3PAR VMware Best Practices

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Note: These best practices have been consolidated from various HPE 3PAR guides and other sources.

VMware Best Practices (3PAR setup)

- Supported Initiator count per 3PAR port, total Initiator count per 3PAR array
- Queue depth support for various 3PAR adapters (per Port)

HBA	Protocol	Array	Bus	Speed	Ports	Max. queue depth
Emulex LP11002	Fibre Channel	F200, F400, T400, T800	PCI-X	4 Gb/s	2	959
HPE 3PAR FC044X	Fibre Channel	F200, F400, T400, T800	PCI-X	4 Gb/s	4	1638
QLogic QLA4052C	iSCSI	F200, F400, T400, T800	PCI-X	1 Gb/s	2	512
Emulex LPe12002	Fibre Channel	StoreServ 7000	PCIe	8 Gb/s	2	3276
Emulex LPe12004	Fibre Channel	StoreServ 7000, StoreServ 10000	PCIe	8 Gb/s	4	3276
QLogic QLE8242	FCoE	StoreServ 7000, StoreServ 10000	PCIe	10 Gb/s	2	1748
QLogic QLE8242	iSCSI	StoreServ 7000, StoreServ 10000	PCIe	10 Gb/s	2	2048
Emulex LPe16002	Fibre Channel	StoreServ 7000, StoreServ 10000	PCIe	16 Gb/s	2	2456

VMware Best Practices (3PAR setup)

- Host definition for VMware. Persona 11 for ALUA Inform OS 3.1.2 + prior to that it was persona 6.
  - Note: to change the persona requires a reboot of ESX.
  - Define a single host to all paths from an ESX server.

- Persistent Ports nothing to set on 3PAR, connect same port number on Node Pairs to same fabric.

- Volume Export, typically create a Host Set and a Volume set for ESX cluster. Export Volume Set to Host Set.

- 3PAR Peer Persistence All of the above rules apply. Also requires cross site SAN connectivity and Remote Copy in synchronous mode.

- HPE StoreOnce Recovery Manager Central 1.1 is the minimum version required for vSphere 6.0 environments. HPE StoreOnce Recovery Manager Central for VMware can be deployed using vSphere Web Client or HPE OneView for VMware vCenter. OV4VC 7.7 is required to deploy RMC-V 1.1.

- HPE OneView for VMware vCenter (OV4VC) 7.6 is the minimum version required for vSphere 6.0 support. HPE OneView for VMware vCenter 7.7 is the minimum version required to deploy HPE StoreOnce Recovery Manager for VMware in vSphere 6.0 environments. Also provides visibility to 3PAR Dedup and Vvol volumes.

VMware Best Practices (3PAR setup)

- 3PAR Priority Optimization (QOS). Done at the volume set, Domain or System level (VMFS prior to Vvols.)

	HPE 3PAR Priority Optimization	vSphere SIOC	vSphere AQD	vSphere Storage DRS
I/O control technique	Set Min Goal (3PAR OS 3.1.3) and Max Limit for IOPS and bandwidth, set latency goal (3.1.3), set priority level (3.1.3)	Enforce predefined I/O shares for each VM	Control queue depth of datastore SAN LUN in VMkernel	Migrate VM to other datastore
Reaction on	None	I/O latency growing	Queue Full or Device Busy at LUN or port level	I/O latency and space utilization growing
Granularity	VVset, Virtual Domain, System	All VMs in a single datastore	All hosts using the SAN LUN for the datastore or a particular port on the HP 3PAR StoreServ Storage system	Single VM
Managed from	HP 3PAR Management Console/HP 3PAR CLI	VMware vSphere/CLI	VMware vSphere/CLI	VMware vSphere/CLI
Available in	HP 3PAR OS 3.1.2 MU2 and later	vSphere 4.1 and later with Enterprise Plus license	vSphere 3.5 U4 and later with Standard license	vSphere 5.0 and later with Enterprise Plus license

Control type	Minimum HPE 3PAR OS version	Description	Details
Max. limit	3.1.2 MU2 and later	Maximum threshold for IOPS or bandwidth for a QoS object	Max. limit has no dependencies on the other control types.
Min. goal	3.1.3	Minimum floor for IOPS or bandwidth below which HPE 3PAR Priority Optimization will not throttle a QoS object	When a Min. goal is set on an object the user must also configure a Max. limit on the same object within the same rule. Min. goal will be ignored if the system has no rules with latency goal set.
Latency goal	3.1.3	Service time target the system will try to achieve for a given workload in a QoS object	This control type requires other rules in the system with Min. goal to be set, as the latency goal algorithm needs direction on which workload to target and throttle. The order in which these will be throttled is provided by the priority levels.
Priority level	3.1.3	Precedence order for QoS subsystem to throttle workloads to meet latency goals	High priority should be used against critical applications, lower priority on less critical applications.

VMware Best Practices (3PAR setup)

- 3PAR VMware and Thin, Dedup and Compression
  - TPVV a thin provisioned volume
  - TDVV a thin deduped volume
  - TPVV/TDVV with compression

- Use separate CPG's for TPVV and TDVV
- Group VM's in data stores by type if possible i.e. Windows 2012, Linux, SQL etc
- Do not use dedup on any data store that has Data Base VM's (separate out these VM's to TPVV data store)

VMware Best Practices (3PAR setup)

- VMware 5 VAAI and T10, Prior to 3.1.1 requires a 3PAR Plug-in for Vsphere, Inform OS 3.1.1 and above uses native support.

- vCenter Plug-in. This is no longer a separate distribution. The Plug-in comes with the Insight Control Storage Module (ICSM) 7.3 from HPE which also includes RMCVM and VASA support.

- HPE Store Front Analytics for VMware vCentre Operations Manager (vROps) vRealize Operations Management (licensed)

- Thin Provisioning, VMware Thin does the same as 3PAR Thin but uses CPU resource. Both can be used but no additional benefit will be seen.

VMware Best Practices VMware Setup

- VMware Adaptive Queue Depth settings 5.1 and above
  - #esxcli storage core device set --device *device_name* --queue-full-threshold *4* --queue-full-sample-size *32*
  - *(on-line change that takes affect immediately)*

- VMware Path Policy, set to Round Robin for 3PAR.
  - Set the IOPs option via CLI to 1
  - # esxcli storage nmp psp roundrobin deviceconfig set --type=iops --iops=1 --device <device-name>
  - Note: you can create a “Storage Array Type Policy” SATP for 3PAR to automate the setting for new LUN’s
  - # esxcli storage nmp satp rule add -s "VMW_SATP_ALUA" -P "VMW_PSP_RR" –O "iops=1" -c
  - "tpgs_on" -V "3PARdata" -M "VV" -e "HP 3PAR Custom Rule”
  - To list the rule use   # esxcli storage nmp satp rule list | grep "3PARdata"

VMware Best Practices VMware Setup

- VMware VMFS alignment: It is recommended to use vSphere Client (5+) as it aligns on a 1 MB boundary for VMFS-3 and VMFS-5. If vmfsktools is used use the partedUtil to align (2048 – 1 MB)
  - Use EZT for VM's
  - Host file systems should be aligned on a 16 KB boundary or multiple of 16 KB.

- Unmap support manual via ESX CLI command
  - # esxcli storage vmfs unmap --volume-label=<label> | --volume_uuid=<uid> [--reclaim-unit=<blocks>]
  - Note default for blocks is 200 or 200 MB but can be increased to 12800 MB

For vSphere 6, it is now possible for a guest OS to issue an UNMAP command to reclaim space. There are several prerequisites that must be met to allow UNMAP to run:
• The VMDK for the VM must be thin provisioned at the 3PAR level.
• The VM hardware version must be 11 (ESXi 6.0).
• The ESXi host advanced setting EnableBlockDelete must be set to 1.
• The guest OS must be able to identify the disk as thin.

Note that Windows® 2008 and above is able to detect that the disk is thin provisioned. Linux® distributions check the SCSI version, and only send UNMAP commands when the SCSI version is 5 or greater. vSphere 6.0 virtual disks support SCSI-2, which prevents the usage of UNMAP for Linux guests.

VMware Best Practices VMware Setup

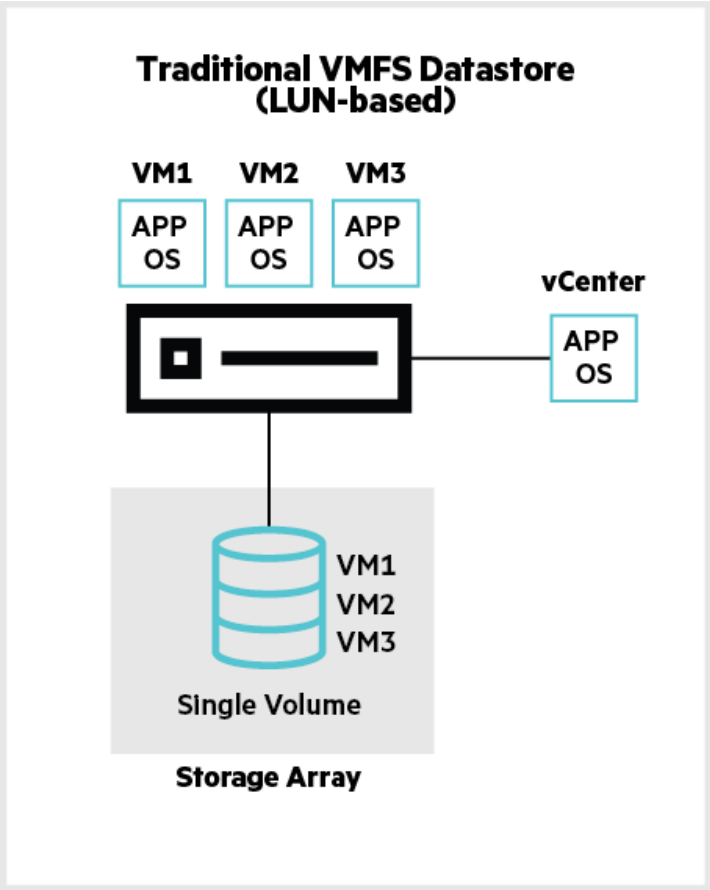
- VMware Storage DRS allocation for VM's based on Capacity and Latency. For AO environments it is recommended to use just capacity. Configure DRS in manual mode with I/O metric disabled.
  - Note DRS is not supported by ESX for Vvols

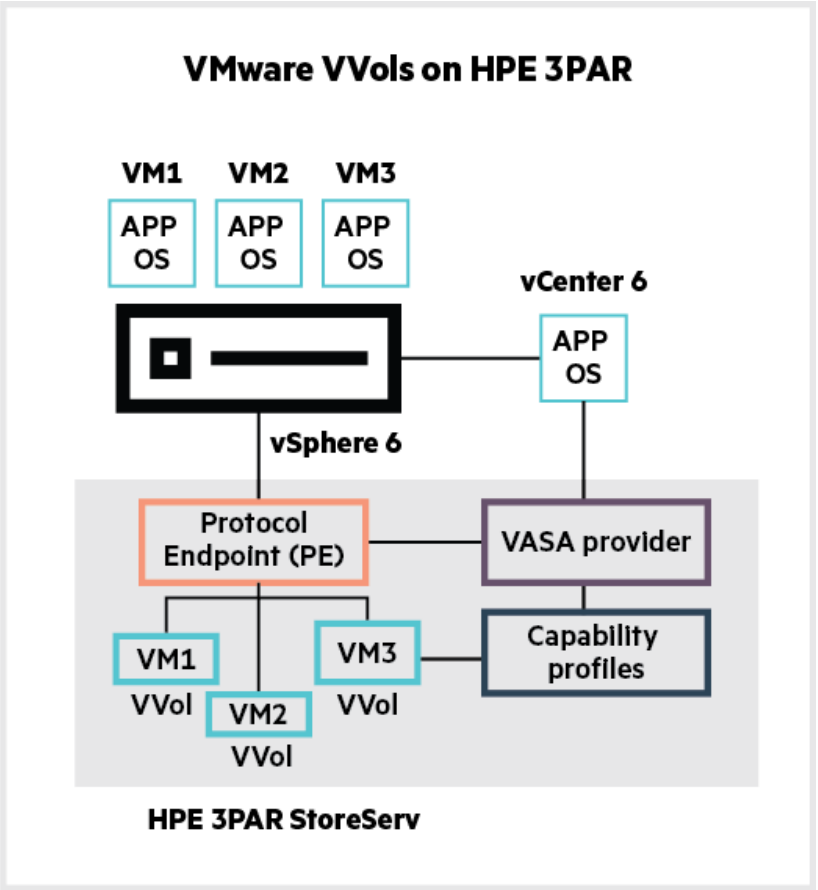
- vSphere Storage I/O Control (SIOC) manages ESXI queue depths. Can coexist with AQD, 3PAR AO, QOS. SOIC is not compatible with Vvols.

SSD	10-15 ms
Fast Class	20-30 ms
Nearline	30-50 ms
Auto-tiered storage	Combine ranges of fastest and slowest storage types

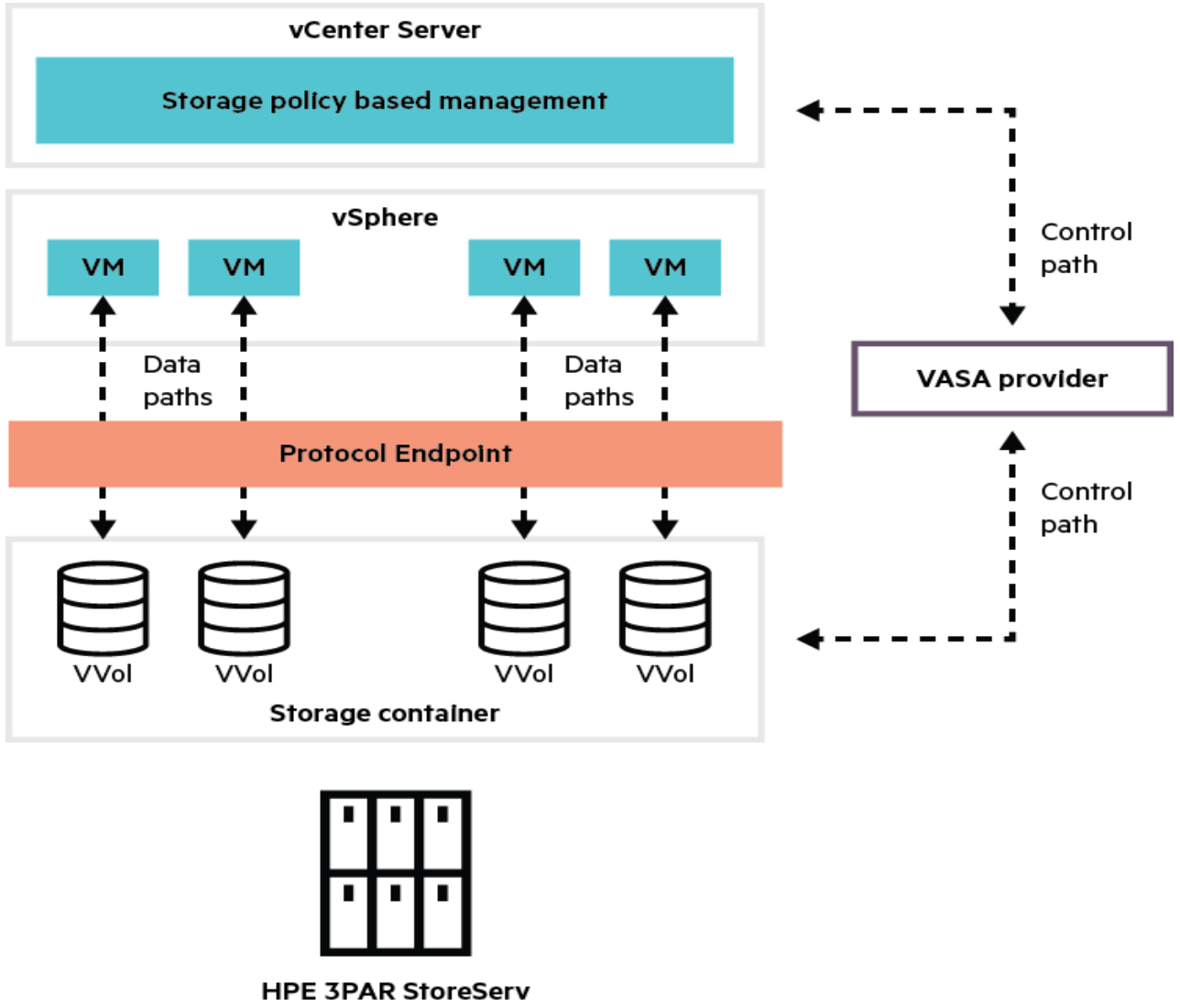
VMware Best Practices VMware Setup Vvols

- VMware Vvols allows VM based volume allocation via Vmware Storage Policy Based Management (SPBM). HPE 3PAR was the Vvols development platform for FC
- Supported with Inform OS 3.2.1 MU2 P12 and above





VMware Best Practices VMware Setup Vvols



Feature support for Vvols

- Array-based snapshots
- Space reclamation (UNMAP)
- Array-based thin provisioning
- Thin deduplication
- Auto Zero Detect
- Priority optimization (QoS)
- Adaptive flash cache

VMware Best Practices VMware Setup Vvols

- vSphere 6 provides several virtual storage adapters, with the default depending upon the guest operating system and virtual hardware version. The paravirtualized SCSI storage adapter (PVSCSI), also called VMware Paravirtual, is recommended for optimal performance

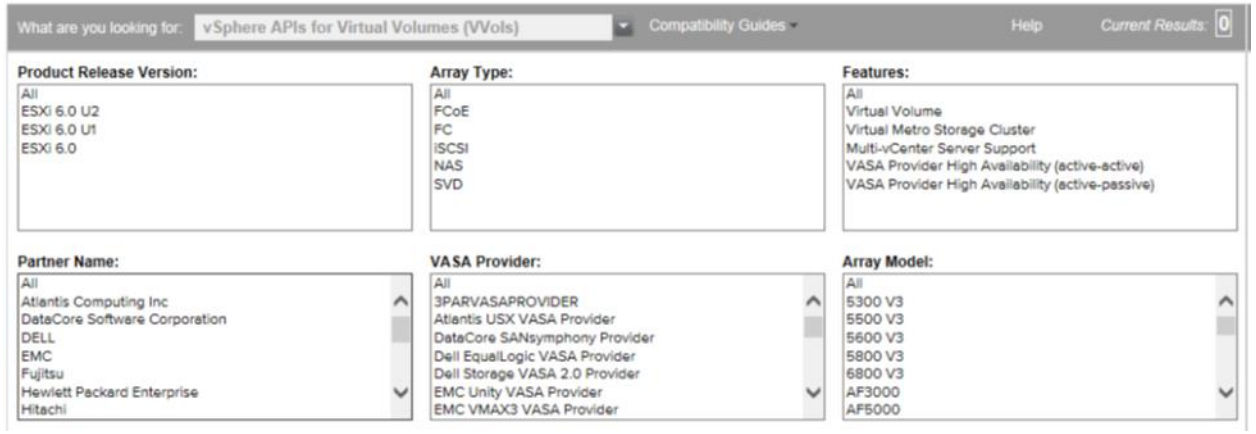
- For details on configuring the PVSCSI adapter and a list of guest operating systems that support it for the boot disk, reference VMware Knowledge Base entry kb.vmware.com/kb/1010398.

- The use of VMware vCenter Site Recovery Manager (SRM) either with array-based replication is not supported for VVols. This is a VMware limitation (see kb.vmware.com/kb/2112039).

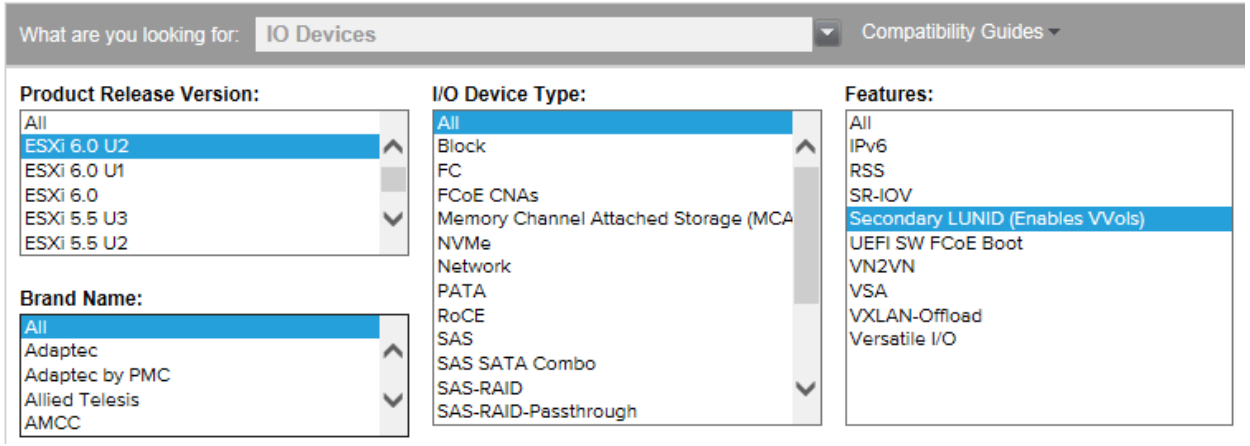
VMware Best Practices VMware Setup Vvols

Ensure HBA is supported for secondary LUNID's and not just vSphere 6.0

Vvols has it's own HCL at VMware



Secondary LUNID HCL is a feature under IO device



VMware Best Practices VMware Setup Vvols

- Default for a Vvols on 3PAR is TPVV or thin volume

3PAR
1)Ensure Virtual Copy is licensed (without Virtual Copy VVolswill not work)
2)Create ESXihost(s) with VMware persona 11
3)Create VASA certificate (createcertvasa) *
4)Enable the VASA Provider service (showvasa; startvasa)
5)Create VV set (createvvset) *
6)Create storage container with VV set (setvvolsc–create) *
7)Create CPGs in case they don't exist
* New to 3PAR OS 3.2.2

On ESXi host(s):
8)Verify on ESXi host that it can see the Protocol Endpoint (esxcli storage core device list --pe-only)

In vCenter:
9)Register VASA Provider (copy/paste URL from step 4)
10)Create VVolStorage Container (using container from step 6)
11)Create Storage Profiles (gold, silver, bronze, etc.)
12)Create VMs using Storage Profiles

Some useful links

ESXi General Implementation Guide
http://h20565.www2.hpe.com/hpsc/doc/public/display?docId=c03290624

VMware 6.0 Implementation Guide
https://h20195.www2.hpe.com/V2/getpdf.aspx/4AA6-5951ENW.pdf?ver=1.0

VMware 6 Best Practice Guide
https://www.hpe.com/h20195/V2/Getdocument.aspx?docname=4AA4-3286ENW

VMware 5 Best Practice Guide
http://h20195.www2.hpe.com/v2/GetPDF.aspx%2F4AA4-4524ENW.pdf

HPE 3PAR general Best Practice Guide
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HPE 3PAR Smart San Guide
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