HP 3PAR OS 3.2.1 GA/MU1/EGA/MU2/EMU1 Release Notes

This document describes the features and issues included in HP 3PAR OS 3.2.1 and is intended for use by HP customers, partners, and HP field representatives. This document is applicable to HP 3PAR OS 3.2.1.46, HP 3PAR OS 3.2.1.120 (MU1), HP 3PAR OS 3.2.1.46 (EGA), and HP 3PAR OS 3.2.1.200 (MU2).

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Online Upgrade Considerations

This feature allows upgrade of the OS concurrently with I/O activity on the attached hosts, provided certain conditions are met. For more information regarding the required order for upgrade and installation of software components, see the *HP 3PAR OS 3.2.1 Upgrade Instructions* (P/N QL226-97907). For further information and pre-planning of online upgrades, refer to the latest version of the *HP 3PAR OS Upgrade Pre-Planning Guide*. To obtain a copy of this documentation, go to http://www.hp.com/3par/support_manuals, select your product, and then click **Manuals**.

NOTE: Direct upgrade from HP 3PAR OS 3.1.1 GA to HP 3PAR OS 3.2.1 is not supported. For details about supported upgarde paths, see the Single Point of Connectivity Knowledge for HP Storage Products (SPOCK) website at http://www.hp.com/storage/spock.

NOTE: Software upgrades to HP 3PAR OS 3.2.1 GA for systems that use Remote Copy Synchronous Long Distance Replication and CLX are not supported. This configuration is supported in the HP 3PAR OS 3.2.1 MU1 release.

Supported Platforms

HP 3PAR OS release supports HP 3PAR StoreServ Storage. For details, see the Single Point of Connectivity Knowledge for HP Storage Products (SPOCK) website at http://www.hp.com/storage/spock.

End of Support Features

The following feature is no longer supported by HP 3PAR OS:

- DHCP is not supported for iSCSI targets.

Components

Component	Version
OS	3.2.1.46
CLI Client	3.2.1.46
SNMP Agent	1.7.0
Drive Cage Firmware:	
DC4 Firmware	2.64
DCN1/DCS1/DCS2 Firmware	3218
NEMOE/MCU Firmware	4.61
HBA Firmware:	
QLogic 8G FC (QLFCX)	04.05.01
QLogic 10G CNA (P3+)	04.11.151
QLogic 1G iSCSI (QLIS)	03.00.01.77
LSI SAS 6G (9205)	17.11.00
Emulex 2-port 4G (Helios)	02.82.x10
Emulex 4-port 8G FC (Saturn)	02.02.x15

Component	Version
Emulex 2-port 16G FC (Lancer)	1.1.65.16
Drive Firmware	
FC 15K HVIPC0300GBFC15K/HUS156030VLF400 (DC4) 300G	3P03
FC 15K HVIPC0600GBFC15K/HUS156060VLF400 (DC4) 600G	3P03
HRALP0100GBFCSSD/HUSSL4010ALF400 SSD (DC4) 100G	3P05
HRALP0200GBFCSSD/HUSSL4020ALF400 SSD (DC4) 200G	3P05
ST3300657FC/SEGLE0300GBFC15K FC 15K (DC4) 300G	3P03
ST3600057FC/SEGLE0600GBFC15K FC 15K (DC4) 600G	3P03
SSD HSSC0920S5xnFMRI 150k (DC4/DCN1/DCS2) 920G	3P03
SSD DOPE0480S5xnNMRI 100k (DC4/DCN1/DCS2) 480G	3P01
SSD DOPE1920S5xnNMRI 100k (DC4/DCN1/DCS2) 1920G	3P01
FC HUC101212CSS600/HCEP1200S5xnN010 10k (DC4/DCS2) 1200G	3P00
SSD DOPA0480S5xnNMRI 150 (DC4/DCS2) 480G	3P02
SSD DOPA0920S5xnNMRI 150 (DC4/DCS2) 920G	3P02
SSD HUSMM8040ASS204/HSSC0480S5xnNMRI 150 (DC4/DCS2) 480G	3P02
SSD HUSMM8080ASS204/HSSC0920S5xnNMRI 150 (DC4/DCS2) 920G	3P02
SSD HUSMM8040ASS204/HSSC0400S5xnNMME 150 (DC4/DCS2) 400G	3P02
SSD HUSMM8080ASS204/HSSC0800S5xnNMME 150 (DC4/DCS2) 800G	3P02
NL ST2000NM0023/SMEG2000S5xnN7.2 7.2k (DC4/DCS1) 2000G	3P01
NL ST3000NM0023/SMEG3000S5xnN7.2 7.2k (DCS1) 3000G	3P01
NL ST4000NM0023/SMEG4000S5xnN7.2 7.2k (DC4/DCS1) 4000G	3P01
NL ST2000NM0063/SMEG2000S5xnF7.2 7.2k (DC4/DCS1) 2000G	3P00
NL ST2000NM0063/SMEG4000S5xnF7.2 7.2k (DC4/DCS1) 4000G	3P00
FC ST450MM0036/SLTN0450S5xnF010 10k (DC4/DCS2) 450G	3P00
FC ST600MM0036/SLTN0600S5xnF010 10k (DC4/DCS2) 600G	3P00
FC ST900MM0036/SLTN0900S5xnF010 10k (DC4/DCS2) 900G	3P00
NL HMRP2000S5xnN7.2 7.2k (DC4/DCS1) 2000G	3P00
NL HMRP3000S5xnN7.2 7.2k (DC4/DCS1) 3000G	3P00
NL HMRP4000S5xnN7.2 7.2k (DC4/DCS1) 4000G	3P00
NL HMRP2000S5xnE7.2 7.2k (DC4/DCS1) 2000G	3P00
NL HMRP3000S5xnE7.2 7.2k (DC4/DCS1) 3000G	3P00
NL HMRP4000S5xnE7.2 7.2k (DC4/DCS1) 4000G	3P00
FC SLTNG0450GBAS10K/SLTN0450S5xnN010 10k (DC4/DCS2) 450G	3P01
FC SLTNG0600GBAS10K/SLTN0600S5xnN010 10k (DC4/DCS2) 600G	3P01
FC SLTNG0900GBAS10K/SLTN0900S5xnN010 10k (DC4/DCS2) 900G	3P01
SSD HUSML4040ASS600/HRLP0400S5xnNMLC 150 (DC4/DCS2) 400G	3P02
SSD HUSML4040ASS601/HRLP0400S5xnEMLC 150 (DC4/DCS2) 400G	3P01

Component	Version
FC SLTNG0450GBAS10K/SLTN0450S5xnE010 10k (DCS2) 450G	3P00
FC SLTNG0900GBAS10K/SLTN0900S5xnE010 10k (DCS2) 900G	3P00
FC SAWK1000S5xnN7.2 7.2k (DCS2) 1000G	3P00
NL ST91000640SS/SAWK1000S5xnE7.2 7.2k (DCS2) 1000G	3P00
FC ST9300653SS/SYJKT0300GBAS15K 15k (DC4/DCS2) 300G	3P01
FC HUC109045CSS600/HCBRE0450GBAS10K 10k (DC4/DCS2) 450G	3P02
FC HUC109045CSS600/HCBRE0600GBAS10K 10k (DC4/DCS2) 600G	3P02
FC HUC109090CSS600/HCBRE0900GBAS10K 10k (DC4/DCS2) 900G	3P02
SSD HUSSL4020BSS600/HRALP0200GBASSLC 150 (DCS2) 200G	3P00
SSD HUSSL4010BSS600/HRALP0100GBASSLC 150 (DCS2) 100G	3P00
NL HUS723020ALS640/HMRSK3000GBAS07K 7.2k (DCS1) 3000G	3P02
NL HUS723020ALS640/HMRSK2000GBAS07K 7.2k (DC4/DCS1) 2000G	3P02
NL ST2000NM0011/SMSKP0002TBAT07K 7.2k (DC4) 2000G	3P01
NL ST1000NM0011/SMSKP0001TBAT07K 7.2k (DC4) 1000G	3P01
NL HUA723020ALA640/HMRSK0002TBAT07K 7.2k (DC4) 2000G	3P01

What's New in the OS

The enchancements available in HP 3PAR OS 3.2.1 deliver flash innovations for improved price and performance in both All-flash and hybrid arrays. HP 3PAR OS 3.2.1 also extends high availability between sites to Microsoft Windows environments and extends security to address compliance requirements.

HP 3PAR OS 3.2.1 includes the following new and enhanced features:

- Adaptive Flash Cache software
- Express Writes software
- Supports new 1.92 TB and 480 GB cMLC solid state drives available for HP 3PAR StoreServ 7000, 7450 and 10000 systems
- Peer Persistence enhancements
- Supports FIPS 140.2 compliance with new external secure key managers
- Supports 920 GB FIPS Encrypted MLC SSD
- Interoperability

HP 3PAR Adaptive Flash Cache

HP 3PAR Adaptive Flash Cache is a new feature that accelerates random read workloads by improving the read response time and reducing the latency. This software feature effectively extends controller cache by acting as a second level of read cache between HDDs in the array and the controller cache. HP 3PAR Adaptive Flash Cache extends the system cache virtually—by leveraging flash capacity from the array SSD tier—to dynamically and flexibly accelerate read intensive workloads at no additional cost. Adaptive Flash Cache includes a simulation feature that helps determine the amount of flash that a system requires for random read acceleration.

HP 3PAR Express Writes Software

HP 3PAR Express Writes Software is a write acceleration feature that optimizes CPU utilization to increase throughput, deliver up to 30 percent more IOPS, and reduce latency by up to 20 percent depending on the workload. Express Writes is enabled with transparent FC protocol optimizations. These benefits extend to both spinning drives and flash-based media.

New cMLC drive support

New cMLC drive support is available with HP 3PAR OS 3.2.1. These drives, available in 1.92 TB and 480 GB capacity for 3PAR StoreServ 7000, 7450 and 10000 models, reduce the $/GB of solid state storage, making it more affordable for mainstream applications. These drives support 3PAR Adaptive Sparing which makes more space available to write data so that more capacity is available at the system level in the same footprint.

HP 3PAR Peer Persistence Software

HP 3PAR Peer Persistence Software supports Microsoft Windows 2008 R2 and Microsoft Windows 2012 R2 Server and Hyper-V, in addition to the existing support for VMware. HP 3PAR Peer Persistence software enables HP 3PAR StoreServ systems located at metropolitan distances to act as peers to each other, presenting a nearly continuous storage system to hosts and servers connected to them. This capability allows to configure a high availability solution between two sites or data centers where failover and failback remains completely transparent to the hosts and applications running on those hosts.

HP 3PAR OS 3.2.1 expands host protocol support to iSCSI and FCoE to all the supported Operating Systems. For details, see the Single Point of Connectivity Knowledge for HP Storage Products (SPOCK) website at http://www.hp.com/storage/spock.

HP 3PAR StoreServ FIPS 140-2 compliance

HP 3PAR StoreServ DAR Encryption support for new external key manager makes it possible to comply with FIPS 140-2 encryption regulations. HP 3PAR OS 3.2.1 supports two new external key managers and enables a new FIPS 140-2 validated 920 GB encrypted SSD. The new external key managers are HP Enterprise Secure Key Manager (HP Atalla) 4.0 and SafeNet KeySecure k450 and k150.

Interoperability

Host Operating System Support

HP 3PAR OS 3.2.1 supports Host Persona 15 for Microsoft Windows Server 2008, Microsoft Windows Server 2008 R2, Microsoft Windows Server 2012, and Microsoft Windows Server 2012 R2.

HP 3PAR OS 3.2.1 is the last major HP 3PAR OS release to support Host Persona 1 and 2 with these Windows versions. Subsequent HP 3PAR OS versions will exclusively use Host Persona 15 for Microsoft Windows Server 2008, Microsoft Windows Server 2008 R2, Microsoft Windows Server 2012, and Microsoft Windows Server 2012 R2.

Modifications to the OS

The following items are addressed in this release:

Issue ID	Item	Description
46823	checkhealth reports current FC CRC errors	The `checkhealth -svc -full portcrc` command compares current LESB error counters to the most recent data in the log. If no errors are reported for a port, the most recent 3:37am samples are compared for errors "yesterday". The sample process creates a small

Issue ID	Item	Description
		checkhealth PR log with just two days of data. This allows `checkhealth` to run in less time.
62394	The no_tp_bzero volume policy is disabled as it can result in TPVV corruption.	TPVV tp_no_bzero policy causes data miscompare for writesame zero/unmap CDB. This policy is disabled.
71325	New Remote Copy (RC) group status is defined for growvv fail condition.	New RC group status - Stopped(Grow_Failed) - is defined for a condition where a Virtual Volume(VV) fails to grow. The group cannot be started when VV fails to grow.
72545	Changed default connection mode to point for the `controlport config host` command.	The default connection type for the `controlport config host` command is set to point connection mode because most of the host ports are connected to point to point typologies.
74054	Addresses the IO performance degradation issue.	Addresses the IO performance degradation issue in systems where certain storage classes are configured on only some node pairs.
74879	Fixed hidden option -r for showversion	The `-r` hidden option for the `showversion` command provides information about the previously installed package. The `showversion -r` correctly displays all the patches that are previously installed and that correspond to the package installed earlier.
76043	Checkhealth reports current SAS bus errors	The `checkhealth -svc -full portpelcrc` command compares current PEL error counters to the most recent data in the log. If no errors are reported for a port, the most recent 3:37am samples are compared for errors "yesterday". The sample process creates a small checkhealth PR log with just two days of data. This allows `checkhealth` to run in less time.
81941	The drives are not powered on after power failure.	Resolved an issue where node cage drives are not powered on after power failure.
82555	The `checkhealth` command checks certificate start and end dates.	The `checkhealth cert` command reports certificates that are expired, will expire in less than 30 days, or are not valid until a future date.
82613	The `checkhealth` command evaluates current network counters.	The `checkhealth` command compares current network error counters with the most recent data in the log. If no errors are reported for a port, the most recent 3:37am samples are compared for errors "yesterday".
83037	Incorrectly zoned peer ports appears as host type.	If an array contains peer ports which are not configured correctly in 1:1 zoning relationship with the source array host ports, then `showport -c` command might show port type as host even though the port is functioning correctly.
85043	The `showbattery` command displays the actual battery part data.	The `showbattery`command displays the actual battery part data.
88152	The `checkhealth` command provides correct cable information.	In case of a a bad cable issue such as broken link or speed issue, the `checkhealth` command reports error for the other cable installed in the same disk cage. This is resolved and only the broken cable is reported.
89263	The "Command failed" error message appears during OOTB preserved data LD creation.	If "Command failed" messages appear during OOTB configuration when creating the preserved data storage, run `checkhealth` command after OOTB finishes. If `checkhealth` reports that the LDs are healthy it is safe to ignore the `Command failed` error messages.
92878	A system manager segmentation fault in devices.	A system manager segmentation fault in devices is resolved by adding additional checks in cage monitoring.
93006	Avoid segmentation fault.	There is a small time gap between region move completion task and marking the task as complete. If a user removes a VV in this time gap for a conversion/import/online copy, then the system manager tries to dereference a NULL pointer when the task is marked as completed.

Issue ID	Item	Description
94331	The IMC Volume Raw Space pie chart on the Physical Disks Summary tab incorrectly displays value on StoreServ with Adaptive Optimization software active.	The IMC Volume Raw Space pie chart on the Physical Disks Summary tab incorrectly displays value for the selected device type on StoreServ with Adaptive Optimization software active.
94462	The `admithw` command provides more accurate estimates for the time required to upgrade cages.	The `admithw` command provides more accurate estimates for the time required to upgrade cages.
95124	Node cage ddumps might terminate prematurely.	Node cage ddumps might terminate prematurely. The ddump file is truncated and it does not shoe BBU entries at the end.
95272	The two sides of the cage report different information.	The two sides of the cage report different information regarding the data cache, battery protection, and metis due to synchronization failure.
95425	The `checkhealth port` command reports unavailable host ports.	The `checkhealth port` command reports any host port found in the `servicehost list` output which are not in the state:ready, mode:target, or type:host.
95862	The `upgradecage` command is improved to handle HP 3PAR StoreServ 7000 series node cage PCMs.	Reliability of HP 3PAR StoreServ 7000 series Node Cage Gold PCMs is improved.
96021	The `servicecage hresetfc` command resets correct IO module on HP 3PAR StoreServ 7000 series.	The `servicecage hresetfc` command resets correct IO module on HP 3PAR StoreServ 7000 series.
98151, 99929	Make several commands automatically retry in the tpdtcl layer.	A VV has several kinds of locks to indicate that an operation is in progress on any of the snapshots. If the operation changes the snapshots, then VV first checks these locks. If it finds a lock, it will return that the VV is busy. A delay is added by making several commands in the tpdtcl layer try twice if it finds a lock on the VV. It will wait 5 seconds before the first retry and 10 seconds before the second retry. This will give time for system manager to get the VV unlocked.
98969	The `showvvmap` command provides region count option.	The `showvvmap` command provides region count option. this is hidden option for support.
100611	Reduce the frequency of QW unreachable alerts.	Under certain circumstances, customers might observe a significant number of QW unreachable alerts due to communication failures between HP 3PAR OS and the Quorum Witness Virtual Machine. These alerts are generated due to some transient conditions on the network such as dropped packets, or timeout due to network congestion. This is resolved and HP 3PAR OS performs a number of retries before raising the alert.
101298	Thin To Fat Conversions are made more efficient.	Efficient import for online thin to fat conversions is turned on. This makes sparse thin to fat conversions perform faster.
101357	The `checkealth` command tolerates 100 MHz variations in processor speed.	The `checkealth` command tolerates 100 MHz variations in processor speed similar to the CPU bus speed check tolerance. It also compares CPU speed of all cores of all CPUs.
101399	The IMC might display incorrect interface card port states for Card 1.	On an HP 3PAR StoreServ 7000 system, the IMC displays Card 0 port states for both Card 0 and Card 1. Depending upon the cabling configuration, Card 1 might differ from Card 0. In such cases, the information displayed for Card 1 is incorrect.
101454	The `showportpel compare` command always returns an error.	The `showportpel compare` command always returns an error. This is resolved.
102474	Improved `setrcopygroup reverse` command with `-stopgroup`option.	The `setrcopygroup reverse` command with `-stopgroup`option might fail in certain scenarios when the the groups do not stop in time. This is resolved.

Issue ID	Item	Description
102619	Host name checking is enforced by default.	Host name checking is enforced by default.
102644	The system manager might incorrectly generate the following event/alert: `Minor Node Thermal Status hw_node:3 Node 3: SBB Canister 1 at WARNING level (50 C)`	An incorrect alert by system manager is resolved by changing the alert to post at the correct WARNING level temperature.
102670	60 new timezones are supported with the `setdate -tz` and `showdate` command.	60 new timezones are supported with the `setdate -tz` and `showdate` command. They are as follows: Africa/Asmara Africa/Juba America/Argentina/Buenos_Aires America/Argentina/Catamarca America/Argentina/ComodRivadavia America/Argentina/Cordoba America/Argentina/Jujuy America/Argentina/La_Rioja America/Argentina/Mendoza America/Argentina/Rio_Gallegos America/Argentina/Salta America/Argentina/San_Juan America/Argentina/San_Luis America/Argentina/Tucuman America/Argentina/Ushuaia America/Atikokan America/Bahia America/Bahia_Banderas America/Blanc-Sablon America/Campo_Grande America/Coral_Harbour America/Indiana/Petersburg America/Indiana/Tell_City America/Indiana/Vincennes America/Indiana/Winamac America/Kralendijk America/Lower_Princes America/Marigot America/Matamoros America/Metlakatla America/Moncton America/North_Dakota/Beulah America/North_Dakota/New_Salem America/Ojinaga America/Resolute America/Santa_Isabel

Issue ID	Item	Description
		America/Santarem America/Sitka America/St_Barthelemy America/Toronto Antarctica/Macquarie Antarctica/Rothera Asia/Hebron Asia/Ho_Chi_Minh Asia/Kathmandu Asia/Kolkata Asia/Makassar Asia/Novokuznetsk Atlantic/Faroe Australia/Currie Australia/Eucla Europe/Guernsey Europe/Isle_of_Man Europe/Jersey Europe/Mariehamn Europe/Podgorica Europe/Volgograd Pacific/Chuuk Pacific/Pohnpei US/Pacific-New
103167	An FCoE port active due to persistent ports failover is taken offline. However, the port is not fully logged out of the fabric and subsequent calls to `showhost` provides information about the hosts associated with that port.	An FCoE port active due to persistent ports failover is taken offline. However, the port is not fully logged out of the fabric and subsequent calls to `showhost` provides information about the hosts associated with that port. This is resolved.
103208	Resolved a potential core dump from occurring during database creation.	This does not allow a bad memory reference from being used during database creation.
103209	Resolved a potential core dump from occurring while issuing a CT command.	This does not allow a bad memory reference from being used when a CT command is issued to the nameserver.
103210	Resolved a potential core dump from occurring during vport control.	This does not allow a bad memory reference from being used while enabling or disabling a vport.
103213	Resolved a potential core dump from occurring after receiving ENTRY_ABTS_RECEIVED message.	This does not allow a bad memory reference from being used after receiving iocb message ENTRY_ABTS_RECEIVED.
103214	Resolved a potential core dump from occurring when disabling target mode I/O.	This does not allow a bad memory reference from being used when disabling target mode I/O.
103215	Resolved a potential core dump from occurring while handling an asynchronous interrupt.	This does not allow a bad memory reference from being used by the asynchronous interrupt handler.

Issue ID	Item	Description
103217	Resolved a potential core dump from occurring during CTIO return message processing.	This does not allow a bad memory reference from being used by the CTIO return message processing.
103218	Resolved a potential core dump from occurring in the abort monitor thread.	This does not allow a bad memory reference from being used in the abort monitor thread.
103219	Corrected a macro that compares unsigned to 0 (NO_EFFECT).	A comparison that has no effect is removed.
103221	Resolved undetermined behaviour in CNA FW download.	Several previously uninitialized variables are initialized and the outcome of the CNA FW download function is more deterministic.
103267	HP 3PAR StoreServ Storage 7000 system PCM fans stay at high speeds.	HP 3PAR StoreServ Storage 7000 system PCM fans stay at medium or high speed for hours, without any environmental cause. This is resolved.
103288	Long resynchronization time for large remote copy volumes if any failed I/O exist.	Large remote copy volume resynchronization takes considerable time if any failed IO exist. This is addressed.
103679	New Qlogic CNA firmware.	Qlogic CNA firmware is updated to address a heartbeat failure.
103713	The deinstall script is not properly set up for Smartstart.	Due to an issue, the deinstall scripts does not work with Smartstart. The scripts are improved so that Smartstart can be used.
104068	The NEMOE version can be displayed or printed using the `shownode -mcu` command.	The NEMOE version can be displayed or printed using the `shownode -mcu` command.
104168	Correct reporting of writeback cache enable bit.	The WCE bit in the Cache Mode page(08h) is set to zero. This enables correct reporting of writeback cache enable bit.
104182	The checkhealth host checks NPIV state of the FC switch port.	The checkhealth host checks NPIV state of the FC switch port at time of login. A state can be updated using command `controlport rst n:s:p`.
104242	Node rescue lock is released automatically when it is manually terminated.	If iderescue is manually terminated during a node rescue, then you need not manually remove the lock file.
104273	Default R1 NL CPGs are not created.	Default R1 NL CPGs are not created. OKVs is used on the admin volume to track if default CPGs are created before, and do not recreate even if there are no CPGs of that type present.
104334	64k and 16k memory leak when RCFC link goes down or comes up.	When RCFC link comes up, memory is allocated in rcfc_test_link_rx_thread but the memory is not free when the thread exits. This is resolved and the memory is available when the thread exits.
104978	Improved error messages.	Error messages are improved when no targets are configured.
105067	Resolved tpd_timeout assertion in INQ code	A synchronization issue that can lead to a tpd_timeout assertion when processing INQ VPD C0h commands is addressed.
105678	New RAID-6 LDs with set sizes 6, 10, and 16 provide increased performance due to internal layout rearrangement.	New RAID-6 LDs with set sizes 6, 10, and 16 provide increased performance due to internal layout rearrangement. Old LDs can be converted to one of these three target set sizes by using tunesys.
105910	Resolved node outage due to SCSI token inconsistency.	This addresses a race condition in which the latest SCSI token data for a LUN is not updated on a new node joining the cluster after a power failure. This leads to a token inconsistency across the cluster forcing a node to go down.
106556	Resolved iSCSI error `fatal exception in interrupt` from abort processing.	This addresses a bad memory reference in the iSCSI driver's abort command processing when completing a port reset.

Issue ID	Item	Description
106779	Tunesys node level tuning is improved so that it does not shuffle chunklets between disks.	An issue in the `tunesys` command causes chunklets to swap between the disks during the intra-node phase. This is resolved using a combination of a redesign of the `tunenodech` command, and a low-level mechanism to specifically disallow chunklet movement to specified disks.
106931, 106933	In networks with a large number of attached hosts, a reboot of the master node can cause an unnecessarily large workload on the StoreServ system manager. This can lead to slow integration of the node or slow response to host inquiry commands.	In networks with a large number of attached hosts, a reboot of the master node can cause an unnecessarily large workload on the SroreServ system manager. This can lead to slow integration of the node or slow response to host inquiry commands. This is resolved.
107805	The minimum like disk requirements are changed.	New minimum disk requirements per node pair for like disks (class,speed,capacity) are: NL minimum for all: 12 FC minimum for p-10000 system: 8 FC minimum for all 7000 series types: 6
108192	System might start with insufficient disks after powerfail .	When trying to recover after a power failure or cluster panic, the system could incorrectly attempt to start when only a low number of disks are present, leading to another cluster panic. This is resolved and require roughly 60% of the disks to be present before the system attempts to start up.
108328	New `relocatepd` command	**NOTE:** This is a hidden command and is only intended for TS and any approved partners to use. The `relocatepd` command facilitates the moving of one or more disks from the current location to an empty location. Each location pair is specified using the following <location_pair> format: `<src_cage>:<src_slot>-<dst_cage>:<dst_slot>` It allows up to eight location pairs to be specified in single command. The individual disk relocate operations are executed one at a time and in any order.
108744	IDE erase failure with SanDisk X110 boot drive is addressed.	IDE erase or AHCI erase command on whack fails with SanDisk X110 boot drive. HP 3PAR StoreServ 7000 series BIOS is modified to use the user password for security erase to support SanDisk X110 drive security erase.
109774	Node rescue could result in system manager deadlock.	With certain network configurations, attempting to perform a node rescue could result in the system manager locking up. This issues is resolved.
109800	If a loss of power is experienced by HP 3PAR StoreServ during the boot up cycle after Linux is loaded, the node might be unresponsive with a tpd_assert() due to incomplete boot up processing of the TPD power fail subsystem.	If a loss of power is experienced by HP 3PAR StoreServ during the boot up cycle after Linux is loaded, the node might be unresponsive with a tpd_assert() due to incomplete boot up processing of the TPD power fail subsystem. This happens only if the power loss occurs between the narrow window after Linux boots but before system initialization is complete. This issue happens only with P10000 series platforms for the HP 3PAR OS version 3.2.1. This is resolved.
109822	An alert is provided at the correct WARNING level temperature.	An alert is provided at the correct WARNING level temperature.
110782	Allow access to read-only standby non-Peer Persistence Remote Copy volumes during upgrade.	Due to a change in ALUA path management policies between HP 3PAR OS version 3.1.2 and 3.1.3, standby read-only volumes became inaccessible during an online upgrade. This is resolved by allowing access to the standby LUNs during the upgrade.
110881	When the Remote Copy group is started, incorrect error handling	When the Remote Copy group is started, incorrect error handling might cause Virtual Volumes to remain in locked state. Therefore, the system

Issue ID	Item	Description
	might cause Virtual Volumes to remain in locked state. Therefore, the system becomes unresponsive for Virtual Volumes operation such as snapshot creation.	becomes unresponsive for Virtual Volumes operation such as snapshot creation. This is resolved and the virtual volumes are restored to their unlocked state.
111479	The `controlport rcip` ping can not prevent administrative access.	Using `controlport rcip` ping on an IP address prevents that IP address from being able to access the admin IP address of the system. This is addressed.
111748	Support for TRX10GVP2010CA03 10G SFP.	Added support for TRX10GVP2010CA03 10G SFP.
113857	An issue with upgrading the BIOS.	An issue with corrupt directory permissions could result in the BIOS not being properly flashed during an upgrade. This issue is automatically detected and corrected on upgrades.
114272	TPVV volume grow request is delayed during system manager failover.	During a system manager failover, due to reboot of the master node or otherwise, a timing window could cause a queued TPVV grow request to be attempted before initialization had progressed to the point where it could be handled. The delay resulting from this might cause snapshots to be marked as stale. The initialization is now done at an earlier point to prevent this issue.

Known Issues with the OS

Issue ID	Item	Description
67582	Potential system manager core at upgrade on systems with AIX and HP-UX hosts.	There is an issue with how AIX and HP-UX hosts are handled in managing their state between system manager and the kernel and it might result in unresponsive system manager. This can cause an issue during an upgrade. Workaround: Examine `showhost` before the upgrade and confirm that all expected entries are present. For missing entries, use `controlport rst` on the port.
69962	Tasks on the array can be ran by local users only.	Tasks like `tunesys` can be run by local users only since the system authenticates users before running these tasks. LDAP user credentials are not maintained locally on the array's persistent repository. Therefore, LDAP users fail authentication and tasks cannot run. Workaround: Use a local user for tasks like `tunesys`.
86140	When setting up a remote copy over fibre channel, there might be an issue if the ports are configured before taking them offline.	When setting up a remote copy over fibre channel, HP recommends to take the ports offline before configuring them. To take the port to be used for the FC RC configuration offline, use the `controlport offline` command. After both ports report as offline, then to configure each port to be an RCFC port, use the `controlport config rcfc -ct point - f` command. The ports must report that they are 'ready' and have a type of 'RCFC'. To confirm this, use the `showport -rcfc` command. Do not continue configuring the fibre channel remote copy ports until both systems report the expected results:`showport -rcfctype: rcfcstate: readyshowrctransport -rcfcstate: new` If the expected states are not meet, take the ports back to the offline state and start again.
96155	Disable health check of non-active network management interface.	To disable the check for admin link status on the array, a `checkhealth_skip_admin_link_check` file must be created on all nodes in `/common/touchfiles`. This file is not reported by `checkhealth` so that the system continues to report "healthy" but it does not bring up the admin interfaces on non-active nodes to prevent unnecessary monitoring alerts in a very sensitive network monitoring.

Issue ID	Item	Description
101049	Renaming a CPG when tunesys is running might cause tunes to fail.	Tunesys can generate a large number of tune commands during the analysis phase. If a CPG is renamed before the generated tunes are executed, the tunes might fail. Workaround: Do not change the name of CPGs when tunesys is running.

103706	If the test after firmware upgrade of a drive using a bridge fails, it leaves the PD in logging and does not turn on LD alloc or move chunklets back to the drive.	When upgrading to HP 3PAR OS 3.2.1, the upgrade process calls `admithw` automatically as a post upgrade task. This upgrades the HMRSK2000GBAS07K disk drives to the 3P02 firmware. After the new drive firmware is upgraded, the upgraded code will call the checkpd diagnostic which turns off ld allocation and sets the lds in logging mode during the diagnostic. Some of these diagnostics fail leaving the disk with ld allocation turned off and the lds in logging mode.
		Workaround: To resolve this:
		`setpd log off`
		[Wait for chunklets to come out of logging]
		`setpd ldalloc on`
		`moverelocpd`
		Example using pdid 12:
		`root@inodee2d1b:~# setpd log off 12`
		[Wait for chunklets to come out of logging]
		`root@inodee2d1b:~# setpd ldalloc on 12`
		`root@inodee2d1b:~# showpd -i -p -devid HMRSK2000GBAS07K 12`
		`12 0:3:0 normal 5000CCA01CBA5CFD HITACHI HMRSK2000GBAS07K YGK9H8ZK 3P02,2498 SAS Magnetic`
		`root@inodee2d1b:~# moverelocpd 12`

104955	After upgrading to HP 3PAR OS 3.2.1, `admithw scheds` must be called.	After upgrading to HP 3PAR OS 3.2.1, `admithw scheds` must be called to ensure that the scheduler is updated with the schedule `checkiperfserver`.
105638	For ESX, upgrade issues occur if "auto_failover" is not set for existing PP group.	To avoid issues while upgrading to HP 3PAR OS 3.2.1 with ESX hosts connected: 1. For PP groups, to set auto_failover for all primary groups on both arrays: `setrcopygroup pol auto_failover` 2. Complete upgrade to HP 3PAR OS 3.2.1. 3. After upgrade is complete, to remove auto_failover for non-auto PP primary group on both arrays: `setrcopygroup pol no_auto_failover`.
110704	An entire system might become unresponsive during a two node system online upgrade from HP 3PAR OS 3.1.2.GA to HP 3PAR OS 3.1.2.MU2 and HP 3PAR OS 3.1.2.MU3.	An entire system might become unresponsive during a two node system online upgrade from HP 3PAR OS 3.1.2.GA to HP 3PAR OS 3.1.2.MU2 and HP 3PAR OS 3.1.2.MU3. This issue arises when the node to be upgraded is unresponsive or is rebooted without using the `upgradesys` command. Workaround: Revert the upgraded node and restart the online upgrade.
111310	For Windows Peer Persistence support, the recovery procedure must be updated to include a manual disk rescan from Windows Disk Management.	For Windows Peer Persistence support, the recovery steps after an automatic failover must include a manual disk rescan from Windows Disk Management to allow failback to the original configuration. The manual disk rescan must be performed after the `setrcopygroup recover` command is issued and before the replication is switched back to its original direction.

Issue ID	Item	Description
111675	If the master node is rebooted while there are ports in a 'failback_pending' state, those ports might enter in an offline or an unconfigured state.	If the master node is rebooted while there are ports in a 'failback_pending' state, those ports might enter in an offline or an unconfigured state.
113925	Peer Persistence Windows 2012 R2 Live Migration of Clustered VM's using vFC adapters is not supported.	Peer Persistence Windows 2012 R2 Live Migration of Clustered VM's using vFC adapters is not supported.
114502	Insufficient checks on target version volume limit during downgrade.	If the cluster has more than 4k volumes and is downgraded to a version lower than HP 3PAR OS 3.1.3, the downgrade succeeds, but volumes over the 4k limit show as internal_consistency_error. Workaround: Remove or migrate some volumes before performing a downgrade.

2 HP 3PAR OS 3.2.1 CLI Release Notes

Installation Notes for the CLI

Virus Checking

Virus checking is known to slow down and potentially cause issues with installation of the CLI. Before attempting an install or uninstall of the OS CLI, shut down all running applications and disable virus-checking software.

Deleted commands

The deprecated commands mentioned in HP 3PAR OS 3.1.3 are deleted.

Compatibility Changes in Next Release

Remote CLI client versions earlier than Remote CLI client 3.1.2 cannot connect to the HP 3PAR OS.

Installation Directory

The default location for HP 3PAR CLI installation is changed. You must manually remove the previous version of HP 3PAR CLI, if you are using a version earlier than HP 3PAR CLI 3.1.3.

Windows 32-bit system:

Old Installation Location: `C:\Program Files\3PAR\inform_cli_<version>`

New Installation Location: `C:\Program Files\Hewlett-Packard\HP 3PAR CLI`

Windows 64-bit system:

Old Installation Location: `C:\Program Files (x86)\3PAR\inform_cli_<version>`

New Installation Location: `C:\Program Files (x86)\Hewlett-Packard\HP 3PAR CLI`

UNIX and Linux:

Old Installation Location: `/opt/3PAR/inform_cli_<version>`

New Installation Location: `/opt/hp_3par_cli`

The program menu is changed in Microsoft Windows OS:

Old menu: **Start→Programs→HP 3PAR→HP 3PAR CLI <version>**

New menu: **Start→Programs→HP 3PAR CLI→HP 3PAR CLI <version>**

Supported Operating Systems

For the list of supported operating systems, see the *HP 3PAR CLI Remote Client* document under Single Point of Connectivity Knowledge for HP Storage Products (SPOCK) website at http://www.hp.com/storage/spock.

NOTE: Support for the following additional operating systems is provided in this release:

- Red Hat Enterprise Linux 6 Update 5 (RHEL 6.5)
- Ubuntu 12.04 LTS
- Solaris 11
- Windows 8.1 Enterprise 64-bit

What's New in the CLI

The following new commands are added in HP 3PAR CLI 3.2.1:

Command	Description
createflashcache	Create flash cache for the cluster.
importcert	Import a signed certificate and supporting CAs (Certificate Authorities) for the HP 3PAR Storage System SSL services.
removecert	Remove SSL certificates from the HP 3PAR StoreServ Storage System.
removeflashcache	Remove flash cache from the cluster.
removespcredential	Remove all Service Processor credentials on the array.
setflashcache	Set the flash cache policy for virtual volumes.
setsshbanner	Set the SSH banner that is displayed before the user logs in.
showflashcache	Show either the status of the flash cache per node or flash cache policy for virtual volumes.
showsr	Show System Reporter status.
showsshbanner	Show the SSH banner that is displayed before the user logs in.
srstatcache	System reporter performance reports for flash cache and data cache.
statcache	Show the flashcache and data cache statistics in a timed loop.

Changed commands

Command	Options added (unless stated otherwise)
admithw	-nopatch
checkrclink	-startserve
compactcpg	-nomatch
controlencryption	-setekm
createcert	
createuser	(New audit user)
movech	-perm (changed)
setnet	-disableports
setsched	-pauseduration
setcim	-pol
setsys	-param SessionTimeout
setuser	(audit user)
setuseracl	(audit user)
setvv	-udid
showcert	
showcim	-pol
showpd	-i (additional output)
showuser	-domain

Command	Options added (unless stated otherwise)
showwsapi	-d
showwsapisession	-at
sr*	-btsecs (defaults changed)
sraomoves	-vv, -withvv
srpdspace	-capacity
startao	-vv
tunesys	-devtype

Removed and Deprecated Commands and Options

The following commands are removed or deprecated in the OS 3.2.1 release.

Removed Commands and Options	
createald	No equivalent command.
createaldvv	Use the createvv command instead.
createavv	Use the createvv command instead.
createld	Use the createvv command instead.
createtpvv	Use the createvv -tpvv command instead.
cli -pwf	No equivalent command.
cli -password	No equivalent command.
controliscsiport dhcp	DHCP is not supported on iSCSI ports.
growaldvv	Use the growvv command instead.
growavv	Use the growvv command instead.
growtpvv	Use the growvv command instead.
setcim	The -httpport and -httpsport options are deprecated.
setpassword -save	No equivalent command.
setpassword -saveonly	No equivalent command.
setntp	Use the setnet ntp command instead.
srstatqos	Options -vvset and -all_others are deprecated
tunealdvv	Use the tunevv command instead.
tunetpvv	Use the tunevv command instead.

Modifications to the CLI

Issue ID	Item	Description
24181	Add support for CLI idle session timeout.	Support for CLI idle session timeout is added.
70792, 100955	The `tunesys -tunenodech` command can now move eight chunklets at a time.	The `tunesys` command can move up to eight chunklets at a time. The default value is eight, but a lower value can be specified.
86454	The `tunesys` command is enhanced to include `-devtype` option.	The `tunesys` command is enhanced to include `-devtype` option. This allows rebalancing of a single device type such as SSD, FC, or NL on a given node.
86894	Added AdmissionTime in the `showpd` command output.	Added AdmissionTime in the `showpd` command output using option `-i`.
87003	For the `dismissrcopyvv` command, options after `-pat` are ignored.	For the `dismissrcopyvv` command, options after `-pat` are ignored.
87174	An issue where the `tunesys` command results in a disk utilization layout different from the other system commands such as `createvv` and `VV growth`.	An issue where the `tunesys` command results in a disk utilization layout different from the other system commands such as `createvv` and `VV growth`. This is resolved and the `tunesys` command produces a layout similar to the rest of the system.
88509	The tunesys node level tuning displays incorrect values for task step.	When `tunesys` performs node level tuning, the task step (the number of chunklets to move divided by number of chunklets moved) for tunenodech tasks is displayed incorrectly.
92443	The `tunesys` command is improved to handle small incremental upgrades.	The `tunesys` command is improved to handle small incremental upgrades.
96087	The tunesys intra-node phase (tunenodech) does not rebalance usage correctly.	Tunesys - intra-node phase distributes chunklets correctly during tunes. The final disk usage balance after tuning is similar to a newly laid-out configuration.
98692	The `tunesys` command is enhanced.	The `tunesys` command is enhanced. The `Tunesys: tunenodech` component changes its task reporting to indicate data movement. The task Max Step field shows the number of GiB to move. The task current step field shows the number of GiB moved.
100880	The tunesys tuneld phase can exit unexpectedly.	The tuneld phase of `tunesys` command can exit unexpectedly if AO is moving a region in an LD when `tunesys` runs tuneld on that LD, or compactcpg on the related CPG. This is resolved.
100955	The `tunesys -tunenodech` command can move up to eight chunklets at a time.	The `tunesys - tunenodech` command can move up to eight chunklets at a time.
101053	Warning message added to the `setrcopygroup override` command.	Warning message are added to the `setrcopygroup override` command when the force option is applied. This is to let the customer know that if f I/O is running it might cause loss of data. The customer can continue or cancel the command if the I/O is running.
101198	When the admin space of the VV is correctly balanced between the nodes but the USR space of the VV is not balanced, a TPVV is not tuned.	When the admin space of the VV is correctly balanced between the nodes but the USR space of the VV is not balanced, a TPVV is not tuned. This is resolved.

Issue ID	Item	Description
101623	A new `-pauseduration` option is provided for `setsched -suspend` and `setsched -suspend_all` command.	A new `-pauseduration` option is provided for `setsched -suspend` and `setsched -suspend_all` command.
102474	Improved `setrcopygroup reverse` command with `-stopgroup`option.	The `setrcopygroup reverse` command with `-stopgroup` option might fail in certain scenarios when the groups do not stop in time. This is resolved.
103969	If all of the PDs of a given devtype are close to 100% utilized, tunesys does not attempt to perform inter-node tuning for that devtype.	Tunesys performs inter-node tuning even if all PDs of a devtype are 100% used on some node pairs.
104439	Multiple events logging a single showeventlog are suppressed.	For a large number of events, `showeventlog` generates multiple geteventlog entries but only first entry is logged.
104787	Checking the `-hafter` argument for missing or invalid values.	Checking the `-hafter` argument for missing or invalid values.
105891	The `showcpg -r` command provides an incorrect value for TPVV raw used space.	The `showcpg -r` command provides an incorrect value for TPVV raw used space. This is resolved.
105929	New data columns are added to the `srstatcmp` command output.	With the availability of new vSSD drives, new corresponding data columns are added to the `srstatcmp` command output to display statistics specific to these drives.
106779	Tunesys node level tuning is improved so that it does not shuffle chunklets between disks.	An issue in the `tunesys` command causes chunklets to swap between the disks during the intra-node phase. This is resolved using a combination of a redesign of the `tunenodech` command, and a low-level mechanism to specifically disallow chunklet movement to specified disks.
107400	Tunesys - inter-node tuning phase will skip small volumes.	The analysis technique used to determine when inter-node tuning is required skips small volumes. These are volumes which if created in isolation would not spread to all possible nodes given the RAID type and set size of the volume. This is by design.
107999	If an illegal `creategroupsv` is issued with some options but not VV, then tpdtcl aborts with a signal 11.	If an illegal `creategroupsv` is issued with some options but not VV, then tpdtcl aborts with a signal 11 and the CLI is disconnected. The `creategroupsv` displays following error: `Insufficient number of arguments`
108197	A new CLI command `srstatcache` is added.	A new CLI command `srstatcache` is added to display flashcache statistics including historical storage for performance analysis of recent flashcache activity.
110217	The `showsr` CLI command is available to all user permission levels.	To be consistent with other System Reporter commands, the `showsr` CLI command is available to all user permission levels. This command displays overall status of the on-node System Reporter.
112163	The `showportdev ns` command is improved to add symbolic node name functionality.	The `showportdev ns` command is improved to add symbolic node name functionality. A 'SNN' column is added to the output of the `showportdev ns` CLI command. This contains the 'symbolic node name' string that a fiber channel device has registered with the name server function of the FC fabric.

Known Issues with the OS CLI

Issue ID	Item	Description
114528	The `showvlun -host set:hset` command might give Internal CLI error: tableSetWidth	Using the `showvlun -host set:hset` command on a system with more than 1000 VLUNs might give internal errors mentioning: Internal CLI error: tableSetWidth line has 8 columns but tableWidth has 6 columns. This can occur if the `showvlun` command is repeated several times in the same session. **Workaround**: Active VLUNs cannot match the `-host set:hset` syntax. Use the command: `showvlun -t -host set:hset`.

3 HP 3PAR OS 3.2.1 CIM API Release Notes

What's new with HP 3PAR CIM API

- The 3PAR SMI-S provider supports Remote Copy extensively. The changes in the implementation of the replication services profile are as follows:
  - Added support for the following extrinsic methods in `ReplicationServiceCapabilities` class:
    - `GetSupportedOperations`
    - `GetSupportedGroupOperations`
    - `GetSupportedWaitForCopyStates`
  - Added support for the following extrinsic methods in `ReplicationService` class:
    - `GetServiceAccessPoints`
    - `ModifyReplicaSynchronization`
    - `CreateGroup`
    - `DeleteGroup`
  - Added support for the following extrinsic methods in `ReplicationGroup` class:
    - `AddMembers`
    - `RemoveMembers`
  - Added support for the `ReplicationEntity` class in TPD_RemoteStorageSynchronized association. This change is not backward compatible with the HP 3PAR OS 3.1.3 firmware. To revert to HP 3PAR OS 3.1.3 behavior, a new option to the `setcim` command allows the CIM server to run in legacy mode. For details, see the CIM *API developer's guide*.
  - Changes to `TPD_ReplicationServiceCapabilities` to support mirror copy
  - Changes to `TPD_ReplicationService.CreateGroupReplicaFromElements` to allow the creation of remote copy groups

Interface changes

- The HP 3PAR OS platform supports CA signed certificates.

Removed and Deprecated Commands and Options

- The `-httport` and `-httpsport` options for the `setcim` CLI command are deprecated.

Modifications to the HP 3PAR CIM API

Issue ID	Item	Description
103708	Inconsistent associations with SCSI controller.	Since provider does not support Group Masking and Mapping, there is no corresponding TPD_SCSIController instances as there are no volumes existing in an empty vvset. However, enumerating on TPD_ControllerForUnit and TPD_PrivilegeForSCSIController associations would yield TPD_SCSIController corresponding to the

Issue ID	Item	Description
		host, thus resulting in inconsistencies. Filtering out template vvset export that is empty should fix the issue.
100543	Association of AuthorizedPrivilege with ResultClass=TPD_AuthorizedPrivilege returns instances of different types	This is resolved by modifying the definition of the following classes: • TPD_PrivilegeForStorageHardwareID • TPD_PrivilegeForSCSIController • TPD_PrivilegeForStorageHardwareIDCollection • TPD_ManagementServiceForAuthorizedPrivilege • TPD_PrivilegeForiSCSIController
102900	SMI-S is supported for Remote Replication with Microsoft Hyper-V Recovery Manager.	Microsoft Hyper-V Recovery Manager (SANDR/AZURE) is supported. This provides the ability to configure new remote copy groups with the `ReplicationServices` function `CreateGroupReplicaFromElements()`. It also provides the ability to perform disaster recovery operations such as failover, failback, reverse roles, and resysnc with `ModifyReplicaSynchronization()`.
106138	When calling `CreateOrModifyElementFromStoragePool` to grow a volume, the operation succeeds but the resulting output parameter *`TheElement`* contains reference to an incorrect StorageVolume.	When calling `CreateOrModifyElementFromStoragePool` to grow a volume, the operation succeeds but the resulting output parameter *`TheElement`* contains reference to an incorrect StorageVolume. This is resolved.
106762	Under certain circumstances, Provider might return incomplete list of TPD_VolumeAllocatedFromDynamicPool instances.	Under certain circumstances, Provider might return incomplete list of TPD_VolumeAllocatedFromDynamicPool instances. This is resolved.
108597	Sequence of statistics received from `BlockStatisticsService.GetStatisticsCollection` does not match the CSVSequence as defined in BlockStatisticsManifest.	Sequence of statistics received from `BlockStatisticsService.GetStatisticsCollection` does not match the CSVSequence as defined in BlockStatisticsManifest. This is resolved.
110819	The `setcim` command options `-httpport` and `-httpsport` are deprecated.	The `-httpport` and `-httpsport` options are deprecated. These options allow the user to set a non-default value for the CIM server's http and https ports. These options are deprecated because the StoreServe now blocks all connections to tcp/udp ports with non-default values.
111687	Volume might not be created due to "Size Not Supported" error.	Calling `CreateOrModifyElementFromStoragePool` to create a fully provisioned volume might occasionally and incorrectly result in a 4097 "Size Not Supported" error, even though the InPool has enough capacity. This is resolved.

Known Issues of the HP 3PAR OS CIM API

Issue ID	Item	Description
100831	Error messages for cimserver requests are truncated	Error messages for SMI-S requests to the cimserver are truncated to about 85 characters. The view the full text of an error message, examine the cimserver log file at /var/log/tpd/cimserver.

4 HP 3PAR OS 3.2.1 Web Services API Release Notes

What's New with the HP 3PAR Web Services API Software

- The 3PAR Web Services API now supports basic Remote Copy functionality:
  - Get the general state and mode of remote copy systems
  - Get detailed remote copy group configuration information
  - Create or Delete remote copy groups
  - Add or Remove volumes to or from remote copy groups
  - Start or Stop remote copy groups
- New query facilities:
  - Query a VLUN based on volume WWN, host WWN or iSCSIName
  - Query volumes based on a volume UUID or a CPG name
- Ability to list user privileges

Interface Changes

- The 3PAR platform now supports CA signed certificates.

Modifications to the HP Web Services API

Issue ID	Item	Description
107956	Return NON_EXISTENT_VLUN error when querying for single instance of VLUN with invalid LUN ID.	When the user queries for a single instance of VLUN with LUN ID out of range, map the error message and return NON_EXISTENT_VLUN instead of returning INT_SERV_ERR.

Known Issues

Issue ID	Item	Description
87441	Domain user is unable to perform certain operations outside default domain.	Domain users with access to multiple domains must specify a domain when creating hosts, CPGs, or host/volume sets. Otherwise, the objects will be created in their default domain (as defined using the CLI). If the domain users does not have “all” domain access, they can not create/modify/remove volumes in any domain other than the default domain.
91250	Premature `maximum number of server connections has been reached` error.	When at least one user is already connected to the target array via the WSAPI server and a new user requests a session key, under certain circumstances, the WSAPI server might return an error even though the theoretical number of sessions is not reached. Workaround: Remove all the sessions associated with a currently connected WSAPI user to make room for the requested new session key. To remove all the sessions associated with a WSAPI user, use the CLI command:`removewsapisession -f -pat *`

5 HP 3PAR OS 3.2.1 MU1 Release Notes

Online Upgrade Considerations

This feature allows upgrade of the OS concurrently with I/O activity on the attached hosts, provided certain conditions are met. For further information and pre-planning of online upgrades, refer to the latest version of the *HP 3PAR OS Upgrade Pre-Planning Guide*. To obtain a copy of this documentation, go to http://www.hp.com/3par/support_manuals, select your product, and then click **Manuals**.

NOTE: Direct upgrade from HP 3PAR OS 3.1.2 MU2 or earlier to HP 3PAR OS 3.2.1 MU1 is not supported. For details about supported upgrade paths, see the Single Point of Connectivity Knowledge for HP Storage Products (SPOCK) website at http://www.hp.com/storage/spock.

NOTE: Patch 41 (P41) is a mandatory patch that must be installed on the HP 3PAR OS 3.1.2.484 (MU3) before upgrading to HP 3PAR OS 3.2.1.120.

NOTE: For HP 3PAR OS 3.1.3 patch documentation, see the Storage Information Library http://www.hp.com/storage/docs.

Supported Platforms

HP 3PAR OS release supports HP 3PAR StoreServ Storage. For details, see the Single Point of Connectivity Knowledge for HP Storage Products (SPOCK) website at http://www.hp.com/storage/spock.

Components

Component	Version
OS	3.2.1.120
CLI Client	3.2.1.120
SNMP Agent	1.7.0
Drive Cage Firmware:	
DC4 Firmware	2.64
DCN1/DCS1/DCS2 Firmware	3218
NEMOE/MCU Firmware	4.62
HBA Firmware:	
QLogic 8G FC (QLFCX)	04.05.01
QLogic 10G CNA (P3+)	04.11.151
QLogic 1G iSCSI (QLIS)	03.00.01.77
LSI SAS 6G (9205)	17.11.00
Emulex 2-port 4G (Helios)	02.82.x10
Emulex 4-port 8G FC (Saturn)	02.02.x15
Emulex 2-port 16G FC (Lancer)	1.1.65.16
Drive Firmware	
FC 15K HVIPC0300GBFC15K/HUS156030VLF400 (DC4) 300G	3P03

Component	Version
FC 15K HVIPC0600GBFC15K/HUS156060VLF400 (DC4) 600G	3P03
HRALP0100GBFCSSD/HUSSL4010ALF400 SSD (DC4) 100G	3P05
HRALP0200GBFCSSD/HUSSL4020ALF400 SSD (DC4) 200G	3P05
ST3300657FC/SEGLE0300GBFC15K FC 15K (DC4) 300G	3P03
ST3600057FC/SEGLE0600GBFC15K FC 15K (DC4) 600G	3P03
SSD HSSC0920S5xnFMRI 150k (DC4/DCN1/DCS2) 920G	3P03
SSD DOPE0480S5xnNMRI 100k (DC4/DCN1/DCS2) 480G	3P01
SSD DOPE1920S5xnNMRI 100k (DC4/DCN1/DCS2) 1920G	3P01
FC HUC101212CSS600/HCEP1200S5xnN010 10k (DC4/DCS2) 1200G	3P00
SSD DOPA0480S5xnNMRI 150 (DC4/DCS2) 480G	3P02
SSD DOPA0920S5xnNMRI 150 (DC4/DCS2) 920G	3P02
SSD HUSMM8040ASS204/HSSC0480S5xnNMRI 150 (DC4/DCS2) 480G	3P02
SSD HUSMM8080ASS204/HSSC0920S5xnNMRI 150 (DC4/DCS2) 920G	3P02
SSD HUSMM8040ASS204/HSSC0400S5xnNMME 150 (DC4/DCS2) 400G	3P02
SSD HUSMM8080ASS204/HSSC0800S5xnNMME 150 (DC4/DCS2) 800G	3P02
NL ST2000NM0023/SMEG2000S5xnN7.2 7.2k (DC4/DCS1) 2000G	3P01
NL ST3000NM0023/SMEG3000S5xnN7.2 7.2k (DCS1) 3000G	3P01
NL ST4000NM0023/SMEG4000S5xnN7.2 7.2k (DC4/DCS1) 4000G	3P01
NL ST2000NM0063/SMEG2000S5xnF7.2 7.2k (DC4/DCS1) 2000G	3P00
NL ST2000NM0063/SMEG4000S5xnF7.2 7.2k (DC4/DCS1) 4000G	3P00
FC ST450MM0036/SLTN0450S5xnF010 10k (DC4/DCS2) 450G	3P00
FC ST600MM0036/SLTN0600S5xnF010 10k (DC4/DCS2) 600G	3P00
FC ST900MM0036/SLTN0900S5xnF010 10k (DC4/DCS2) 900G	3P00
NL HMRP2000S5xnN7.2 7.2k (DC4/DCS1) 2000G	3P00
NL HMRP3000S5xnN7.2 7.2k (DC4/DCS1) 3000G	3P00
NL HMRP4000S5xnN7.2 7.2k (DC4/DCS1) 4000G	3P00
NL HMRP2000S5xnE7.2 7.2k (DC4/DCS1) 2000G	3P00
NL HMRP3000S5xnE7.2 7.2k (DC4/DCS1) 3000G	3P00
NL HMRP4000S5xnE7.2 7.2k (DC4/DCS1) 4000G	3P00
FC SLTNG0450GBAS10K/SLTN0450S5xnN010 10k (DC4/DCS2) 450G	3P01
FC SLTNG0600GBAS10K/SLTN0600S5xnN010 10k (DC4/DCS2) 600G	3P01
FC SLTNG0900GBAS10K/SLTN0900S5xnN010 10k (DC4/DCS2) 900G	3P01
SSD HUSML4040ASS600/HRLP0400S5xnNMLC 150 (DC4/DCS2) 400G	3P02
SSD HUSML4040ASS601/HRLP0400S5xnEMLC 150 (DC4/DCS2) 400G	3P01
FC SLTNG0450GBAS10K/SLTN0450S5xnE010 10k (DCS2) 450G	3P00
FC SLTNG0900GBAS10K/SLTN0900S5xnE010 10k (DCS2) 900G	3P00
FC SAWK1000S5xnN7.2 7.2k (DCS2) 1000G	3P00

Component	Version
NL ST91000640SS/SAWK1000S5xnE7.2 7.2k (DCS2) 1000G	3P00
FC ST9300653SS/SYJKT0300GBAS15K 15k (DC4/DCS2) 300G	3P01
FC HUC109045CSS600/HCBRE0450GBAS10K 10k (DC4/DCS2) 450G	3P02
FC HUC109045CSS600/HCBRE0600GBAS10K 10k (DC4/DCS2) 600G	3P02
FC HUC109090CSS600/HCBRE0900GBAS10K 10k (DC4/DCS2) 900G	3P02
SSD HUSSL4020BSS600/HRALP0200GBASSLC 150 (DCS2) 200G	3P00
SSD HUSSL4010BSS600/HRALP0100GBASSLC 150 (DCS2) 100G	3P00
NL HUS723020ALS640/HMRSK3000GBAS07K 7.2k (DCS1) 3000G	3P02
NL HUS723020ALS640/HMRSK2000GBAS07K 7.2k (DC4/DCS1) 2000G	3P02
NL ST2000NM0011/SMSKP0002TBAT07K 7.2k (DC4) 2000G	3P01
NL ST1000NM0011/SMSKP0001TBAT07K 7.2k (DC4) 1000G	3P01
NL HUA723020ALA640/HMRSK0002TBAT07K 7.2k (DC4) 2000G	3P01

What's New in the OS

HP 3PAR OS 3.2.1 MU1 offers in-line deduplication on all the systems with GEN4 ASIC only for an SSD tier.

Thin Deduplication and Thin Clones software are licensed as a part of the HP 3PAR Operating System Software Suite with no additional charge.

HP 3PAR Thin Deduplication

After upgrading to HP 3PAR OS 3.2.1 MU1, customers with an SSD CPG can provision TDVVs(Thinly Deduped Virtual Volume).

With HP 3PAR OS 3.2.1 MU1, customers with a Dynamic Optimization license can covert to and from a TDVV (from and to both Thinly Provisioned volumes and Full volumes).

With HP 3PAR OS 3.2.1 MU1, a thin deduplication estimation functionality is available. The dedupe estimation function provides a way to determine the expected space savings following the deduplication of existing Thinly Provisioned Volumes. Run the estimator on-line against any volume, independent from the storage tier the volume resides in, as long as the volume is a TPVV.

Snapshots of TDVVs are dedup aware, provided the snap space resides in the same CPG as the base volume.

Thinly Deduped volumes are fully supported with Remote Copy. However, Remote Copy is not dedup aware meaning all write data is sent across the RC transport to the target array and id deduped when it is applied at the target array.

For more details on Thin Deduplication, see the Thin Technologies White Paper available at : http://h20195.www2.hp.com/v2/GetPDF.aspx%2F4AA3-8987ENW.pdf.

Known Thin Deduplication limitations in HP 3PAR OS 3.2.1 MU1 are as follows:

- CPGs with TDVV volumes cannot be part of an Adaptive Optimization configuration.
- The maximum number of TDVVs per CPG is 256; there is no limit on the number of TDVV snapshots.
- Peer Motion is currently not supported for TDVVs.
- Online Import from EVA and EMC Storage directly to TDVV volumes is not supported. As a workaround it's possible to import to a TPVV and then covert to TDVV.

Modifications to the OS

The following items are addressed in this release:

Issue ID	Description
108545	Under certain environments, the system manager process might restart during disk drive failure handling or drive firmware upgrade. This was caused by access to transient drive inquiry response data.
109638	System Manager terminates unexpectedly after a Remote Copy volume dismiss operation using keepSnap option and no snapshot exists.
114244	Loss of host persona capabilities after upgrading to HP 3PAR OS 3.2.1 GA from HP 3PAR OS 3.1.2 MU5 or HP 3PAR OS 3.1.2 MU3 + P41.
114409	On HP StoreServ 7440 systems, each SAS initiator port on a node can support a maximum of 10 daisy-chained cages, with 24 drives in each cage. If 11 cages are installed with drives, the unsupported number of drives on the port could make the node to become unresponsive. When replacing an existing cage of a fully populated port, ensure that the eleventh cage does not contain any drives before connecting it. After connecting the cage, existing drives from the cage being replaced can be migrated to the new cage. When all of the drives are moved, the cage being replaced can be safely removed from the back end topology.
114502	If the cluster has more than 4k volumes and is downgraded to a version lower than HP 3PAR OS 3.1.3, the downgrade succeeds, but volumes over the 4k limit show as internal_consistency_error.
114689	An incomplete remote copy transition log cleanup causes unexpected controller node restart.
114947	The total capacity of the volumes in a Peer Persistence Remote Copy group is limited to 32 TB.
114957	System manager halts because the locks are dropped after the tpd_rw_owned command. The command fails to check the thread id in the field mode. When the thread corresponding to the lock attempts to drop the same lock, system manager halts.
115121	SLD (Synchronous Long Distance) Remote Copy groups are incorrectly marked as stale by the `startrcopygroup` command.
115253	An issue in Remote Copy causes indefinite I/O delay.
115450	The `controlencryption` command provides additional information about keystore location in the output.
115594	System manager restarts while setting up a Peer Motion migration operation.
116151	Remote Copy replication becomes unresponsive during certain setrcopygroup switchover operations or OS upgrades.
116196	On a two node system, one of the controller nodes might not join the cluster after a system restart.
116690	An issue in QoS and ODX from Windows hosts causes an uncontrolled shutdown.
116915	Updates the openssl packages to resolve a security issue documented as CVE-2014-0224.
117123	The version of Bash is updated to resolve the vulnerabilities CVE-2014-6271 and CVE-2014-7169 commonly known as “shellshock”.
117687	The SysRq invocation through the console is disabled to avoid any unintentional or incorrect use which can cause problems.
118477	While performing VV provisioning conversions on volumes greater than 1 TB, the VV offsets might not be calculated correctly.

Known Issues with the OS

NOTE: The known issues for HP 3PAR OS 3.2.1 GA are still present in HP 3PAR OS 3.2.1 MU1 unless otherwise listed as addressed in HP 3PAR OS 3.2.1 MU1.

Issue ID	Description
114409	On HP StoreServ 7440 systems, each SAS initiator port on a controller node can support a maximum of ten daisy-chained cages, with 24 drives in each cage. If an 11th cage is installed with drives, the unsupported number of drives on the port could result in a node panic. **Workaround**: When replacing an existing cage of a fully populated port, ensure that the eleventh cage does not contain any drives before connecting it. After connecting the cage, existing drives from the cage being replaced can be migrated to the new cage. When all of the drives have been moved, the cage being replaced can be safely removed from the backend topology.
115470	Do not configure the RC link when prompted by OOTB. Remote Copy interfaces must be configured using the `controlport rcip` command after OOTB completes .
	The cimserver process could fail after code upgrade completes, resulting in loss of SMI-S communication. **Workaround**: After the upgrade is complete, to restore the communication issue the following CLI commands: 1. `stopcim -f -x` 2. `startcim`

6 HP 3PAR OS 3.2.1 MU1 CLI Release Notes

Supported Operating Systems

For the list of supported operating systems, see the *HP 3PAR CLI Remote Client* document under Single Point of Connectivity Knowledge for HP Storage Products (SPOCK) website at http://www.hp.com/storage/spock.

NOTE: Support for the following additional operating systems is provided in this release:

- Red Hat Enterprise Linux 6 Update 5 (RHEL 6.5) & Linux 6 Update 6 (RHEL 6.6)
- Ubuntu 12.04 LTS
- Solaris 11
- Windows 8.1 Enterprise 64-bit

Changed commands

Command	Options added (unless stated otherwise)
`createtemplate`	`-type tdvv`
`createvv`	`-tdvv`
`createvvcopy`	`-tdvv`
`checkvv`	`-dedup_dryrun`
`importvv`	Imports into TDVVs
`showcpg`	`-space`
`showvv`	`-space`
`statcmp`	`-ni -sortcol`
`tunevv`	`-tdvv conversions`

Modifications to the CLI

Issue ID	Description
108502	Security: ActiveState/libtls MITM vulnerability CVE-2014-0224
117822	A HA_Ver (host agent version) column is added to the output of CLI command `showhost -agent`. This contains the version of the host explorer agent currently running on the given host.

7 HP 3PAR OS 3.2.1 MU1 Web Services API Release Notes

What's New with the HP 3PAR Web Services API Software

- Added support for deduplication:
  - Create a thin deduplicated volume (TDVV)
    - A new TDVV value is added to Volume ProvisioningType
  - Tune volume to convert it to TDVV
  - Create an online TDVV physical copy
  - Added new fields to spacereporter, Volume and Capacity objects to show compaction and deduplication capacity efficiency numbers

Known Issues

Issue ID	Description
116472	When in SLD configuration, remotecopygroups representation shows only one target instead of two. This will be resolved in later release, but it will not be backward compatible with the current remotecopygroups representation. A client should therefore refrain from querying for /remotecopygroups in HP 3PAR OS 3.2.1 GA and HP 3PAR OS 3.2.1 MU1.

8 HP 3PAR OS 3.2.1 Extended GA (EGA) Release Notes

Online Upgrade Considerations

This feature allows upgrade of the OS concurrently with I/O activity on the attached hosts, provided certain conditions are met. For more information regarding the required order for upgrade and installation of software components, see the *HP 3PAR OS 3.2.1 Upgrade Instructions*. For further information and pre-planning of online upgrades, refer to the latest version of the *HP 3PAR OS Upgrade Pre-Planning Guide*. To obtain a copy of this documentation, go to http://www.hp.com/3par/support_manuals, select your product, and then click **Manuals**.

NOTE: Direct upgrade from HP 3PAR OS 3.1.1 GA to HP 3PAR OS 3.2.1 EGA is not supported. For details about supported upgrade paths, see the Single Point of Connectivity Knowledge for HP Storage Products (SPOCK) website at http://www.hp.com/storage/spock.

NOTE: Software upgrades to HP 3PAR OS 3.2.1 EGA for systems that use Remote Copy Synchronous Long Distance Replication and CLX are not supported. This configuration is supported in the HP 3PAR OS 3.2.1 MU1 release.

Supported Platforms

HP 3PAR OS release supports HP 3PAR StoreServ Storage. For details, see the Single Point of Connectivity Knowledge for HP Storage Products (SPOCK) website at http://www.hp.com/storage/spock.

Components

Component	Version
OS	3.2.1.46
CLI Client	3.2.1.46
SNMP Agent	1.7.0
Drive Cage Firmware:	
DC4 Firmware	2.64
DCN1/DCS1/DCS2 Firmware	3218
NEMOE/MCU Firmware	4.61
HBA Firmware:	
QLogic 8G FC (QLFCX)	04.05.01
QLogic 10G CNA (P3+)	04.11.151
QLogic 1G iSCSI (QLIS)	03.00.01.77
LSI SAS 6G (9205)	17.11.00
Emulex 2-port 4G (Helios)	02.82.x10
Emulex 4-port 8G FC (Saturn)	02.02.x15
Emulex 2-port 16G FC (Lancer)	1.1.65.16
Drive Firmware	
FC 15K HVIPC0300GBFC15K/HUS156030VLF400 (DC4) 300G	3P03
FC 15K HVIPC0600GBFC15K/HUS156060VLF400 (DC4) 600G	3P03

Component	Version
HRALP0100GBFCSSD/HUSSL4010ALF400 SSD (DC4) 100G	3P05
HRALP0200GBFCSSD/HUSSL4020ALF400 SSD (DC4) 200G	3P05
ST3300657FC/SEGLE0300GBFC15K FC 15K (DC4) 300G	3P03
ST3600057FC/SEGLE0600GBFC15K FC 15K (DC4) 600G	3P03
SSD HSSC0920S5xnFMRI 150k (DC4/DCN1/DCS2) 920G	3P03
SSD DOPE0480S5xnNMRI 100k (DC4/DCN1/DCS2) 480G	3P01
SSD DOPE1920S5xnNMRI 100k (DC4/DCN1/DCS2) 1920G	3P01
FC HUC101212CSS600/HCEP1200S5xnN010 10k (DC4/DCS2) 1200G	3P00
SSD DOPA0480S5xnNMRI 150 (DC4/DCS2) 480G	3P02
SSD DOPA0920S5xnNMRI 150 (DC4/DCS2) 920G	3P02
SSD HUSMM8040ASS204/HSSC0480S5xnNMRI 150 (DC4/DCS2) 480G	3P02
SSD HUSMM8080ASS204/HSSC0920S5xnNMRI 150 (DC4/DCS2) 920G	3P02
SSD HUSMM8040ASS204/HSSC0400S5xnNMME 150 (DC4/DCS2) 400G	3P02
SSD HUSMM8080ASS204/HSSC0800S5xnNMME 150 (DC4/DCS2) 800G	3P02
NL ST2000NM0023/SMEG2000S5xnN7.2 7.2k (DC4/DCS1) 2000G	3P01
NL ST3000NM0023/SMEG3000S5xnN7.2 7.2k (DCS1) 3000G	3P01
NL ST4000NM0023/SMEG4000S5xnN7.2 7.2k (DC4/DCS1) 4000G	3P01
NL ST2000NM0063/SMEG2000S5xnF7.2 7.2k (DC4/DCS1) 2000G	3P00
NL ST2000NM0063/SMEG4000S5xnF7.2 7.2k (DC4/DCS1) 4000G	3P00
FC ST450MM0036/SLTN0450S5xnF010 10k (DC4/DCS2) 450G	3P00
FC ST600MM0036/SLTN0600S5xnF010 10k (DC4/DCS2) 600G	3P00
FC ST900MM0036/SLTN0900S5xnF010 10k (DC4/DCS2) 900G	3P00
NL HMRP2000S5xnN7.2 7.2k (DC4/DCS1) 2000G	3P00
NL HMRP3000S5xnN7.2 7.2k (DC4/DCS1) 3000G	3P00
NL HMRP4000S5xnN7.2 7.2k (DC4/DCS1) 4000G	3P00
NL HMRP2000S5xnE7.2 7.2k (DC4/DCS1) 2000G	3P00
NL HMRP3000S5xnE7.2 7.2k (DC4/DCS1) 3000G	3P00
NL HMRP4000S5xnE7.2 7.2k (DC4/DCS1) 4000G	3P00
FC SLTNG0450GBAS10K/SLTN0450S5xnN010 10k (DC4/DCS2) 450G	3P01
FC SLTNG0600GBAS10K/SLTN0600S5xnN010 10k (DC4/DCS2) 600G	3P01
FC SLTNG0900GBAS10K/SLTN0900S5xnN010 10k (DC4/DCS2) 900G	3P01
SSD HUSML4040ASS600/HRLP0400S5xnNMLC 150 (DC4/DCS2) 400G	3P02
SSD HUSML4040ASS601/HRLP0400S5xnEMLC 150 (DC4/DCS2) 400G	3P01
FC SLTNG0450GBAS10K/SLTN0450S5xnE010 10k (DCS2) 450G	3P00
FC SLTNG0900GBAS10K/SLTN0900S5xnE010 10k (DCS2) 900G	3P00
FC SAWK1000S5xnN7.2 7.2k (DCS2) 1000G	3P00
NL ST91000640SS/SAWK1000S5xnE7.2 7.2k (DCS2) 1000G	3P00

Component	Version
FC ST9300653SS/SYJKT0300GBAS15K 15k (DC4/DCS2) 300G	3P01
FC HUC109045CSS600/HCBRE0450GBAS10K 10k (DC4/DCS2) 450G	3P02
FC HUC109045CSS600/HCBRE0600GBAS10K 10k (DC4/DCS2) 600G	3P02
FC HUC109090CSS600/HCBRE0900GBAS10K 10k (DC4/DCS2) 900G	3P02
SSD HUSSL4020BSS600/HRALP0200GBASSLC 150 (DCS2) 200G	3P00
SSD HUSSL4010BSS600/HRALP0100GBASSLC 150 (DCS2) 100G	3P00
NL HUS723020ALS640/HMRSK3000GBAS07K 7.2k (DCS1) 3000G	3P02
NL HUS723020ALS640/HMRSK2000GBAS07K 7.2k (DC4/DCS1) 2000G	3P02
NL ST2000NM0011/SMSKP0002TBAT07K 7.2k (DC4) 2000G	3P01
NL ST1000NM0011/SMSKP0001TBAT07K 7.2k (DC4) 1000G	3P01
NL HUA723020ALA640/HMRSK0002TBAT07K 7.2k (DC4) 2000G	3P01

What's New in the OS

HP 3PAR OS 3.2.1 EGA provides all the benefits provided by HP 3PAR OS 3.2.1 GA and addresses the following issue:

- Resolves an issue where the system manager becomes unresponsive or the controller nodes shutdown unexpectedly during online upgrade to HP 3PAR OS 3.2.1 GA.

Modifications to the OS

Issue	Description
115591	Corrects conditions causing an uncontrolled shutdown during online upgrade to HP 3PAR OS 3.2.1 GA.

9 HP 3PAR OS 3.2.1 MU2 Release Notes

Online Upgrade Considerations

This feature allows upgrade of the OS concurrently with I/O activity on the attached hosts, provided certain conditions are met. For further information and pre-planning of online upgrades, refer to the latest version of the *HP 3PAR OS Upgrade Pre-Planning Guide*. To obtain a copy of this documentation, go to http://www.hp.com/3par/support_manuals, select your product, and then click **Manuals**.

⚠ **WARNING!** Upgrade to HP 3PAR OS 3.2.1 is supported on HP 3PAR StoreServ P10000 and 7000 systems only. HP 3PAR OS 3.2.1 is not supported on prior InServ systems.

NOTE: Direct upgrade from HP 3PAR OS 3.1.2 MU2 or earlier to HP 3PAR OS 3.2.1 MU2 is not supported. For details about supported upgrade paths, see the Single Point of Connectivity Knowledge for HP Storage Products (SPOCK) website at http://www.hp.com/storage/spock.

NOTE: Patch 41 (P41) is a mandatory patch that must be installed on the HP 3PAR OS 3.1.2.484 (MU3) before upgrading to HP 3PAR OS 3.2.1.xxx.

NOTE: For HP 3PAR OS 3.1.3 patch documentation, see the Storage Information Library http://www.hp.com/storage/docs.

Supported Platforms

HP 3PAR OS release supports HP 3PAR StoreServ Storage. For details, see the Single Point of Connectivity Knowledge for HP Storage Products (SPOCK) website at http://www.hp.com/storage/spock.

Components

Component	Version
OS	3.2.1.200
CLI Client	3.2.1.200
SNMP Agent	1.7.0
Drive Cage Firmware:	
DC4 Firmware	2.64
DCN1/DCS1/DCS2 Firmware	3219
NEMOE/MCU Firmware	4.62
HBA Firmware:	
QLogic 8G FC (QLFCX)	04.05.01
QLogic 10G CNA (P3+)	04.11.151
QLogic 1G iSCSI (QLIS)	03.00.01.77
LSI SAS 6G (9205)	17.11.00
Emulex 2-port 4G (Helios)	02.82.x10
Emulex 4-port 8G FC (Saturn)	02.02.x15
Emulex 2-port 16G FC (Lancer)	1.1.65.16

Component	Version
Drive Firmware	
FC 15K HVIPC0300GBFC15K/HUS156030VLF400 (DC4) 300G	3P03
FC 15K HVIPC0600GBFC15K/HUS156060VLF400 (DC4) 600G	3P03
HRALP0100GBFCSSD/HUSSL4010ALF400 SSD (DC4) 100G	3P05
HRALP0200GBFCSSD/HUSSL4020ALF400 SSD (DC4) 200G	3P05
ST3300657FC/SEGLE0300GBFC15K FC 15K (DC4) 300G	3P03
ST3600057FC/SEGLE0600GBFC15K FC 15K (DC4) 600G	3P03
SSD HSSC0920S5xnFMRI 150k (DC4/DCN1/DCS2) 920G	3P03
SSD DOPE0480S5xnNMRI 100k (DC4/DCN1/DCS2) 480G	3P01
SSD DOPE1920S5xnNMRI 100k (DC4/DCN1/DCS2) 1920G	3P01
FC HUC101212CSS600/HCEP1200S5xnN010 10k (DC4/DCS2) 1200G	3P00
SSD DOPA0480S5xnNMRI 150 (DC4/DCS2) 480G	3P02
SSD DOPA0920S5xnNMRI 150 (DC4/DCS2) 920G	3P02
SSD HUSMM8040ASS204/HSSC0480S5xnNMRI 150 (DC4/DCS2) 480G	3P02
SSD HUSMM8080ASS204/HSSC0920S5xnNMRI 150 (DC4/DCS2) 920G	3P02
SSD HUSMM8040ASS204/HSSC0400S5xnNMME 150 (DC4/DCS2) 400G	3P02
SSD HUSMM8080ASS204/HSSC0800S5xnNMME 150 (DC4/DCS2) 800G	3P02
NL ST2000NM0023/SMEG2000S5xnN7.2 7.2k (DC4/DCS1) 2000G	3P01
NL ST3000NM0023/SMEG3000S5xnN7.2 7.2k (DCS1) 3000G	3P01
NL ST4000NM0023/SMEG4000S5xnN7.2 7.2k (DC4/DCS1) 4000G	3P01
NL ST2000NM0063/SMEG2000S5xnF7.2 7.2k (DC4/DCS1) 2000G	3P00
NL ST2000NM0063/SMEG4000S5xnF7.2 7.2k (DC4/DCS1) 4000G	3P00
FC ST450MM0036/SLTN0450S5xnF010 10k (DC4/DCS2) 450G	3P00
FC ST600MM0036/SLTN0600S5xnF010 10k (DC4/DCS2) 600G	3P00
FC ST900MM0036/SLTN0900S5xnF010 10k (DC4/DCS2) 900G	3P00
NL HMRP2000S5xnN7.2 7.2k (DC4/DCS1) 2000G	3P00
NL HMRP3000S5xnN7.2 7.2k (DC4/DCS1) 3000G	3P00
NL HMRP4000S5xnN7.2 7.2k (DC4/DCS1) 4000G	3P00
NL HMRP2000S5xnE7.2 7.2k (DC4/DCS1) 2000G	3P00
NL HMRP3000S5xnE7.2 7.2k (DC4/DCS1) 3000G	3P00
NL HMRP4000S5xnE7.2 7.2k (DC4/DCS1) 4000G	3P00
FC SLTNG0450GBAS10K/SLTN0450S5xnN010 10k (DC4/DCS2) 450G	3P01
FC SLTNG0600GBAS10K/SLTN0600S5xnN010 10k (DC4/DCS2) 600G	3P01
FC SLTNG0900GBAS10K/SLTN0900S5xnN010 10k (DC4/DCS2) 900G	3P01
SSD HUSML4040ASS600/HRLP0400S5xnNMLC 150 (DC4/DCS2) 400G	3P02
SSD HUSML4040ASS601/HRLP0400S5xnEMLC 150 (DC4/DCS2) 400G	3P01
FC SLTNG0450GBAS10K/SLTN0450S5xnE010 10k (DCS2) 450G	3P00

Component	Version
FC SLTNG0900GBAS10K/SLTN0900S5xnE010 10k (DCS2) 900G	3P00
FC SAWK1000S5xnN7.2 7.2k (DCS2) 1000G	3P00
NL ST91000640SS/SAWK1000S5xnE7.2 7.2k (DCS2) 1000G	3P00
FC ST9300653SS/SYJKT0300GBAS15K 15k (DC4/DCS2) 300G	3P01
FC HUC109045CSS600/HCBRE0450GBAS10K 10k (DC4/DCS2) 450G	3P02
FC HUC109045CSS600/HCBRE0600GBAS10K 10k (DC4/DCS2) 600G	3P02
FC HUC109090CSS600/HCBRE0900GBAS10K 10k (DC4/DCS2) 900G	3P02
SSD HUSSL4020BSS600/HRALP0200GBASSLC 150 (DCS2) 200G	3P00
SSD HUSSL4010BSS600/HRALP0100GBASSLC 150 (DCS2) 100G	3P00
NL HUS723020ALS640/HMRSK3000GBAS07K 7.2k (DCS1) 3000G	3P02
NL HUS723020ALS640/HMRSK2000GBAS07K 7.2k (DC4/DCS1) 2000G	3P02
NL ST2000NM0011/SMSKP0002TBAT07K 7.2k (DC4) 2000G	3P01
NL ST1000NM0011/SMSKP0001TBAT07K 7.2k (DC4) 1000G	3P01
NL HUA723020ALA640/HMRSK0002TBAT07K 7.2k (DC4) 2000G	3P01
SSD HCBF0600S5xeF010 600 GB	3P00
SSD HCBF1200S5xeF010 1200 GB	3P00
SSD HCBF1800S5xeF010 1800 GB	3P00
SSD HKCF0300S5xeN015 300 GB	3P00
SSD HKCF0600S5xeN015 600 GB	3P00
SSD HSCP0920S5xnFMRI 920 GB	3P00
SSD HSCP0480S5xnFMRI 480 GB	3P00

What's New in the OS

HP 3PAR OS 3.2.1 MU2 provides following benefits:

- Improved procedures for online cage maintenance. To know more about this new feature, contact HP support.
- Support for multiple LDAP servers in a single domain.
- Support for Red Hat Directory Server 9 as LDAP server.
- Support for Peer Motion and Online Import for TDVVs.
- Support for Microsoft Azure Site Recovery : on-premise to on-premise protection
- Support is added for following SFPs:
  - HP-A[QW923A]
  - HP-F[QW923A]
- Supports the following new Solid State drives for all HP 3PAR StoreServ 7xxx and 10xxx storage systems:
  - HCBF0600S5xeF010 - 600 GB
  - HCBF1200S5xeF010 - 1200 GB

- HCBF1800S5xeF010 - 1800 GB
- HKCF0300S5xeN015 - 300 GB
- HKCF0600S5xeN015 - 600 GB
- HSCP0920S5xnFMRI - 920 GB
- HSCP0480S5xnFMRI - 480 GB

- Maximum number of VV limit for 7440c system is changed as follows:
  - maximum number of virtual volume IDs : 64K
  - maximum number of virtual volumes : 64K
  - maximum number of virtual volume default base : 32K
  - earlier maximum number of virtual volume IDs : 32K

Modifications to the OS

The following items are addressed in this release:

Issue ID	Description
84984	Resolved IO stall issue on CN1000Q card.
101366	This improves the handling of RTPG (Remote Target Port Group) commands by handling them in the kernel of the HP 3PAR OS. This makes the system robust and frees up system manager resources to handle other events in a more timely manner.
104133	This resolves an issue where an "Active VLUN Limit Exceeded" alert might be raised prematurely and repeatedly.
106850	An issue where VV physical copy, snapshot promotion, and VV removal overlaps in such a way that the temporary snapshot used by the physical copy process is abandoned and can not be removed.
113885	When the EKM (External Key Manager) user is changed on a system with Data At Rest Encryption enabled, the new user must have permissions to the current key on the External Key Manager.
113951	Enable CHAP when using CN1000Q at the host side.
115658	Resolved an issue related to removing a cage from the system which is disconnected on both the ports.
116189	While processing the list of VVs to collect stats, the code exits without processing the rest of the VVs in the list upon encountering a VV which is deleted or closed. This in turn displays incorrect values by `statvv` command.
116362	On very rare occasions, a write to flash by NEMOE can fail during upgrade. A retry operation might cause an overall command failure. The StoreServ waits for the response to the current command.
116574	Cache buffers are freed after a write failure to Peer Motion volumes.
116686	Support for Red Hat Directory Server 9 as LDAP server.
117185	System Write Cache Availability might not be cleared even after resolving the issue.
117388	Reuse the reclaimed pages generated by GC for new writes. This avoids the overhead to free those reclaimed pages which cause performance issues.
117480	An incorrect behavior in ASIC driver which causes correctable link errors to become fatal.
118358	If both I/O modules of an HP 3PAR StoreServ 7000 system cage are rebooted concurrently, this can cause system manager to become unresponsive.

Issue ID	Description
118824	The IO error reporting logic is changed to consistently report SCSI BUSY status when an array in a Peer Motion configuration is overloaded.
118962	When issuing the `setrcopygroup` failover command on a group that has more than one target, use the `-t` target option.
119815	An unwanted usage of memory in fibre channel port device discovery is corrected.
119921	Support is added for following SFPs: • HP-A[QW923A] • HP-F[QW923A]
120179	Resolved an issue whereby a system with more than 1000 LDs fails to optimize data layout with the `startao` command and prevents valid data from being displayed in the `srstatld` command with the `-cpg` filter option.
120319	Prevents host I/O stall during upgrade from HP 3PAR OS 3.2.1 GA with Remote Copy.
120788	A performance issue for Thin Conversions is resolved.
120838	Slow freeing up of unreferenced pages in dedup store causes space used by dedup store to grow excessively. This is resolved by making space free up operations parallel and asynchronous.
121213	Maximum number of VV limit for 7440c system is changed as follows: • maximum number of virtual volume IDs = 64K • maximum number of virtual volumes = 64K • maximum number of virtual volume default base = 32K • earlier maximum number of virtual volume IDs = 32K
121239	If a virtual volume (VV) block operation exits when the dedup garbage collector is scanning deduplication VVs for referenced pages and the block operation completes before all the dedup VVs are scanned by the garbage collector, it can cause valid and referenced pages to be unallocated and overwritten. A timing window that can cause data inconsistency in volumes that are deduplicated is closed.
121467	The limitation where a checkvv -dedup_dryrun does not execute on a volume with snapshot removed.
121879	Only one node will have network connectivity and hence there are chances that the admin interface is not on the cluster master node and QW (Quorum Witness) creation will fail. QW creation does not require the admin interface to be present on the cluster master node.
122329	SSD VVs (all TDVVs) maximum grow size is changed to 25% of CPG grow size. • 2-node: 2 GB (SSD CPG grow size is 8 GB) • 4-node: 4 GB (SSD CPG grow size is 16 GB) • 8-node: 8 GB (SSD CPG grow size is 32 GB)

Known Issues with the OS

NOTE: The known issues for HP 3PAR OS 3.2.1 MU1 are still present in HP 3PAR OS 3.2.1 MU2 unless otherwise listed as addressed in HP 3PAR OS 3.2.1 MU2.

Issue ID	Description
113472	If an ESX is added first to vCenter before creating a host entry on array, then VASA provider cannot find ESX host name and fails to create a new virtual machine or bind an existing virtual machine. **Workaround**: Use either of the following methods: • Complete set up as follows:

Issue ID	Description
	1. Create host entry for ESX on the array. 2. Add ESX host to vCenter server • Register VP again. If ESX is added after VP is registered, register VASA Provider from vCenter interface again. • Restart VP. If ESX is added after VP is registered, go to the array and issue command `stopvasa` and then command `startvasa`.
119851	Peer Motion import operations might require additional time.

10 HP 3PAR OS 3.2.1 MU2 CLI Release Notes

Supported Operating Systems

For the list of supported operating systems, see the *HP 3PAR CLI Remote Client* document under Single Point of Connectivity Knowledge for HP Storage Products (SPOCK) website at http://www.hp.com/storage/spock.

What's New in the CLI

The following new commands are added in HP 3PAR CLI 3.2.1 MU2:

Command	Description
`removesshbanner`	Remove the SSH banner.
`setkv`	Set or remove key/value pairs on a domain, CPG or VV.
`setvasa`	Set the VASA Provider server properties.
`showvasa`	Show properties of the VASA web service provider.
`showvvolvm`	Show information about virtual machines (vVol-based) in the system.
`startvasa`	Start the VASA Provider server to service HTTPS requests.
`stopvasa`	Stop the VASA Provider server from servicing HTTPS requests.

Modifications to the CLI

Issue ID	Description
118268	Verify VVOL usage with flashcache. When using the `showflashcache` command for VVOLs, provide exact name or use the `-matchbulkobjs` option.
122338	The number of tpdtcl and SSH sessions supported on a StoreServ array is based on the amount of adjusted control cache on a controller node. On the converged 7000 series models 7200c, 7400c, 7440c and 7450c, the control cache size is reduced by 8 GB to compute the adjusted control cache size. On earlier models, there is no adjustment made.

Adjusted Control Cache Size Per Controller Node	Total	SSH connections
4 GB or lower (prior to HP 3PAR OS 3.1.2)	64	16
8 GB	96	24
16 GB	128	32
24 GB	160	40 (New)
32 GB	192	48
56 GB	240	60 (New)
>56 GB	256	64

11 HP 3PAR OS 3.2.1 MU2 CIM API Release Notes

What's new with HP 3PAR CIM API

- Validation of HP 3PAR support for Microsoft Azure Site Recovery
  - Create and Protect Replication Groups
  - Planned Failover of Replication Group
  - Reverse Replication of Replication Group
  - Unplanned Failover of Replication Group
  - Test Failover of Replication Group
- Replication Services
  - Enhanced `CreateGroupReplicaFromElements` in ReplicationService class—If the specified *`TargetAccessPoint`* cannot support the specified *`SyncType`*, the provider automatically selects another access point that can support the *`SyncType`* provided that it is linked to the same remote array as the one specified in the *`TargetAccessPoint`* parameter.

Interface changes

SSLv3 support is disabled due to CVE-2014-3566 OpenSSL POODLE protocol downgrade vulnerability.

Modifications to the HP 3PAR CIM API

Issue ID	Description
115166	Multicast traffic over SLP port can cause excessive nf_conntrack table entries to be created and never expired. This is resolved by not loading the interface responsible for the non-expiring entries.
117199	The cimserver correctly reports the parent and child snapshot relationships for an intermediate read-write snapshot.
120750	Cimserver process could fail after system reboot or upgrade, resulting in loss of SMI-S communication.
120848	TPD_VolumeAllocatedFromDeltaReplicaPool association between a snapshot volume and its parent pool (TPD_DeltaReplicaStoragePool) could be missing in certain situations.
121286	CIMserver could fail if lot of indications are sent to an indication receiver which is not operational.

Known Issues of the HP 3PAR OS CIM API

Issue ID	Description
100831	Error messages for SMI-S requests to the cimserver are truncated to about 85 characters. To view the full text of an error message, examine the cimserver log file at `/var/log/tpd/cimserver`.

12 HP 3PAR OS 3.2.1 MU2 Web Services API Release Notes

What's New with the HP 3PAR Web Services API Software

- Enhanced support for remote copy
  - New representation for /remotecopygroups resource
  - New sub-resources defined for targets and volumes under a remotecopygroup
  - All disaster recovery operations
  - syncrcopy
- Added support for iSCSI host CHAP secret retrieval
- Added support for Adaptive Flash Cache
- Added capability to filter on vLUN based on host name and volume name
- Added template option when creating CPG

Interface Changes

- SSLv3 support is disabled due to CVE-2014-3566 OpenSSL POODLE protocol downgrade vulnerability
- New field is added in the `showwsapi -d` command to show the configured session timeout
- New option is provided for the `setwsapi` command to configure session timeout

Obsolete Options

Resource representation for /remotecopygroups in WSAPI version 1.4.0 (HP 3PAR OS 3.1.2 GA) and 1.4.1 (HP 3PAR OS 3.2.1 MU1) is obsoleted. Use 1.4.2 version (HP 3PAR OS 3.1.2 MU2) when doing GET /remotecopygroups.

Modifications to the HP 3PAR Web Services API

The following issues are addressed in this release.

Issue ID	Dsecription
116472	When in SLD configuration, `remotecopygroups` representation shows only one target instead of two. This is resolved in HP 3PAR OS 3.2.1 MU2 release. But, it is not backward compatible with the old version of `remotecopygroups` representation.
121780	WSAPI server fails if there are duplicate HTTP headers in client request.

13 HP 3PAR OS 3.2.1 Extended MU1 (EMU1) Release Notes

Online Upgrade Considerations

This feature allows upgrade of the OS concurrently with I/O activity on the attached hosts, provided certain conditions are met. For further information and pre-planning of online upgrades, refer to the latest version of the *HP 3PAR OS Upgrade Pre-Planning Guide*. To obtain a copy of this documentation, go to http://www.hp.com/3par/support_manuals, select your product, and then click **Manuals**.

NOTE: Direct upgrade from HP 3PAR OS 3.1.2 MU2 or earlier to HP 3PAR OS 3.2.1 EMU1 is not supported. For details about supported upgrade paths, see the Single Point of Connectivity Knowledge for HP Storage Products (SPOCK) website at http://www.hp.com/storage/spock.

NOTE: Patch 41 (P41) is a mandatory patch that must be installed on the HP 3PAR OS 3.1.2.484 (MU3) before upgrading to HP 3PAR OS 3.2.1.120 (EMU1).

NOTE: To avoid online upgrade issues, upgrade from HP 3PAR OS 3.2.1.46 (GA) or 3.2.1.46 (EGA) to HP 3PAR OS 3.2.1.120 (EMU1).

NOTE: For HP 3PAR OS 3.1.3 patch documentation, see the Storage Information Library http://www.hp.com/storage/docs.

Supported Platforms

HP 3PAR OS release supports HP 3PAR StoreServ Storage. For details, see the Single Point of Connectivity Knowledge for HP Storage Products (SPOCK) website at http://www.hp.com/storage/spock.

Components

Component	Version
OS	3.2.1.120
CLI Client	3.2.1.120
SNMP Agent	1.7.0
Drive Cage Firmware:	
DC4 Firmware	2.64
DCN1/DCS1/DCS2 Firmware	3218
NEMOE/MCU Firmware	4.62
HBA Firmware:	
QLogic 8G FC (QLFCX)	04.05.01
QLogic 10G CNA (P3+)	04.11.151
QLogic 1G iSCSI (QLIS)	03.00.01.77
LSI SAS 6G (9205)	17.11.00
Emulex 2-port 4G (Helios)	02.82.x10
Emulex 4-port 8G FC (Saturn)	02.02.x15

Component	Version
Emulex 2-port 16G FC (Lancer)	1.1.65.16
Drive Firmware	
FC 15K HVIPC0300GBFC15K/HUS156030VLF400 (DC4) 300G	3P03
FC 15K HVIPC0600GBFC15K/HUS156060VLF400 (DC4) 600G	3P03
HRALP0100GBFCSSD/HUSSL4010ALF400 SSD (DC4) 100G	3P05
HRALP0200GBFCSSD/HUSSL4020ALF400 SSD (DC4) 200G	3P05
ST3300657FC/SEGLE0300GBFC15K FC 15K (DC4) 300G	3P03
ST3600057FC/SEGLE0600GBFC15K FC 15K (DC4) 600G	3P03
SSD HSSC0920S5xnFMRI 150k (DC4/DCN1/DCS2) 920G	3P03
SSD DOPE0480S5xnNMRI 100k (DC4/DCN1/DCS2) 480G	3P01
SSD DOPE1920S5xnNMRI 100k (DC4/DCN1/DCS2) 1920G	3P01
FC HUC101212CSS600/HCEP1200S5xnN010 10k (DC4/DCS2) 1200G	3P00
SSD DOPA0480S5xnNMRI 150 (DC4/DCS2) 480G	3P02
SSD DOPA0920S5xnNMRI 150 (DC4/DCS2) 920G	3P02
SSD HUSMM8040ASS204/HSSC0480S5xnNMRI 150 (DC4/DCS2) 480G	3P02
SSD HUSMM8080ASS204/HSSC0920S5xnNMRI 150 (DC4/DCS2) 920G	3P02
SSD HUSMM8040ASS204/HSSC0400S5xnNMME 150 (DC4/DCS2) 400G	3P02
SSD HUSMM8080ASS204/HSSC0800S5xnNMME 150 (DC4/DCS2) 800G	3P02
NL ST2000NM0023/SMEG2000S5xnN7.2 7.2k (DC4/DCS1) 2000G	3P01
NL ST3000NM0023/SMEG3000S5xnN7.2 7.2k (DCS1) 3000G	3P01
NL ST4000NM0023/SMEG4000S5xnN7.2 7.2k (DC4/DCS1) 4000G	3P01
NL ST2000NM0063/SMEG2000S5xnF7.2 7.2k (DC4/DCS1) 2000G	3P00
NL ST2000NM0063/SMEG4000S5xnF7.2 7.2k (DC4/DCS1) 4000G	3P00
FC ST450MM0036/SLTN0450S5xnF010 10k (DC4/DCS2) 450G	3P00
FC ST600MM0036/SLTN0600S5xnF010 10k (DC4/DCS2) 600G	3P00
FC ST900MM0036/SLTN0900S5xnF010 10k (DC4/DCS2) 900G	3P00
NL HMRP2000S5xnN7.2 7.2k (DC4/DCS1) 2000G	3P00
NL HMRP3000S5xnN7.2 7.2k (DC4/DCS1) 3000G	3P00
NL HMRP4000S5xnN7.2 7.2k (DC4/DCS1) 4000G	3P00
NL HMRP2000S5xnE7.2 7.2k (DC4/DCS1) 2000G	3P00
NL HMRP3000S5xnE7.2 7.2k (DC4/DCS1) 3000G	3P00
NL HMRP4000S5xnE7.2 7.2k (DC4/DCS1) 4000G	3P00
FC SLTNG0450GBAS10K/SLTN0450S5xnN010 10k (DC4/DCS2) 450G	3P01
FC SLTNG0600GBAS10K/SLTN0600S5xnN010 10k (DC4/DCS2) 600G	3P01
FC SLTNG0900GBAS10K/SLTN0900S5xnN010 10k (DC4/DCS2) 900G	3P01
SSD HUSML4040ASS600/HRLP0400S5xnNMLC 150 (DC4/DCS2) 400G	3P02
SSD HUSML4040ASS601/HRLP0400S5xnEMLC 150 (DC4/DCS2) 400G	3P01

Component	Version
FC SLTNG0450GBAS10K/SLTN0450S5xnE010 10k (DCS2) 450G	3P00
FC SLTNG0900GBAS10K/SLTN0900S5xnE010 10k (DCS2) 900G	3P00
FC SAWK1000S5xnN7.2 7.2k (DCS2) 1000G	3P00
NL ST91000640SS/SAWK1000S5xnE7.2 7.2k (DCS2) 1000G	3P00
FC ST9300653SS/SYJKT0300GBAS15K 15k (DC4/DCS2) 300G	3P01
FC HUC109045CSS600/HCBRE0450GBAS10K 10k (DC4/DCS2) 450G	3P02
FC HUC109045CSS600/HCBRE0600GBAS10K 10k (DC4/DCS2) 600G	3P02
FC HUC109090CSS600/HCBRE0900GBAS10K 10k (DC4/DCS2) 900G	3P02
SSD HUSSL4020BSS600/HRALP0200GBASSLC 150 (DCS2) 200G	3P00
SSD HUSSL4010BSS600/HRALP0100GBASSLC 150 (DCS2) 100G	3P00
NL HUS723020ALS640/HMRSK3000GBAS07K 7.2k (DCS1) 3000G	3P02
NL HUS723020ALS640/HMRSK2000GBAS07K 7.2k (DC4/DCS1) 2000G	3P02
NL ST2000NM0011/SMSKP0002TBAT07K 7.2k (DC4) 2000G	3P01
NL ST1000NM0011/SMSKP0001TBAT07K 7.2k (DC4) 1000G	3P01
NL HUA723020ALA640/HMRSK0002TBAT07K 7.2k (DC4) 2000G	3P01
SMKA2000S5xeN7.2 2000G	3P01
SMKA4000S5xeN7.2 4000GB	3P01
SMKA6000S5xeN7.2 6000GB	3P01

What's New in the OS

HP 3PAR OS 3.2.1 EMU1 provides all the benefits provided by HP 3PAR OS 3.2.1 MU1 and provides the following benefits:

- Provide support for the following drives:
  - SMKA2000S5xeN7.2
  - SMKA4000S5xeN7.2
  - SMKA6000S5xeN7.2

Modifications to the OS

HP 3PAR OS 3.2.1 EMU1 addresses following issues:

- Addresses TDVV region moves, conversion speed, various Remote Copy items and a high memory usage scenario
- Ensures access to the StoreServ through CLI after reaching the maximum limit for connection tracking table entries.

The following items are addressed in this release:

Issue ID	Description
110619	Provides support for SMKA2000/4000/6000S5xeN7.2 drives.
119815	Resolves an undesirable memory usage issue.

Issue ID	Description
120319	Resolves an issue in the HP 3PAR OS 3.2.1 MU1 to allow Remote Copy groups to remain online during HP 3PAR OS 3.2.1 GA to HP 3PAR OS 3.2.1 MU1 upgrade.
120788	Resolves an issue that impacts the performance of conversion from TPVV.
121239	Resolves an issue with Dedup garbage collection that can happen during region move operation.
121757	Resolves a cache cleanup issue that arises while using dedup function with VAAI (VMware vSphere Storage APIs – Array Integration) locking primitive ATS.
121879	Resolves an issue with a Quorum Witness creation when the admin interface is not on the cluster master.
115166	Multicast traffic over SLP (Service Location Protocol) port (UDP 427) might cause creation of excessive connection tracking table entries which never expire.

14 Support and Other Resources

Contacting HP

For worldwide technical support information, see the HP support website:

http://www.hp.com/support

Before contacting HP, collect the following information:

- Product model names and numbers
- Technical support registration number (if applicable)
- Product serial numbers
- Error messages
- Operating system type and revision level
- Detailed questions

Specify the type of support you are requesting:

HP 3PAR storage system	Support request
HP 3PAR StoreServ 7200, 7400, and 7450 Storage systems	StoreServ 7000 Storage
HP 3PAR StoreServ 10000 Storage systems HP 3PAR T-Class storage systems HP 3PAR F-Class storage systems	3PAR or 3PAR Storage

HP 3PAR documentation

For information about:	See:
Supported hardware and software platforms	The Single Point of Connectivity Knowledge for HP Storage Products (SPOCK) website: SPOCK (http://www.hp.com/storage/spock)
Locating HP 3PAR documents	The HP Storage Information Library: Storage Information Library (http://www.hp.com/go/storage/docs/) By default, **HP 3PAR Storage** is selected under **Products and Solutions**.
Customer Self Repair procedures (media)	The HP Customer Self Repair Services Media Library: Customer Self Repair Services Media Library (http://h20464.www2.hp.com/index.html) Under **Product category**, select **Storage**. Under **Product family**, select **3PAR Storage Systems** for HP 3PAR E-Class, F-Class, S-Class, and T-Class Storage Systems, or **3PAR StoreServ Storage** for HP 3PAR StoreServ 10000 and 7000 Storage Systems.
HP 3PAR storage system software	
Storage concepts and terminology	*HP 3PAR StoreServ Storage Concepts Guide*
Using the HP 3PAR Management Console (GUI) to configure and administer HP 3PAR storage systems	*HP 3PAR Management Console User's Guide*

For information about:	See:
Using the HP 3PAR CLI to configure and administer storage systems	*HP 3PAR Command Line Interface Administrator's Manual*
CLI commands	*HP 3PAR Command Line Interface Reference*
Analyzing system performance	*HP 3PAR System Reporter Software User's Guide*
Installing and maintaining the Host Explorer agent in order to manage host configuration and connectivity information	*HP 3PAR Host Explorer User's Guide*
Creating applications compliant with the Common Information Model (CIM) to manage HP 3PAR storage systems	*HP 3PAR CIM API Programming Reference*
Migrating data from one HP 3PAR storage system to another	*HP 3PAR-to-3PAR Storage Peer Motion Guide*
Configuring the Secure Service Custodian server in order to monitor and control HP 3PAR storage systems	*HP 3PAR Secure Service Custodian Configuration Utility Reference*
Using the CLI to configure and manage HP 3PAR Remote Copy	*HP 3PAR Remote Copy Software User's Guide*
Updating HP 3PAR operating systems	*HP 3PAR Upgrade Pre-Planning Guide*
Identifying storage system components, troubleshooting information, and detailed alert information	*HP 3PAR F-Class, T-Class, and StoreServ 10000 Storage Troubleshooting Guide*
Installing, configuring, and maintaining the HP 3PAR Policy Server	*HP 3PAR Policy Server Installation and Setup Guide* *HP 3PAR Policy Server Administration Guide*

For information about:	See:
Planning for HP 3PAR storage system setup Hardware specifications, installation considerations, power requirements, networking options, and cabling information for HP 3PAR storage systems	
HP 3PAR 7200, 7400, and 7450 storage systems	*HP 3PAR StoreServ 7000 Storage Site Planning Manual* *HP 3PAR StoreServ 7450 Storage Site Planning Manual*
HP 3PAR 10000 storage systems	*HP 3PAR StoreServ 10000 Storage Physical Planning Manual* *HP 3PAR StoreServ 10000 Storage Third-Party Rack Physical Planning Manual*
Installing and maintaining HP 3PAR 7200, 7400, and 7450 storage systems	
Installing 7200, 7400, and 7450 storage systems and initializing the Service Processor	*HP 3PAR StoreServ 7000 Storage Installation Guide* *HP 3PAR StoreServ 7450 Storage Installation Guide* *HP 3PAR StoreServ 7000 Storage SmartStart Software User's Guide*
Maintaining, servicing, and upgrading 7200, 7400, and 7450 storage systems	*HP 3PAR StoreServ 7000 Storage Service Guide* *HP 3PAR StoreServ 7450 Storage Service Guide*
Troubleshooting 7200, 7400, and 7450 storage systems	*HP 3PAR StoreServ 7000 Storage Troubleshooting Guide* *HP 3PAR StoreServ 7450 Storage Troubleshooting Guide*
Maintaining the Service Processor	*HP 3PAR Service Processor Software User Guide* *HP 3PAR Service Processor Onsite Customer Care (SPOCC) User's Guide*
HP 3PAR host application solutions	
Backing up Oracle databases and using backups for disaster recovery	*HP 3PAR Recovery Manager Software for Oracle User's Guide*
Backing up Exchange databases and using backups for disaster recovery	*HP 3PAR Recovery Manager Software for Microsoft Exchange 2007 and 2010 User's Guide*
Backing up SQL databases and using backups for disaster recovery	*HP 3PAR Recovery Manager Software for Microsoft SQL Server User's Guide*
Backing up VMware databases and using backups for disaster recovery	*HP 3PAR Management Plug-in and Recovery Manager Software for VMware vSphere User's Guide*
Installing and using the HP 3PAR VSS (Volume Shadow Copy Service) Provider software for Microsoft Windows	*HP 3PAR VSS Provider Software for Microsoft Windows User's Guide*
Best practices for setting up the Storage Replication Adapter for VMware vCenter	*HP 3PAR Storage Replication Adapter for VMware vCenter Site Recovery Manager Implementation Guide*
Troubleshooting the Storage Replication Adapter for VMware vCenter Site Recovery Manager	*HP 3PAR Storage Replication Adapter for VMware vCenter Site Recovery Manager Troubleshooting Guide*
Installing and using vSphere Storage APIs for Array Integration (VAAI) plug-in software for VMware vSphere	*HP 3PAR VAAI Plug-in Software for VMware vSphere User's Guide*

Typographic conventions

Table 1 Document conventions

Convention	Element
Bold text	• Keys that you press • Text you typed into a GUI element, such as a text box • GUI elements that you click or select, such as menu items, buttons, and so on
`Monospace text`	• File and directory names • System output • Code • Commands, their arguments, and argument values
`<Monospace text in angle brackets>`	• Code variables • Command variables
`Bold monospace text`	• Commands you enter into a command line interface • System output emphasized for scannability

WARNING! Indicates that failure to follow directions could result in bodily harm or death, or in irreversible damage to data or to the operating system.

CAUTION: Indicates that failure to follow directions could result in damage to equipment or data.

NOTE: Provides additional information.

Required

Indicates that a procedure must be followed as directed in order to achieve a functional and supported implementation based on testing at HP.

HP 3PAR branding information

- The server previously referred to as the "InServ" is now referred to as the "HP 3PAR StoreServ Storage system."
- The operating system previously referred to as the "InForm OS" is now referred to as the "HP 3PAR OS."
- The user interface previously referred to as the "InForm Management Console (IMC)" is now referred to as the "HP 3PAR Management Console."
- All products previously referred to as “3PAR” products are now referred to as "HP 3PAR" products.