p>When this desktop is deleted from Horizon View, VMware fails to delete the VVol clone of the disposable disk; only the disposable disk itself is deleted. This will be fixed in the next vSphere release. VMware bug number 1807857 should be used to track this fix.</p> <p>This issue occurs on all versions of VMware Horizon and vSphere that support VVols:</p> <ul style="list-style-type: none"> • Horizon 6 version 6.1 and later • vSphere 6.0 and later
Important	<p>On Windows Server 2012, 2012 R2, 2016, and 2019, the disk optimization process may record the following error in the Application event log: "The volume was not optimized because an error was encountered: Neither Slab Consolidation nor Slab Analysis will run if slabs are less than 8 MB. (0x8900002D)". Although Windows records this as an Error in the event log, the event can be safely ignored for HPE Nimble Storage volumes. HPE Nimble Storage volumes do not benefit from or require slab consolidation.</p>
Important	<p>TRIM on ReFS is not supported by Microsoft on Windows Server versions prior to 2019.</p>

Note	Description
Important	<p>HPE Nimble Storage recommends that you update to HPE Nimble Storage Windows Toolkit (NWT) 7.0.1 or later if you are using Microsoft VSS Synchronization with NimbleOS 5.0.9.0 or later.</p> <p>Using application consistent snapshots with earlier versions of NWT and NimbleOS 5.0.9.0 or later may result in the following error messages:</p> <ul style="list-style-type: none"> In the host's VSS requestor log (C:\ProgramData\Nimble Storage\Logs\VssRequestor.log): <pre>PID:1996 TID:5752 ERR reqcommon. cpp:683 Request-Status=QueryStatus(), Function=pAsync->QueryStatus(), Error=VSS_E_PROVIDER_VETO, rc=SystemError, ca=ContactSupport</pre> In the Windows event viewer: <pre>event id 4100: EndPrepareSnapshots method: failed to find LUN s/n <SERIAL_NUMBER> on connected arrays. Make sure that the Nimble array version is compatible with this version of Nimble Windows Toolkit.</pre> <pre>event id 4170: Nimble VSS provider is not compatible with the current version of the Nimble array software(). Install appropriate version of the Nimble VSS provider.</pre> <p>NWT 7.0.1 resolves this issue.</p>
Important	<p>Numerous host integration toolkits are supported in NimbleOS 5.0.10.0. It is strongly recommended that they be installed on all Windows, Linux, and VMware hosts. For more information about supported toolkits, refer to the Validated Configuration Matrix, which is available on HPE Nimble Storage InfoSight:</p> <p>https://infosight.hpe.com/resources/nimble/validated-configuration-matrix</p>
Important	<p>Hosts leveraging VSS integration with HPE Nimble Storage Windows Toolkit (NWT) 2.1 and earlier will not work with NimbleOS 3.x. and later.</p>
Important	<p>HPE Nimble Storage Connection Manager (NCM) for VMware 6.1.0 is signed by VMware for ESXi 6.x. It can be installed through the VMware Update Manager or esxcli command without the <code>--no-sig-check</code> flag.</p> <p>See <i>NCM for VMware Release Notes 6.1.0</i> or later and the latest VMware Integration Guide for further details.</p>

Note	Description
<p>Important</p>	<p>Performing a group merge from a source group that contains running Hyper-V virtual machines requires additional care. Group merges require changes to the discovery IP address that can adversely impact running systems. Therefore, if you perform a group merge, you should plan a maintenance outage to gracefully stop all applications and Hyper-V virtual machines on the source group to eliminate unexpected downtime caused by changing IP address during the group merge process. A typical group merge should take only a few minutes to complete and then virtual machines and applications can be restarted.</p> <p>The group merge and pool merge operations will also have impact on SCVMM. The impact will depend on whether the source and destination groups or pools are under SCVMM's management.</p> <p>Please refer to the <i>SMI-S Integration Guide</i> which includes details about SCVMM and the impacts in these situations before performing merge operations.</p>
<p>Important</p>	<p>Various timeout values affect HPE Nimble Storage targets from Windows/Linux hosts. Before you update the NimbleOS, install the HPE Nimble Storage Windows Toolkit (NWT) or HPE Nimble Storage Linux Toolkit (NLT) on the host or tune the timeout values. Timeout details for various operating systems can be found on HPE InfoSight under Resources > Documentation. From the HPE Nimble Storage Documentation page, locate the article you want.</p> <p>The following Knowledge Base articles and Integration Guides explain how to configure and verify host timeout settings for the major supported operating systems (OS):</p> <ul style="list-style-type: none"> For Windows, refer to KB-000052: Windows Host Disk Timeout Values. <p>In the context of Microsoft Windows, the following article should also be considered:</p> <p>KB-000246 MPIO Timeout Parameters for MSDSM and NimbleDSM in Windows 2012 R2</p> <ul style="list-style-type: none"> For VMware, refer to the Common Tasks and Best Practices > Host Timeout Values section of the <i>VMware Integration Guide</i>. For Linux, refer to KB-000304: Linux Host Disk Timeout Values.
<p>Important</p>	<p>The Backup Repository performance policy introduced in NimbleOS 4.2 cannot be used when replicating against a downstream array running an older release. Replicated volumes need to be associated at the time of creation with a performance policy that either exists downstream or that can be manually created on the downstream array.</p>

New Features in 5.0.10.0

There are no new features introduced in NimbleOS 5.0.10.0.

Recent Release Features

The following new features were released in NimbleOS 5.0.x:

Deduplication Support for CS1000 Hybrid Arrays

NimbleOS 5.0.8.0 added support for deduplication on HPE Nimble Storage CS1000 hybrid arrays.

Note Deduplication is not supported on HPE Nimble Storage CS1000H arrays.

Support for HPE Nimble Storage ES2 Expansion Shelves on Certain CSxxx Arrays

NimbleOS 5.0.7.0 added support for ES2-H and ES2-AFS2 expansion shelves for the CS235, CS300, CS500, and CS700 arrays.

The array can be connected to either ES1 or ES2 shelves. You must update your software version to NimbleOS 5.0.7.0 before you attach the ES2 shelf. Do not attach the shelf if you are running a previous release of the software.

Support for the new HF60C array

NimbleOS version 5.0.6.0 added support for the HPE Nimble Storage HF60C array.

Support for replicating encrypted volumes to HPE CV

It is now possible to use your on-premises arrays with HPE Cloud Volumes to gain access to the public cloud.

Deduplication Support for CS700 and CS500 Hybrid Arrays

Deduplication is now available on HPE Nimble Storage CS700 and CS500 hybrid arrays.

There are certain restrictions for using this feature. For CS500 and CS700 arrays, these restrictions include a limit on the total capacity that can be deduplicated and a requirement that the ratio of SSD cache to HDD storage must be at least 8%. Before you enable deduplication on hybrid arrays, review the product documentation for complete details.

Support for In-Family Controller Upgrades for HPE Nimble Storage Arrays

NimbleOS 5.0.5.0 added support for non-disruptively upgrading the controllers on some storage arrays. The newly enabled upgrades are listed in the following table:

System	Possible Upgrade Targets	Notes
HF40C	HF60C	
HF20H	HF40H	1
HF20C	HF40C , HF60C	
HF20	HF40, HF60	
HF40	HF60	
AF20Q	AF40Q	2
AF20	AF40, AF60, AF80	
AF40	AF60, AF80	
AF60	AF80	

Notes

- 1 The HF20H cannot be upgraded beyond the HF40H.
- 2 The AF20Q cannot be upgraded beyond the AF40Q.

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For detailed information about performing controller upgrades, see the *Controller Upgrade Guide* for your array. To get to the hardware documentation, log onto HPE InfoSight and go to **Resources > Documentation**. Under **Documentation Type** select **Hardware Guide**.

Support for HPE Nimble Storage AF Array Expansion Shelves

NimbleOS 5.0.5.0 added support for AFS3 expansion shelves for the AF20Q, AF20, AF40, AF60, and AF80 arrays.

Support for Additional Cache Size Options in ES3 Expansion Shelves

NimbleOS 5.0.5.0 added support for a number of different cache size options in ES3 expansion shelves for HF arrays.

Support for Microsoft Active Directory using SMBv2

For security reasons, NimbleOS 5.0.4.0 now integrates with Microsoft Active Directory using SMBv2, replacing the older SMBv1 implementation..

Support for New Hardware Platforms

NimbleOS 5.0.3.0 included support for the following new hardware platforms: AF80, AF60, AF40, AF20, AF20Q, HF60, HF40, HF20, HF20H, and HF20C.

Deduplication Support for CS7000/CS5000/CS3000/CS1000 Hybrid Arrays

NimbleOS 5.0.1.0 and 5.0.2.0 added support for deduplication on HPE Nimble Storage CS7000, CS5000, and CS3000 hybrid arrays. NimbleOS 5.0.8.0 added support for deduplication on HPE Nimble Storage CS1000 hybrid arrays.

There are certain restrictions for using this feature. For example, to use deduplication with CS7000, CS5000, and CS3000 hybrid arrays, your system environment must include six or more SSD drives. Before you enable deduplication on hybrid arrays, review the product documentation for complete details.

The following table provides information about the Maximum Dedupe Capacity (MDC) on supported hybrid arrays and the additional Flash to Disk Ratio (FDR) required to support MDC.

Note You must have a four percent Flash to Disk Ratio (FDR) to enable dedupe on these hybrid models. For MDC, you must have a flash capacity that is greater than or equal to 4% FDR plus 4% MDC. To see the dedupe capacity (MiB), log in as an administrator and run the **pool --info <pool_name>** command from the CLI.

Platform	Maximum Dedupe Capacity (MDC)	Effective Capacity with 3x Dedupe	Additional Flash Required to Support MDC
CS1000	10 TiB	30 TiB	0.4 TiB
CS3000	40 TiB	120 TiB	1.6 TiB
CS5000	100 TiB	300 TiB	4 TiB
CS7000	200 TiB	600 TiB	8 TiB

Additional VVol Workflows for Protection, Restore, Clone, View, Claim, Delete, Undelete, and Purge Operations

HPE Nimble Storage added several workflows for VMware virtual volumes (VVols) to the HPE Nimble Storage vCenter Plugin. These include the following:

- Granular virtual machine (VM) restore based on selectable recovery points
- Restore in place or clone a VM from local snapshots
- Restore individual disks or attach cloned disks to another VM
- Bring up a VM at a replication site via a clone
- Protect VMs against accidental deletion on the primary or replication site

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- Protect VMs by cloning from previous snapshots, individual volumes, or a replica
- Purge all deleted VMs

Support for vSphere (HTML5) Client with New VVol Workflows

When you use the new VMware VVol workflows, you can also use the VMware vSphere Client, known as the HTML5 Client. This client is included the HPE Nimble Storage Web Client Plugin.

Note The HTML5 vSphere Client does not support workflows that involve managing VMFS datastores on HPE Nimble Storage arrays. At this time, it is only supported with the new VVol workflows.

Additional Monitoring of VM Capacity and Performance

The HPE Nimble Storage vCenter Plugin provides additional monitoring of VM capacity and performance, including providing the following information:

- Summary of the data and snapshot usage
- Average latency across all disks
- Summary of IOPS for all disks of the VM
- Summary of throughput of all disks of the VM

Volume Shadow Copy Service for VVols

Starting with NimbleOS 5.0.1.0 and Nimble Windows Toolkit 5.0.0, HPE Nimble Storage Volume Shadow Copy Service (VSS) integration has been extended to include VVols in both iSCSI and Fibre Channel environments. You can use VSS to take application-consistent snapshots for Microsoft Exchange Server and Microsoft SQL Server when the application data is hosted on a VVol. You no longer need to back up an entire virtual machine in order to back up an application.

In addition, having application backups means you only need to restore the VVol that contains the application data instead of the entire VM.

System Performance Improvements

For most systems and workloads, top-line performance is expected to improve by 5% to 10% relative to performance seen with NimbleOS 4.3.1.0.

Adaptive Compression

Starting with NimbleOS 5.0.1.0, a more advanced compression algorithm is used on data written during times of relatively low CPU load. During times of higher CPU load, the existing compression algorithm will be used. If you have mid-range and high-end arrays, you can expect at least 10% better compression on newly written data. Low-end and older systems might not experience any change because CPU cycles are a scarcer resource on those systems.

Note The new compression algorithm does not affect data already on the array.

Documentation

These Release Notes and other user documentation are available on HPE InfoSight:

<https://infosight.hpe.com/resources/nimble/docs>

You can manually reach the documentation page by logging onto HPE InfoSight and selecting **Resources > Nimble Storage > Documentation**.

Document Search Interface

There are several methods you can use to locate the documents you need.

The **Nimble Storage Documentation** page provides a search interface that allows you to search for information across all documentation, including support and knowledge base articles, best practices, solutions and integration guides, product documentation, and configuration matrices.

To go directly to a document, use the navigation pane on the left side of the **Nimble Storage Documentation** page. The navigation pane organizes documents into categories, including:

- Document Type
- Nimble Software and Solutions
- Software Version
- Integration
- Platform

You can use the page scroll bar to move up and down the navigation pane.

Third-Party Software Notices

All third-part software notices can be found in the Documentation Portal on HPE InfoSight.

Here are the steps to manually access the third-party software notices.

- 1 Log in to HPE InfoSight (<https://infosight.hpe.com>) .
- 2 From the menu, select Resources Nimble Documentation .
- 3 In the left navigation pane of the Documentation Portal, scroll through the Document Type section and select Support Policy.
- 4 From the list of documents, select General Terms and Conditions. The document opens in a new browser tab.

Core User Documentation

The following is the core user documentation for NimbleOS:

- *GUI Administration Guide*
- *CLI Administration Guide*
- *SNMP Reference*
- *Command Reference*
- *REST API Reference*

Workflow Documents

There are several workflow guides that contain procedures you can perform using either the CLI or the GUI. Each workflow guide covers a specific, frequently performed task related to HPE Nimble Storage products. Each task described by a workflow document is explained in detail in the *GUI Administration Guide* and the *CLI Administration Guide*.

Hardware

Documentation for all hardware components is available on HPE InfoSight. Click the Hardware Guide link in the **Document Type** category. Hardware documentation includes array and expansion shelf installation quick start guides, installation, upgrade, and replacement guides, and comprehensive hardware guides.

Host Integration Guides

Host Integration Guides are available from HPE InfoSight. To locate these documents on the HPE InfoSight **Documentation** page, scroll down the navigation pane to the section called **Integration Guide**. The available guides include the following:

- *Linux Integration Guide*
- *OpenStack Cinder Driver Integration Guide*
- *SMI-S Integration Guide*
- *UCS Director Open Automation Module Integration Guide*
- *VMware Integration Guide*
- *Windows Integration Guide*

Note The version numbers of the host integration guides match the version numbers of their companion Integration Toolkit software packages.

Integration Toolkits

The following Integration Kits include documents that are associated with the toolkit software. You can search for them by entering the HPE Nimble Storage software type and version. The following integration toolkits are supported:

- HPE Nimble Storage Adaptive Flash Cinder Driver for OpenStack
- HPE Nimble Storage AIX ODM
- HPE Nimble Storage Connection Manager (NCM) for Linux
- HPE Nimble Storage Connection Manager (NCM) for VMware
- HPE Nimble Storage PowerShell Toolkit (PSTK)
- HPE Nimble Storage Replication Adapter (SRA)
- HPE Nimble Storage UCS Director Open Automation for Cisco UCS Director
- HPE Nimble Storage Windows Toolkit (NWT)

Note To download Integration Kit software, go to HPE InfoSight (<https://infosight.hpe.com>) and choose **Resources > Software Downloads**.

Verified Update Paths

Table 1: From Versions 5.x

From Versions 5.x	
From Version	To Version
5.0.9.100	5.0.10.0
5.0.9.0	5.0.10.0
5.0.8.0	5.0.10.0
5.0.7.300	5.0.10.0
5.0.7.200	5.0.10.0
5.0.7.100	5.0.10.0

From Versions 5.x	
From Version	To Version
5.0.7.0	5.0.10.0
5.0.6.0	5.0.10.0
5.0.5.200	5.0.10.0
5.0.5.0	5.0.10.0
5.0.4.0	5.0.10.0
5.0.3.100	5.0.10.0
5.0.3.0	5.0.10.0
5.0.2.0	5.0.10.0
5.0.1.100	5.0.10.0
5.0.1.0	5.0.10.0

Table 2: From Versions 4.x

From Versions 4.x	
From Version	To Version
4.5.6.0	5.0.10.0
4.5.5.0	5.0.10.0
4.5.4.0	5.0.10.0
4.5.3.0	5.0.10.0
4.5.2.0	5.0.10.0
4.5.1.0	5.0.10.0
4.5.0.0	5.0.10.0
4.4.1.0	5.0.10.0
4.4.0.0	5.0.10.0
4.3.1.0	5.0.10.0
4.3.0.0	5.0.10.0
4.2.1.0	5.0.10.0
4.2.0.0	5.0.10.0
4.1.0.0	5.0.10.0

Table 3: From Versions 3.x

From 3.x Versions	
From Version	To Version
3.9.3.0	5.0.10.0
3.9.2.0	5.0.10.0

From 3.x Versions	
From Version	To Version
3.9.1.0	5.0.10.0
3.9.0.0	5.0.10.0
3.8.1.0	5.0.10.0
3.8.0.0	5.0.10.0
3.7.0.0	5.0.10.0
3.6.2.0	5.0.10.0
3.6.1.0	5.0.10.0
3.6.0.0	5.0.10.0
3.5.4.0	5.0.10.0
3.5.3.0	5.0.10.0
3.5.2.0	5.0.10.0
3.5.0.0	5.0.10.0
3.4.1.0	5.0.10.0
3.4.0.0	5.0.10.0
3.3.0.0	5.0.10.0
3.2.1.0	5.0.10.0
3.1.0.0	5.0.10.0

Table 4: From Versions 2.x

From 2.2.x, 2.3.x Versions		From 2.1.x Versions		From 2.0.x Versions	
From Version	To Version	From Version	To Version	From Version	To Version
2.3.18.0	4.5.6.0	2.1.9.1	2.3.18.0	2.0.8.0	2.1.9.1
2.3.16.0	4.5.6.0	2.1.9.0	2.3.18.0	2.0.7.0	2.1.9.1
2.3.15.0	4.5.6.0	2.1.8.0	2.3.18.0	2.0.6.*	2.1.9.1
2.3.14.0	4.5.6.0	2.1.7.0	2.2.9.0	2.0.5.0	2.1.9.1
2.3.12.*	4.5.6.0	2.1.6.0	2.2.9.0	2.0.4.0	2.1.9.1
2.3.9.*	4.5.6.0	2.1.5.0	2.2.9.0		
2.3.8.0	4.5.6.0	2.1.4.0	2.2.9.0		
2.3.7.0	4.5.6.0	2.1.3.0	2.2.9.0		
2.3.6.0	4.5.6.0	2.1.2.0	2.2.9.0		
2.3.4.0	4.5.6.0	2.1.1.0	2.1.9.1		
2.3.3.0	4.5.6.0	2.1.0.0	2.1.9.1		
2.3.2.1	4.5.6.0				
2.3.2.0	4.5.6.0				

From 2.2.x, 2.3.x Versions		From 2.1.x Versions		From 2.0.x Versions	
From Version	To Version	From Version	To Version	From Version	To Version
2.3.1.0	4.5.6.0				
2.2.11.0	3.9.3.0				
2.2.10.0	3.9.3.0				
2.2.9.0	3.9.3.0				
2.2.7.*	3.9.3.0				
2.2.6.0	3.9.3.0				
2.2.5.*	3.9.3.0				
2.2.3.*	2.2.11.0				
2.2.2.0	2.2.11.0				
2.2.1.0	2.2.11.0				
2.2.0.0	2.2.11.0				

Table 5: From Versions 1.x

From 1.4.x Versions		From 1.3, 1.2, 1.1 Versions		From 1.0.x Versions	
From Version	To Version	From Version	To Version	From Version	To Version
1.4.12.0	2.1.9.1	1.3.*.*	1.4.6.0	1.0.7.*	Contact Support
1.4.11.0	2.1.9.1	1.2.*.*	1.4.6.0	1.0.6.*	Contact Support
1.4.10.0	2.1.9.1	1.1.*.*	1.2.2.0		
1.4.9.0	2.1.9.1				
1.4.8.0	2.1.9.1				
1.4.7.0	2.1.9.1				
1.4.*.*	1.4.12.0				

Known Critical Issues

Known Critical Issues in NimbleOS version 5.0.10.0				
ID	Component	Title	Description	Workaround
AS-77607	Data Service	Removing member array from multi-array group may cause IO disruption to scaled vVol environments	Scaled vVol environments with 500 vVol VDI VMs or more than 5000 Nimble vVol volumes may experience IO disruption when removing a member array from group. Symptom of problem would appear as vVol datastores being (inaccessible). Virtual Machine status would also appear as (inaccessible).	When planning to remove a member array from group, schedule a planned maintenance window and place all ESX hosts into maintenance mode to minimize impact to availability. ESX typically resumes connection to vVol datastores, and reconnects to VMs, after a period of 15-30 minutes automatically without a manual intervention.
AS-90668	Data Service	Data Service restarts when detecting metadata inconsistency	When the Data Service detects a metadata inconsistency, the service may restart repeatedly and hosts could experience unexpected application behavior.	Contact HPE Nimble Storage Support
AS-76520	Data Service	Red overtemp LED is illuminated after NimbleOS software update to 5.0.x	After performing a software update to NimbleOS 5.0.x, the over temperature LED is illuminated on the array front LED panel. However, no alerts are triggered from the array software.	This issue has been confirmed as cosmetic. To resolve this issues, you may reboot the controller(s) reporting the illuminated over temp LED. Please contact HPE Nimble Storage Support if further assistance is needed.
AS-65615	Data Service	Group Management Service must be restarted to unlock additional volume limits after controller upgrade	When performing a controller upgrade to a high-end model, the object limits will still show the lower limits if the Group Management Service is not restarted.	A failover can be initiated in order to restart the Group Management Service. You may also contact HPE Nimble Storage Support to restart the service manually.
AS-87736	Data Service	Software precheck failures return generic error message	If a software update precheck fails, in some cases it will return only the failure status without providing additional information about the cause of the failure..	Contact HPE Nimble Storage Support for assistance in determining the cause of the failure.

Resolved Critical Issues

Resolved Critical Issues in NimbleOS version 5.0.10.0				
ID	Component	Title	Description	Workaround
AS-106462	Platform	False power supply, fan, and temperature readings on Controller B of AFX and HFX arrays	Missing IPMI sensors on Controller B of AFX and HFX arrays may lead to incorrect power supply, fan and temperature readings. This may result in false power supply, fan, and temperature alerts following a controller reboot or failover.	Please contact HPE Nimble Storage Support.

Resolved Issues

Resolved Issues in NimbleOS version 5.0.10.0				
ID	Component	Title	Description	Workaround
AS-105249	Data Service	Drop in performance for various array models after update to 5.0.9.0	For various arrays models with high CPU usage and heavily sustained read workloads, after updating to NimbleOS 5.0.9.0, they may experience a negative impact on performance.	Software updates to NimbleOS 5.0.9.0 are not recommended unless the CPU usage on the array is lightened.
AS-105778	Platform	Improved NVDIMM failure detection	NVDIMM health checks have been improved to remove erroneous alerts and to improve handling of actual failures.	Not applicable
AS-106609	SAN	SCSI HA Service restarts unexpectedly on standby controller	The SCSI High Availability Service may restart unexpectedly on the standby controller when a SCSI forward command returns a failure, but the memory buffer is not cleared. This service will recover successfully after the restart. There should be no impact to data access or performance.	None
AS-107593	SAN	HP-UX cannot access nimble volume if mapped LU ID is greater than 255	Due to a NimbleOS software defect, invalid LUN information response for LU IDs greater than 255 prevents connection for HP-UX hosts.	Not applicable

Resolved Issues in NimbleOS version 5.0.10.0				
ID	Component	Title	Description	Workaround
AS-107566	System Management	A volume clone operation can fail and a volume move operation can stall.	A volume move operation will stall under these conditions: - The volume is in a folder in the source pool. - The volume is cloned while it is moving. The clone operation will fail if any condition above is true.	Not applicable

Known Issues

Known Issues in NimbleOS version 5.0.10.0				
ID	Component	Title	Description	Workaround
AS-86720	Data Service	Unassigning and reassigning array to a pool within 5 minutes will fail	Assigning an array to a pool immediately after unassigning it from the same pool will fail with the following error - Failed to assign arrays to the pool: A service is not running or is not reachable	Retry operation after a few minutes to reassign array to pool.
AS-27387	Data Service	Bin migration destination could lock up space and block branch deletions (internally) if bin migration source aborts as it can not reach destination	In case of a network failure and the bin migration source cannot reach the destination, bin migration will abort. This could lead to the locking of space at the bin migration destination. The following alert will be issued if bin migration fails repeatedly. "Data Migration is delayed because of repeated restarts. Contact Nimble Storage Support."	Contact HPE Nimble Storage Support if there is a need to recover space.

Known Issues in NimbleOS version 5.0.10.0				
ID	Component	Title	Description	Workaround
AS-49747	Platform	Data Service disrupted when standby controller is in a reboot loop	In a rare case, when the standby controller is in a reboot loop, this may disrupt the Data Service. As a result, the array will report several failed SSDs.	Active controller will operate as expected after the faulty standby controller is disabled. (1) Remove the rebooting standby controller from the chassis or contact HPE Nimble Storage Support to remotely power off the rebooting standby controller from the array's active controller. (2) Then reseat or disk --remove add the failed SSDs to recover the SSDs.
AS-56942	Platform	Multi-bit Error-Correcting Code (ECC) errors on NVRAM card caused Data Service restart	In rare cases, multi-bit ECC errors on the NVRAM card may cause the Data Service to restart unexpectedly.	Contact HPE Nimble Storage Support.
AS-56600	Platform	NVRAM overloaded on high end platforms under heavy stress	In rare cases, heavy load compounded by unaligned workloads on high-end platforms with many CPU cores can cause the NVRAM driver to become overloaded when all cores are busy. The Data Service may restart unexpectedly with a health check error.	Contact HPE Nimble Storage Support.
AS-55765	Platform	Network storm causes writes to slow down to a point where Data Service restarts due to a health check failure	On lower-end platforms with a lower number of CPU cores, a network storm could keep the kernel busy serving network interrupt requests, and ultimately delay IO requests. This in turn causes IOs to timeout and causes a Data Service restart to recover.	Address the network storm, and then perform a controller failover.
AS-32895	Platform	Removing an array from a group leaves the array in an unusable state.	Upon removing an array from a group and removing any expansion shelves from that array, the array will need to be re-imaged prior to any array reuse.	Schedule time for a Sales Engineer to field-image the array.

Known Issues in NimbleOS version 5.0.10.0				
ID	Component	Title	Description	Workaround
AS-33275	Platform	Unexpected controller takeover due to incorrect state of the SAS HBA	When the SAS HBA detects faulty states, to recover, the array needs to reset the SAS HBA's firmware. The SAS HBA firmware reset can block disk I/Os significantly longer than our High Availability monitoring timeouts allow. Instead, a controller reboot is triggered immediately if this state is detected, resulting in an unexpected takeover event.	Contact HPE Nimble Storage Support.
AS-93296	Platform	Data service may restart if maximum cache exceeded for CS215, CS235, CS300, CS500, CS700 arrays	ES2 and AFS2 expansion shelves contain additional slots for upgrading cache capacity of the array. Older array models have a maximum cache limit that can be handled by the array. If ES2 or AFS2 expansion shelves are added to an array and the cache exceeds the max cache limit for the array type, the data service may restart due to running out of data pages.	Review the array configuration matrix for the array model: https://infosight.hpe.com/InfoSight/media/local/active/34/CSxxx%20Config%20Matrix.pdf Remove any additional cache from the expansion shelf that exceeds the max cache limit based on array model.
AS-56019	Security	Group Management restarts while shutting down	While the group management process is shutting down, it may experience a fault that causes a restart attempt.	None required. The process is shutting down.
AS-99679	System Mgmt	Eventd process may restart due to exceeding memory limit	The eventd process may restart unexpectedly in systems with larger configurations due to exceeding memory limit. The service will recover after the restart.	N/A
AS-50821	System Mgmt	Alerts and Alarms processing service may restart unexpectedly	Alerts and Alarms processing service may restart unexpectedly when certain operation surpass the designated health check timeout. The process will stabilize following the restart.	N/A

Known Issues in NimbleOS version 5.0.10.0				
ID	Component	Title	Description	Workaround
AS-28992	System Mgmt	Array removal might not complete in time	In some cases when there is high load, array removal can take longer than usual and timeout, which leads to an intermediate state where the group leader believes the array still belongs to the group, but the array has been removed.	Re-run array removal to clear the group leader metadata.
AS-71090	System Mgmt	No Audit Log entry is created if user does not have the privilege to create user	If a user tries to create a new user account, but the user doesn't have the privilege to do so, the user creation will fail. However, an audit log entry is not created.	N/A
AS-55005	System Mgmt	Unexpected Group Management restart due to memory inconsistency	In rare cases, a memory inconsistency causes an unexpected Group Management Daemon (GMD) restart.	N/A
AS-87749	System Mgmt	Max limit of 120 nics in netconfig alarm does not get cleared	When alarm for number of nics in array net config reaching 120 is triggered, it doesn't get cleared even when the number of nics goes down.	Delete the alarm using the alarm --delete CLI.
AS-92577	System Mgmt	Partner Info not saved after removing all volume collection schedules	After deleting all protection schedules belonging to a volume collection and adding new ones, the Replication Partner information is not retained after saving the changes.	Refresh the browser, edit the volume collection, and re-add the replication partner
AS-21697	System Mgmt	GUI shows a general error message during group merge when, for the two groups, the total number of snapshot schedules with a snapshot interval of less than five minutes exceeds five	The GUI shows a general error message during group merge when the total count of snapshot schedules with a snapshot interval of less than five minutes exceeds five: System limits for the number of protection schedules would be violated after adding the array. Current limit is 5.	Delete the appropriate protection schedule with a snapshot interval of less than five minutes to meet the system limits of these protections schedules, and retry the group merge operation.

Known Issues in NimbleOS version 5.0.10.0				
ID	Component	Title	Description	Workaround
AS-77372	System Mgmt	Group Merge via GUI unable to process large amount of conflicts	Currently within the HPE Nimble Storage Array GUI, when performing a group merge, if there is a large amount of group merge conflicts (1000 or more), the GUI is unable to process and resolve all of them.	To work around this issue: 1. Log into the destination array to resolve the conflicts. 2. Attempt the group merge again.
AS-87701	System Mgmt	Incorrect information on hardware page displayed when controller is down	When a controller is down, the user may see incorrect representation of physical ports within the Hardware Page of the array GUI. This is due to the lack of information from the missing controller.	When the controller is back up, all the information is displayed correctly on hardware page.
AS-86545	System Mgmt	Unable to create dedupe enabled volumes on a new install	After a CSx000 array is installed, it takes one minute for the array to determine its deduplication capability. If a volume is created prior to this, it will not have dedupe enabled even if the array is dedupe capable.	Once the array is able to determine its deduplication capability, all newly created volumes will have dedupe enabled, if specified. In order to enable dedupe on the previously created volumes, you may run the following command via the HPE Nimble Storage Array CLI: <code>vol --edit <vol_name> --dedupe_enabled yes</code>
AS-49590	System Mgmt	Unexpected Group Management restart due to high memory utilization	In rare cases, the standard memory allocator does not reuse freed memory efficiently during heavy workloads. When Group Management Daemon (GMD) utilization becomes too high, GMD may restart to recover.	N/A
AS-28589	System Mgmt	Network issues may cause restart of Group Management service	On rare occasions, a very slow network (or network issues like dropped packets) can cause a restart of the Group Management services. However, replication and other services will resume where they left off prior to the restart.	N/A

Known Issues in NimbleOS version 5.0.10.0				
ID	Component	Title	Description	Workaround
AS-44941	System Mgmt	Adding/removing volumes while replication is in progress may cause Group Management restart	Adding or removing volumes to a volume collection while replication is in progress for that volume collection could potentially lead to a restart of the Group Management services. This does not have a significant impact however, since replication (and other services) resume where they left off before the restart	N/A
AS-74242	System Mgmt	Force deletion of user defined performance policy should not be supported	<p>There is a --force switch available when deleting a performance policy via the HPE Nimble Storage Array CLI.</p> <p>This --force switch does not work and will fail with the following:</p> <p>"ERROR: Failed to delete performance policy. Resource busy."</p> <p>The --force command is not supported since the specified performance policy should not be removed without first checking its volume or folder associations.</p>	N/A