

MIDRANGE ARRAY VSPHERE INTEGRATION SPECIAL REPORT

The Six Key Ways in Which Organizations May Capitalize on HP 3PAR's Deep Levels of vSphere Integration

Many of today's enterprise midrange arrays boast of integration with VMware vSphere VAAI primitives, boot from SAN protocols and snapshot functionality. But in the case of the HP 3PAR F200 and F400 models, this is only where their integration begins. HP 3PAR F-class midrange arrays provide enhanced levels of VMware integration and optimized virtual machine density so users experience levels of VMware efficiency, performance and visibility well beyond what other midrange arrays natively provide.

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Founded 1939

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Industry

Computer Systems

Solution

• HP 3PAR F-class Models (F400 & F200)

vSphere Integration and VM Density Strengths

- Leverage vSphere VAAI primitives to enhance performance, increase scalability, improve resource utilization and provide storage capacity reporting
- Provide multiple options to improve array performance and increase VM densities
- Expand the practical use cases for snapshots of VMs
- Optimize storage efficiency and improve space utilization
- Integrate with vCenter Server and VASA to provide visibility into and management of HP 3PAR arrays
- Facilitate the implementation of VMware SRM
- Decrease storage capacity requirements using thin provisioning and thin persistence

The Six Key Ways in Which Organizations May Capitalize on HP 3PAR's Deep Levels of vSphere Integration

VMware VMs Make Midrange Arrays Their New Home

Midrange arrays are moving well beyond just providing high amounts of storage capacity, high levels of performance and multiple options for storage network connectivity. While these features remain relevant when making a midrange array buying decision, the rapid adoption of VMware by enterprises is resulting in virtual machines (VMs) finding a new home on midrange arrays.

Recent statistics provide some insight into how quickly server virtualization in general and VMware specifically are finding their way into the enterprise:

- A new VM is created somewhere in the world every 6 seconds 1
- 10 million VMs existed in the world at the end of 2010²
- VMware customers crossed the 50% virtualization threshold in 2011³

This rapid adoption rate of VMware has led to enterprises using fewer, more powerful servers in order to maximize the number of VMs that each one hosts. But as VM densities on servers increase, so do requirements for back-end storage capacity, higher levels of performance and improved levels of application availability.

Midrange Array vSphere Integration

These requirements explain why many organizations turn to midrange arrays to host their VMware VMs. They also provide insight into why enterprises find midrange arrays with traditional storage capacity, networking and performance features now inadequate to meet the new needs that hosting VMware VMs creates.

In every case, the HP 3PAR F-class models provide additional layers of functionality that result in higher levels of application performance, application recoverability and storage efficiency while reducing management overhead."

- Jerome Wendt, DCIG Lead Analyst

Midrange arrays have to integrate with VMware storage features to optimize certain VMware-specific operations. However, the best arrays also possess new capabilities that enhance these basic vSphere integration features to address growing availability, capacity utilization, management, and performance requirements.

The vSphere Storage APIs for Array Integration (VAAI), released in VMware vSphere 4.1 and then enhanced in VMware vSphere 5.0, enable array integration to more efficiently deliver this new storage functionality. The commands included in these APIs minimize or eliminate the need to perform many repetitive operations. As such, organizations improve the performance of specific VM operations and optimize host, network, and array resource utilization.

A prime example is VAAI's Full Copy capability. This command directs storage arrays to create a complete copy of data *within the array* and is extremely useful for copying large amounts of data while conserving host CPU, I/O bandwidth and memory. This command is used to quickly enable rapid VM deployment, expedite cloning, and for faster VMware Storage vMotion™ operations.

vSphere Integration Impact on Midrange Array Scores

This is why midrange array vSphere integration was so closely examined in the *DCIG 2012 Midrange Array Buyer's Guide* and why this integration had the impact it did on each midrange array's score. However support for VAAI primitives such as Full Copy, Block Zeroing and Hardware Assisted Locking represented only a few of the points of vSphere integration that were evaluated. Other included:

- Boot from SAN. This feature enables VMware ESX/ ESXi to boot from a midrange array LUN presented over a FC or iSCSI connection.
- Load balancing. This feature indicates if the midrange array can detect how virtualized workloads are impacting it and what steps the midrange array can take to adapt to them.
- Snapshots. This aligns VM snapshots taken by the storage array by putting VMs and the applications they host in an application consistent state before the snapshot is taken.

Additional vSphere-specific features coming into play are further impacting how organizations manage midrange arrays in their VMware environments. For example, VMware server and storage administrators are being consolidated into single teams and use vCenter Server to manage ESX/ESXi hosts, VMs and midrange arrays. This dictates that midrange arrays integrate with vCenter Server.

Similarly more organizations are looking to automate business continuity and disaster recovery for their virtualized environments. This is creating a steadily growing demand for midrange arrays that integrate with and may be managed by VMware Site Recovery Manager (SRM). Using VMware SRM, organizations may then automate and centrally manage the failover and failback of VMs.

HP 3PAR F-Class Models Achieve "Best-in-Class" Ranking in vSphere Integration

It is these types of integration between enterprise midrange arrays and vSphere that were evaluated in the DCIG 2012 Midrange Array Buyer's Guide. It was only after a qualitative analysis of these points of vSphere integration that DCIG found the HP 3PAR F-class F400 and F200 models to be among the best enterprise midrange arrays in vSphere integration and were awarded "Best-in-Class" rankings in this very important category.

	Midrange Array Model	Score
1.	HP 3PAR F400	30.0
2.	HP 3PAR F200	30.0
3.	NetApp FAS3270	30.0
4.	NetApp FAS3240	30.0
5.	NetApp FAS3210	30.0
6.	HDS AMS 2500	29.0
7.	HDS AMS 2300	29.0
8.	HDS AMS 2100	29.0
9.	Dell EqualLogic PS6000/6100 Series	28.0
10.	HP P4000 G2 LeftHand SAN Solution	28.0

All midrange array models, rankings and scores in the DCIG 2012 Midrange Array Buyer's Guide are available at this link.

Yet what the high scores and rankings on the HP 3PAR F-class models fail to fully reflect is how they optimize their support for VMware vSphere VMs from other competitive midrange arrays. In every case, the HP 3PAR F-class models do more than simply integrate with vSphere. They provide additional functionality that result in higher levels of VM density, performance, recoverability and storage efficiency while reducing management overhead.

The Six Key Ways HP 3PAR Optimizes Its VMware vSphere Integration

HP 3PAR F400 and F200 models differentiate themselves in six key ways from other enterprise midrange arrays with levels of VMware vSphere integration and optimization that go well beyond what other midrange arrays offer. These HP 3PAR differentiators include:

1. Full support for vSphere 4.1 and 5.0 VAAI primitives to increase storage efficiency, increase performance and offload I/O intensive storage operations. The HP 3PAR F-class models, like many other midrange arrays, support the VAAI primitives found in vSphere such as block zeroing, full copy and hardware-assisted locking features. However, the HP 3PAR F-class models do this and more.

For example, many midrange arrays support the vSphere Full Copy command that triggers the movement of VM data within an array using that array's

built-in replication functionality. In this case, it invokes HP 3PAR's own Full Copy command to perform that operation.

HP 3PAR Full Copy improves upon this by creating thin-aware, point-in-time copies that only copy blocks that have data residing on them. Further, HP 3PAR has configurable priority levels that control the speed at which Full Copy occurs to mitigate the possibility of impacting other processing occurring within the HP 3PAR array.

2. Provide multiple options to improve array performance and optimize VM density. A number of midrange arrays provide software utilities that monitor and report on the performance of their internal components (hot spots on disk, cache usage, port utilization, etc). This information may then be used to balance and optimize workloads on midrange arrays.

How well midrange arrays act on this information varies. Some take action and balance workloads dynamically based on preset policies. Others support only manual intervention. Still others permit administrators to schedule when these workloads are re-balanced across existing midrange arrays resources. A few even support a mix of all of these options.

HP 3PAR inherently provides all of these array performance reporting and management options, as well as some features that most midrange arrays do not support at all. For example, HP 3PAR's wide striping feature minimizes hot spots by striping data across all of the disks in the array.

In this way, all disks are available to service the work-loads of all of the VMs it hosts. Further, if more disk drives are added to the HP 3PAR array, it redistributes the data across new and existing drives to take advantage of the performance these new drives afford.

As VMs require varying levels of performance, HP 3PAR supports multiple tiers of disk (SSD, FC and SATA) that satisfy these differing performance characteristics. HP 3PAR also provides an Adaptive Optimization feature that dynamically places data on the appropriate tier of disk.

Rather than moving an entire volume to another tier of disk as some midrange arrays do, HP 3PAR's Adaptive Optimization analyzes the performance of specific blocks and only moves those blocks that are the most (or least) active to the most appropriate tier of storage. This minimizes the resources that the HP 3PAR has to dedicate to moving data

within the array while enabling it to optimize its available storage capacity.

In consolidated virtualized environments the ability for a single array to reliably support a wide mix of application types on the array while maintaining high performance levels becomes critical.

HP 3PAR's mixed workload support enables different types of applications requiring both transaction-based and throughput-intensive workloads to run concurrently without contention on a single system.

Further, through its integration with VMware Adaptive Queue Depth Throttling and Storage I/O Controls (SIOC), HP 3PAR minimizes the impact of I/O congestion often found in VMware deployments. Together these capabilities increase the number of VMs per physical server while also supporting the addition of higher-performing applications residing on physical servers that use HP 3PAR arrays on the back end.

Finally, the new Peer Motion feature is HP 3PAR's crown jewel. This gives organizations the flexibility to non-disruptively move VMs *between* HP 3PAR arrays to balance VM workloads between existing HP 3PAR arrays or a new and an existing HP 3PAR array. It may also provide a performance boost to existing VMs while better optimizing the available resources on each HP 3PAR array.

3. Expands the use cases for snapshots of VMs. Using a midrange array's snapshot feature to take snapshots of VMs is rapidly becoming a major reason why organizations use midrange arrays to host VMs. Snapshots offload the workload associated with performing the backups from the ESX/ESXi server to

the midrange array.

HP 3PAR's snapshot feature (HP 3PAR Recovery Manager Software for VMware vSphere) again provides some distinct benefits over competitive midrange arrays. HP 3PAR integrates with vCenter Server so VMs may first be quiesced from the vCenter Server prior to a snapshot occurring on the HP 3PAR array. Once application-consistent snapshots are created, they may be used as a source for recovery and testing purposes.

HP 3PAR snapshots are also managed by a growing number of enterprise backup software platforms. These include HP's own Data Protector as well as third party solutions like CommVault Simpana and Symantec NetBackup. Support by these products further eases the adoption and use of HP 3PAR snapshots by enterprises.

When used together, HP 3PAR Recovery Manager Software and HP 3PAR Virtual Copy Software give VMware administrators an automated and integrated process for protecting and recovering Virtual Machine Disks (VMDKs), VMware Virtual Machine File Systems (VMFS), individual virtual machines, and even individual files within VMware vSphere environments.

4. Advanced storage efficiency and utilization technologies. One of the most difficult tasks associated with managing storage in virtualized environments is reclaiming storage capacity after it has been allocated to a specific VM. While the forthcoming VMware UNMAP command provides some needed functionality to reclaim storage after a VM is deleted, it does nothing to help organizations reclaim unused storage capacity from VMs that are active.

HP 3PAR already accomplishes this feat with its Thin Persistence technology through the use of an ASIC that has zero-detection capabilities. The feature analyzes the blocks of data within active VMs on the HP 3PAR array and detects if zeros have been written to specific blocks of data within these VMs. These zeros indicate that the data has been deleted and that the blocks may be returned to the HP 3PAR's general storage pool.

Using HP 3PAR's Thin Persistence software, organizations may automate this storage reclamation process. This facilitates the efficient use of the storage capacity on HP 3PAR arrays, minimizes administrative intervention and enables the hosting of additional VMs on the midrange array. This feature particularly comes into play for organizations that use the highest-performing VMDK format, Eager Zeroed Thick. On other storage platforms, Eager Zeroed Thick virtual disks write zeros across the entire VMDK file at the time they are created so the full size of the VMDK is reserved on the storage array before the VM is ever used. This may over time result in performance degradation and storage over-provisioning.

The HP 3PAR Thin Persistence eliminates these concerns. HP 3PAR detects the zeros in Eager Zeroed Thick VMDKs so as the ESX host writes zeros to the VMDK file, the zeros are detected in-line by HP 3PAR. In this way no space is allocated for the VMDK in the thin provisioned volume.

5. Integrate with vCenter Server to provide visibility into and management of HP 3PAR arrays. Midrange array integration with vCenter Server is on the upswing as organizations look to manage both VMs and storage from the vCenter Server console. However, there are varying levels of vCenter integration ranging from visibility into the array to providing management capabilities.

The HP 3PAR F400 and F200 models satisfy this more expansive definition of integration with both management and recovery manager vCenter Server plug-ins. These provide visibility into the array to include displaying how LUNs are mapped as well as giving administrators the ability to provision LUNs to specific VMs from vCenter Server.

Bundled with HP 3PAR is a feature called Autonomic Groups Software which makes provisioning HP 3PAR storage in clustered vSphere environments faster, simpler, and more reliable. Autonomic Groups eliminates many tedious administrative tasks by reducing the number of commands required to provision multiple volumes to multiple virtual servers that may take hours or even days to complete on traditional storage arrays.

HP 3PAR also includes plug-ins for VASA, the new VMware API for Storage Awareness, that passes fifteen unique storage descriptors from HP 3PAR to a vCenter Server. These pass very granular information about the HP 3PAR arrays to VMware so it may then make decisions about storage in ways that it never before could. Examples include dividing the available storage into different tiers of performance and determining the exact capabilities of storage volumes such as their specific availability, performance and storage efficiency characteristics.

6. Facilitate the implementation of VMware Site Recovery Manager (SRM) 5.0. Hosting multiple VMs on a single ESX/ESXi host heightens the needs for automated business continuity and disaster recovery (DR) solutions. In this area, a sizeable gap exists between those midrange arrays that deliver this functionality and those that do not.

HP 3PAR falls clearly on the side of those arrays that deliver this functionality. HP 3PAR's Storage Replication Adaptor (SRA) software for VMware vCenter SRM centralizes recovery management and automates VM failover and failback by using HP 3PAR's Remote Copy and Virtual Copy replication software in conjunction with VMware SRM 5.0 to deliver this functionality.

HP 3PAR F-class Models Provide Comprehensive vSphere Integration and Tomorrow's Private Storage Clouds Today

Enterprise organizations today are deciding to adopt VMware at an accelerating rate. But as they do, they need to choose the right midrange array to host VMware that will meet their immediate storage needs, scale with them as they grow and facilitate the introduction of new features such as centralized administration and automated business continuity.

The HP 3PAR F400 and F200 models achieved "Best-in-Class" rankings in the *DCIG 2012 Midrange Array Buyer's Guide* in the vSphere Integration category by supporting all key vSphere Integration features covered in the guide. But in the case of HP 3PAR, these points of vSphere integration are only where its support of VMware starts, not where it ends.

HP 3PAR's support of vCenter Server and vCenter SRM are only a few of the many advanced integration functions that it offers to best position companies for the future of virtualized infrastructures. HP 3PAR's entire underlying architecture was built in anticipation of meeting the management, performance, storage efficiency and recovery needs of today's vSphere environments. But what is equally important, the architecture and software found on the HP 3PAR F400 and F200 models put organizations on a path to creating tomorrow's private storage clouds today.

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