Hewlett Packard Enterprise

HPE 3PAR Storage

Competitive to Other Brands

Competitive

Hewlett Packard
Enterprise

HPE 3PAR StoreServ vs. EMC VMAX

What would it take to scale each AFA to >25 PB Effective Usable?

EMC VMAX 850F:

>6x the racks + support costs
>6x the power
6x the arrays to manage

Scalable. Flexible. Resilient. Future-proof

HPE 3PAR StoreServ 20850 All-Flash Storage

25.8 PBs Effective Usable
12 Racks (w/3.84 TB SSDs*)
69 KW

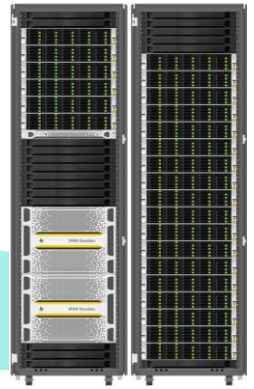
6 arrays

vs

HPE 3PAR StoreServ 20850

28.8 PB Effective Usable
2 Racks (w/15.36 TB SSDs)
13.1 KW

1 array



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* 7.68 TB and 15.36 TB SSDs only supported on VMAX 250F (1/11/2017)

Dell EMC VMAX comparison on mid-range flash

HPE StoreServ is space and power efficient

HPE 8450 can scale to 1.1 PB effective usable capacity in only 4U

.665 kW[1]

.6 Watt per TBe

Dell EMC VMAX 250F requires 10U to scale to only 1.1 PB effective usable capacity

1.7 kW

1.5 Watts per TBe

Standard Customer Buying Criteria:

	EMC VMAX AF	HPE 3PAR	HPE ADVANTAGE
Performance			
IOPS	Claims millions of IOPS. No public benchmarks.	3.2M IOPS from 20850, 1.9M from 20450, 1.2M from 8450. Block size used is 8K. SPC-1 of 545K IOPS and 0.8ms. Proven to greater than 17K IO per SSD drive.	Although EMC has historically had a solid reputation for performance, it's never truly been the fastest array. 3PAR has a history of publicly benchmarking numbers far superior to what EMC can deliver. The same is true now.
Bandwidth	Claims to be able to exceed 100GB/s, however the VMAX has an SPC-2 of only 55GB/s.	HPE 3PAR 20850 delivered 62GB/s in its SPC-2. Sustainable 20GB/s with 20450 & 14-16GB/s with 8450.	Simple math makes 3PAR better in this category over the VMAX.
Latency	Marketing claims <1ms	Marketing claims <1ms	3PAR's marketing numbers were exceeded in real-world, public benchmarks. EMC has not proven their marketing claims.

Standard Customer Buying Criteria:

	EMC VMAX AF	HPE 3PAR	HPE ADVANTAGE
Scalability			
Overall Capacity	Up to 4PB. No Data Reduction as of now.	Over 3PB physical RAW limit. Can grow up to 24PB effective usable.	Simple math. It would take 6 VMAX AF's to equal the capacity delivery of one 20850.
Online Growth	Yes hardware upgrades are done online.	Yes. Nodes/Drives added online.	NEUTRAL
Non-disruptive, data in place upgrade	No. This is why EMC positions VPLEX to solve this problem. VPLEX delivers storage virtualization which allows EMC to seamlessly plug in or pull out storage subsystems.	Yes through Peer Motion.	Existing EMC customers are accustomed to dealing with multiple appliances to get to their end solution. However this practice is no longer being accepted by the industry.

Standard Customer Buying Criteria:

	EMC VMAX AF	HPE 3PAR	HPE ADVANTAGE
Capacity Efficiency			
Deduplication	None	Hardware drive, inline deduplication. (Done in ASIC). Read back compare done in ASIC. 100% lossless.	Global, 100% inline, hardware offload, 100% lossless, no performance impact, ability to toggle on/off.
Compression	YES, but their max array capacity hasn't increased.	Roadmap	NEUTRAL
Thin Provisioning	Provided through software layer. *(Virtual provisioning)*	Native, always on.	NEUTRAL
Capacity Overhead	Traditional Raid supported however mirroring or shorter stripes with Raid 6 are best practices for protection and performance.	Configurable Raid options. Default is 25% overhead total (RAID 5 (7+1) + Sparing).	Simple math.

Standard Customer Buying Criteria:

Data Services	EMC VMAX AF	HPE 3PAR	HPE ADVANTAGE
Native File	eNAS	3PAR File Persona	NEUTRAL
VMware/ Microsoft Integration	Full integration with both Microsoft & Vmware including Vvol, VASA 2., MS ODX, etc.	Full integration with both Microsoft & Vmware including Vvol, VASA 2., MS ODX, etc.	NEUTRAL
Replication	SRDF: Sync, Async Streaming, & Async Periodic. Consistency Groups, and Cluster Extension. VPLEX is required for Active/Active data Centers.	Native Sync, Async Streaming, & Async Periodic. Consistency Groups. Native Snapshot integration. Peer Persistence for Active/Active data centers. Cluster Extension for native OS Cluster failover integration.	HPE: 3PAR's Replication has no performance overhead, provides 3DC support, and with Peer Persistence can deliver true Active/Active Data Centers, all 100% natively.
Snapshots/Clones	BCV's are the original snapshot technology. Up to 32,000 supported. Full cloning support.	Native, efficient snapshots scaling up to 64,000 Read/Write capable. Full cloning support.	HPE: BUT this one could be neutral. Our greater number of both supported clones & snaps is the major differentiator overall. No performance impact, seamless, and reservation-less are advantages over VMAX specifically.
Quality-of-Service	Thresholds for IO & bandwidth. Maximum & Minimum settings for each.	Thresholds for IO, bandwidth, and latency. Maximum & Minimum settings for each.	HPE: In addition to the obvious latency advantage, 3PAR provides granularity at an individual volume level or groups of volumes.
OpenStack/Cloud	EMC offers a robust marketing message around cloud & Openstack. EMC also offers a Cloud stack with VMAX.	HPE is the leader in OpenStack but not with storage. 3PAR supports specific drivers only and is trailing on releases.	NEUTRAL
Other Software	VMAX has a full portfolio suite of software that includes FAST VP for sub-volume tuning & FTS for some basic federation services.	3PAR offers full volume tuning, sub-volume tuning, full federation, security domains, and other software features like volume/snapshot retention that leads the entire industry of flash arrays.	NEUTRAL

HPE 3PAR StoreServ vs. EMC VNX Hybrid

StoreServ 8440/20800 CFAs Vs. VNX Hybrid Details (1)

	HP 3PAR StoreServ CFAs	EMC VNX Hybrids
Max controllers	4 (8440), 8 (20800)	2
Controllers always Active/Active	Yes	No – can't be used with pools
Performance evenly balanced across controllers	Yes	No
Controller scale-out ability for HA	Yes	No
Native Converged block, file, object support	Yes[2]	No – 1-8 bolt-on X-blades
Maximum drives	960 (8440) 1920 (20800)	1500 (too much for 2 controllers)
Max. usable capacity – raw	3PB (8440), 6PB (20800)	6PB
Inline dedupe	Yes	No – out of band
Full performance with Thin LUNs	Yes	No
Max. IOPS	1m+ (8440), 2.5M (20800) [4KB, 100% RR]	0.5M to ~1M
Max. Bandwidth	24GB/s (8440), 75GB/s (20800)	~10GB/s[4]
$/GB – post compaction	~ $1.60/GB (7440c)	<$5/GB?

StoreServ 8440/20800 CFAs Vs. VNX Hybrid Details (2)

	HP 3PAR StoreServ CFAs	EMC VNX Hybrids
Highest rated mid-range array	Yes	No
Easiest to use	Yes	No
Express Writes	Yes	No
16Gb FC host connect	Yes	No
12Gb SAS backend	Yes (20800)	No
Snapshots without needing reserved space	Yes	No
Distributed spare drives	Yes	No
Zero reclaim with minimal performance drop	Yes (< 5%)	No (~40%)
Zero reclaim time	Minutes (via ASIC)	hours
Reclaimed zero pages returned to a common pool	Yes	No
Dedupe returns bocks to the global pool	Yes	No
Separate data and control traffic	Yes	No
Automatically wide stripe across entire array	Yes	No
SSD caching of HDD reads	Yes (Adaptive Write Cache)	Yes

StoreServ 8440/20800 CFAs Vs. VNX Hybrid Details (3)

	HP 3PAR StoreServ CFAs	EMC VNX Hybrids
Max. volumes	128K (20800 VVs)	8K (non-pool)
Max SSD size	3.8TB	1.6TB
Max HDD size	6TB	4TB
Encryption method	FIPS certified SED drives	Roadmap
Max. Flash Cache	32TB (20800)	4.2TB
Max. cache	1.8TB (20800)	256GB
Offloading ASIC	Yes	No
Max. initiators	8192	8192 (8000)
Max. FC host ports	160	72
Max. 10Gb iSCSI/FCoE ports	80/80	32/36
6-Nines availability guarantee	Yes (8440)*	No
5 year SSD Warranty	Yes	No
Soonest/Best VMware integration	Yes	No
Windows & Hyper-V Native MetroCluster support	Yes	No

StoreServ 8440/20800 CFAs Vs. VNX Hybrid Details (4)

	HP 3PAR StoreServ CFAs	EMC VNX Hybrids
Max SSDs Drives	1024	?
QoS support	Yes	No
Workflows, Clicks to provision 20 SMB file shares	45, 135	23, 318
Workflows, Clicks to expand 20 SMB file shares	1, 7	20, 140
Workflows, Clicks to provision a block LUN	1, 4	2, 12
Max snapshots per system	32k	2k
cMLC support	Yes	No
End-to-end T10	PI (8440, 20800)	No
Can mix RAID types on same spindles	Yes	No
FC initiators per sys	8192	8192
Max FS size	32TB/FPG	16TB

StoreServ 8440/20800 CFAs Vs. VNX Hybrid Details (5)

	HP 3PAR StoreServ CFAs	EMC VNX Hybrids
Max File capacity	256TB	512TB per data mover
HDD Spin down capability	No	Yes
Compression support	Roadmap	Yes
Max. raw, usable TB/U	46 (24x3.84 in 2U), 46x4	160 (120 drive DAE, 40x4TB/U)
SPC-1 KIOPS	450 (3PAR family, from 3 yrs. ago)	435

HPE 3PAR 8000
StoreServ vs. EMC Unity All-Flash

Competitive Landscape (All Flash Configurations)

Performance (IOPS)

HPE 3PAR StoreServ 8450-4N
3686 TB Raw
10.3 PBe* in 20U
654k IOPS**

HPE 3PAR StoreServ 8400-4N
1843 TB Raw
5.1 PBe* in 12U
532k IOPS**

HPE 3PAR StoreServ 8200
922 TB Raw
2.6 PBe* in 8U
251k IOPS**

When Value matters
8200 AFSK starting at <$15k for 6.4 TBe or $2.22/GBe

EMC Unity 300F
2.4 PBs Raw[1]
4.8 PBe* in 12U
101K IOPS

EMC Unity 400F
4 PBs Raw[1]
8 PBe* in 20U
202K IOPS

EMC Unity 500F
8 PBs Raw[1]
16 PBe* in 40U
257K IOPS

EMC Unity 600F
10 PBs Raw[1]
20 PBe* in 80U
295K IOPS

Starting at ~$10K for only 2.4 TBe or $3.96/GBe

Scale out to 3PAR 20000 Series in Same Architecture

- Midrange – Flash – High-end
- Common Tier-1 Feature Set
- Interoperability end-to-end
- Up to 29 PBe in single array

Only HPE

Max Effective Usable Capacity

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* PBe refers to Effective Usable Capacity after sparing, 25% RAID 6 (6+2) overhead and data reduction (OS 3.3.1-)
** 3PAR Performance from Ninja STARS (v2.9.7.2). To align with Unity specifications, both 3PAR and Unity performance at 8k 80/20 R/W random workload, RAID 1, 0% TDVV, does not include Express Write performance improvements

HPE StoreServ AFAs Vs. Dell EMC Unity (1)

Feature	HPE 3PAR StoreServ 8450 (8200)	Dell EMC Unity 600F (300F)
Max. IOPS (8kB, 80% R/W)	654k (251K)[1]	☹ 295K, (101K)
Max. throughput (GB/s)	24 GB/s[2] (10 GB/s)	Not Specified
Largest SSDs	15.36 TB	15.36 TB
Max SSDs Supported	480 (120)	1000 (150)
Max. raw capacity, before RAID and compaction	3351 TiB (838 TiB)	10 PBs (2.4 PBs)
Max effective usable capacity	10.3 PBe (2.6 PBe)	20 PBe (4.8 PBe)[3]
Offloading ASIC	Yes	☹ No
Performance balanced controllers	Yes	☹ No
Max CPUs Per Array	4-(2) 10-core 2.4 GHz	☹ 2 12-core 2.5 GHz
Object support	Yes	☹ No[4]
Max Fibre Channel Ports	24 (12) @ 16Gb/s	Up to 24[5] @ 16Gb/s
Max iSCSI Ports	☹ 8 (4) @ 10Gb/s	Up to 24[5] @ 10Gb/s
FCoE Support	Yes	☹ No

*Based on a review of Dell EMC Unity on 10/24/2016.

HPE StoreServ AFAs Vs. Dell EMC Unity (2)

Feature	HPE 3PAR StoreServ 8450 (8200)	Dell EMC Unity 600F (300F)
HW accelerated Zero page reclaim with virtually no performance hit	Yes	☹ No
Reclaimed pages return to a common pool	Yes	☹ No
Reclaim finishes within minutes	Yes	☹ No
Object access API	Yes	☹ No
Reservation-less snapshots	Yes	☹ No
Distributed sparing	Yes	☹ No (requires dedicated spares)
Ability to separate data and control traffic	Yes	☹ No
Max LUNs per System	128K (64K)	6,000 (1,000)
Max LUN Size	16 TiB TDVV, 64 TiB TPVV CPVV	256 TB
5 year SSD Warranty	Yes	☹ No[1]
DCIG "Best in Class"	Yes	☹ No
6-Nines availability guarantee	Yes	☹ No

*Based on a review of Dell EMC Unity on 10/24/2016.

HPE 3PAR StoreServ vs. IBM Storwize V7000

HPE 3PAR StoreServ 8000 vs. IBM Storwize V7000 Competitive Positioning - Top Reasons to Buy 3PAR StoreServ 8000 vs. IBM Storwize V7000

	IBM Storwize V7000	HPE 3PAR StoreServ 8000	HPE ADVANTAGE
Features			
ASIC	No ASIC to offload tasks from processors	One ASIC per controller	The HPE 3PAR StoreServ uses ASICs to prevent various tasks from taking cycles from controller processors to ensure optimal performance.
Support Block, File, and Object storage	No, only block and file	Yes	Because HPE 3PAR StoreServ can support all three types of storage there is no need for additional array types
Use SSDs as adaptive Flash cache	No	Yes (except 8450)	HPE 3PAR provides the flexibility when extra cache is needed.
Reliability	5 Nines	6 Nines Guarantee	HPE 3PAR guarantees the industry's best reliability via the HPE Six Nines program.

HPE 3PAR StoreServ 8000 vs. IBM Storwize V7000 Competitive Positioning - Top Reasons to Buy 3PAR StoreServ 8000 vs. IBM Storwize V7000

	IBM Storwize V7000	HPE 3PAR StoreServ 8000	HPE ADVANTAGE
Features			
3-way Replication	No	Yes	HPE 3PAR offers three different ways to replicate data: Synchronous mode, Asynchronous Periodic mode, and Asynchronous Streaming mode to meet most customers' needs.
Delta Replication	No	Yes	HPE 3PAR protects data updates.
FC Asymmetric LUN Access	No	Yes	HPE 3PAR supports the most optimal pathing.
PIT per LUN	256	2048 r/o 2048 r/w	HPE 3PAR's greater number of both supported clones & snaps is the major differentiator overall. No performance impact, seamless, and reservation-less.

HPE 3PAR StoreServ 8000 vs. IBM Storwize V7000 Competitive Positioning - Top Reasons to Buy 3PAR StoreServ 8000 vs. IBM Storwize V7000

	IBM Storwize V7000	HPE 3PAR StoreServ 8000	HPE ADVANTAGE
Features			
LUNs	10,000	128K to 256K LUNs system (depending on the 8000 model)	HPE 3PAR's greater number of LUNs allows more data granularity .
Deduplication	No	Yes	HPE 3PAR supports inline deduplication to further increase storage efficiency
Compression	Yes	OS 3.3.1	HPE 3PAR supports compression with OS 3.3.1
Automated SAN Zoning	No	Yes	**HPE 3PAR StoreServ offers a reduction in SAN Configuration and Management errors by automating SAN zoning and configuration via Smart SAN**

HPE 3PAR StoreServ 8000 vs. IBM Storwize V7000 Competitive Positioning - Top Reasons to Buy 3PAR StoreServ 8000 vs. IBM Storwize V7000

	IBM Storwize V7000	HPE 3PAR StoreServ 8000	HPE ADVANTAGE
Features			
SSD Warranty	IBM warranties SSDs for 3 years	HPE provides a 5 year SSD warranty	HPE 3PAR is clearly up-front with its SSD warranty. Who would you trust your data to?

HPE 3PAR StoreServ 8000 vs. NetApp FAS 8200

HPE 3PAR StoreServ vs. NetApp FAS8000 Competitive Positioning - Top Reasons to Buy 3PAR StoreServ 8000 vs. NetApp FAS8200

	NetApp FAS8200	HPE 3PAR StoreServ 8000	HPE ADVANTAGE
Storage Media			
SSDs	Only 4 choices: 960 GB, 3.8 TB, 7.68 TB, and 15.36 TB*	Many more choices and higher capacities: 400GB, 480 GB. 920 GB, 1.92 TB, 3.84 TB, 7.68 TB, and 15.36 TB	The HPE 3PAR StoreServ 8000 storage solutions provide a comprehensive choice of SSD capacities to meet customers' needs and the highest capacity SSDs to eliminate data center sprawl.
SSD Warranty	3 years*	5 Years	HPE warranties SSDs for 5 years, two full years longer than the FAS8200
Drive intermix within an enclosure	No	Yes	HPE 3PAR allows intermix of drives in the same enclosure to reduce data center sprawl.

* Per NetApp Storage Shelf Specifications denoting only the DS224C and DS212C as the only storage shelves that can contain SSDs that are supported with the FAS8200
- http://www.netapp.com/us/products/storage-systems/disk-shelves-and-storage-media/disk-shelves-tech-specs.aspx

** NetApp will replace a worn-out SSD up to 7 years provided it is under an active support contract

HPE 3PAR StoreServ vs. NetApp FAS8000 Competitive Positioning - Top Reasons to Buy 3PAR StoreServ 8000 vs. NetApp FAS8200

	NetApp FAS8200	HPE 3PAR StoreServ 8000	HPE ADVANTAGE
Key Data Replication Features			
Maximum LUNs	12,288	64K LUNs + 64K LUNs for snapshots per system	HPE 3PAR's greater number of both supported clones & snaps is the major differentiator overall. No performance impact, seamless, and reservation-less are advantages.
Max PIT copies per LUN	255	2,048 r/o 2,048 r/w	HPE 3PAR has a more granular approach to snapshots which promotes providing a more accurate and current journal of transactions.
3-Way Replication	No	Yes	HPE 3PAR offers three different ways to replicate data: Synchronous mode, Periodic Asynchronous mode, and Asynchronous Streaming mode to meet most customers' needs.

HPE 3PAR StoreServ vs. NetApp FAS8000 Competitive Positioning - Top Reasons to Buy 3PAR StoreServ 8000 vs. NetApp FAS8200

	NetApp FAS8200	HPE 3PAR StoreServ 8000	HPE ADVANTAGE
Key Data Replication Features			
Deduplication	NetApp just added more controller processors (more hardware, more power, more cost)	Full time ASIC to offload 3PAR StoreServ 8000 controller processors with world class deduplication performance	The HPE 3PAR StoreServ 8000 storage solutions provide high performance deduplication all the time without requiring an extra hardware component and cost.
ASIC to offload background tasks from CPUs	No	Yes, most background tasks	**HPE 3PAR StoreServ AFAs use of the Gen 5 AIC offloads most background tasks that typically sap other array CPU performance**
Automated SAN Zoning	No	Yes	**HPE 3PAR StoreServ offers a reduction in SAN Configuration and Management errors by automating SAN zoning and configuration via SmartSAN**

HPE 3PAR StoreServ vs. NetApp FAS8200 Competitive Positioning - Top Reasons to Buy 3PAR StoreServ 8000 vs. NetApp FAS8200

	NetApp FAS8200	HPE 3PAR StoreServ 8000	HPE ADVANTAGE
Reliability and Serviceability			
Reliability	5 Nines	6 Nines	HPE 3PAR guarantees the industry's best reliability via the HPE Six Nines program.

* NetApp claims their FAS9000 arrays "are built" for 6 Nines or better, but they won't offer any guarantee

Collaboration

Hewlett Packard
Enterprise

Thank You