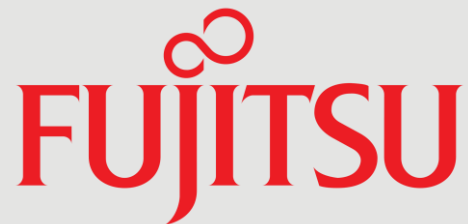




Inside Track Research Note

In association with



The Impact of VMware VVOLs on Storage

Easier deployment of VMs needs
sophisticated storage arrays

January 2015

In a nutshell

About this Inside Track

The insights presented in this document are derived from independent research conducted by Freeform Dynamics. Inputs include in-depth discussions on the latest technology developments with IT vendors and service providers, along with intelligence gathered from mainstream enterprises during broader market studies.

More and more virtual machines are being deployed to run all types of business services in VMware environments, from simple file share solutions up to business critical applications. But getting virtual machines (VMs) to run today requires considerable efforts from both your VMware administrators and your storage specialists. Close coordination is required and even with the best operational processes, deploying your VMs can take more time than you would like. VMware Virtual Volumes (VVOLs) are due to be released in 2015 and have been designed to help streamline deployment, make ongoing administration of VMs more straightforward, and to allow each VM to be managed individually.

Virtualisation is mainstream

Server virtualisation has gone mainstream. No longer is it reserved only for tier two and three applications while your important and mission critical workloads run on dedicated servers. But as the use of server virtualisation extends, the demands placed on your storage arrays grow. More importantly, it is very likely that the IT professionals administering your virtual server environment and those looking after your storage are being pushed to their limits.

Today VMware is the provider of the most widely utilised server virtualisation solution. In order to minimise the complexity currently entailed in getting virtual machines deployed and running, VMware is rolling out a new approach, Virtual Volumes (VVOLs), designed to make storage more virtual machine friendly and much simpler for your VMware administrators and storage professionals to implement and manage.

This paper will look at the challenges VVOL addresses and the impact it is likely to have on how you run your virtual machine environments as they deliver more and more of your business IT services.

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What is VVOL?

Virtual Volumes, commonly referred to as VVOLs, are a development of Software Defined Storage (SDS) that VMware has built to make it easier for VM administrators to deploy and manage virtual machines in systems using the ESXi hypervisor and associated software stacks.

In effect, VVOL works by having supported storage arrays publish the various services it offers, such as replication, RAID capabilities etc. via VASA (VMware APIs for Storage Awareness) APIs. These can be seen by the VMware management tools to allow your VM team to describe the needs of any individual VM and allow the software to allocate it to any storage array that offers those characteristics and has the required space available.

But what impact could VVOL make on how your IT department runs?

The art of deploying VMs today

Until now the process by which the VMDK files of your VMs have been deployed onto storage arrays has not been straightforward. It has also likely involved members of

The current process for deploying Virtual Machines (VMs) onto storage arrays is complex and time consuming.

your storage team working closely with the VMware administrators in your IT department. Common steps in this process include:

- 1) Firstly, the VM admin describes to your storage administrator the data capacity and performance characteristics needed for the application that will run in the new VM. They then also describe the data protection features the VM must have.
- 2) Next your storage admin creates a storage pool on an array that possesses the desired performance characteristics, including setting up the desired data protection features such as RAID type, snapshot capabilities, replication features etc.
- 3) The storage admin then divides the new storage pool into either LUNs (Block storage) or Shares (in File storage platforms). The LUNs or shares are then presented to the VMware ESXi hypervisor.
- 4) At this stage your VMware admin can use the VMware management tools, usually vCenter, to deploy the new VM to the storage.

This process is clearly complex and time consuming, potentially delaying the speedy deployment of new applications and business services. In addition, the storage pool created and presented via the LUNs or Shares could hold many VMs to ensure that storage is effectively utilised. This has some benefits in terms of storage utilisation but means that it is very difficult to manage each VM as an individual entity over its lifetime.

In these scenarios your VMware administrator has to ensure that all the VMs allocated to each storage pool have similar performance and protection requirements as these matters are fixed in each LUN or share. This pooling of VMs means that it is very difficult to change the performance or protection characteristics of any individual VM.

Deploying VMs with VVOL

With VVOL, the entire VM deployment process is greatly simplified. In effect the multiple steps above are replaced by just two, both executed by your VMware admin and should usually require no input from your storage specialists.

- 1) Your VMware admin decides on the desired performance and protection characteristics needed by the application running in the new VM.
- 2) They then use the VMware management tools to allocate the VM to any storage that has the desired features. The array provisions the storage and the VM uses it (consumes it).

Deploying VMs using VVOL should be faster and well suited to automation.

The benefits of VVOL

Clearly the process of allocating and consuming storage using VVOLs should be far faster and with so few steps should also be less likely to encounter manual errors, never mind eliminating the many potential places where human error could manifest itself.

As well as being faster and therefore allowing new business services to be used sooner, the new process is one well suited to automation. This second benefit is

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likely to be one greatly valued as the number of VMs being utilised in businesses of all sizes continues to grow rapidly.

A third benefit of using VVOL could be even more important. Under the current system of deploying VMs to storage arrays, it is very difficult to manage VM performance and protection individually unless only a single VM is allocated to each LUN or Share.

Even then if the storage pool holding the VM is used by more than one LUN or Share, each VM operating will experience similar storage performance in terms of IO and bandwidth allocation. Each will also be subject to the same protection features allocated at the time the LUN or share was created.

It is thus very difficult to modify the performance and protection characteristics of the storage allocated to any individual VM. In effect these are set once and for all at the time the storage is allocated. This approach may be well suited to some virtual machines and the applications they hold, but will not be appropriate for others whose usage or importance may vary over time.

VVOL will provide your VM administrators with the ability to manage each VM as an individual entity, and allow them to modify its storage characteristics individually in line with changing business or operational requirements. The growing use of shared storage infrastructure rather than using storage dedicated to individual applications makes the ability to manage each VM individually essential.

This is especially important in terms of the storage performance each VM experiences in times when the storage arrays will be under stress, e.g. year end, 'Black Friday' and 'Cyber Monday' etc. Having each VM set with performance SLAs and a policy describing which VMs are more important than others at times of resource competition will allow your IT team far more flexibility to ensure that business requirements are reflected in VM performance.

Storage array capabilities to support VVOL

In order for VVOL to function effectively it is essential that the storage arrays which hold data and which are used by the VMware virtual machines meet certain criteria.

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In particular the metadata that the storage arrays will publish, and which your VMware administrators will need to allocate to be consumed by the VMs they deploy will include:

- Storage capacity available on the array
- Encryption capabilities available
- Deduplication policies
- Storage provisioning schema (Thin or Fat)
- Data replication facilities (synchronous / asynchronous) and time schedules
- Data tiering capabilities and data movement policies - Use array capabilities to offload processor workload or employ data movement provided by VMware or other software higher up the stack? Etc.
- Storage performance (IOPs, latency, bandwidth)

While basic capabilities will be common to all storage systems that support VVOL you may wish to investigate what, if any, additional storage functionality array suppliers are integrating into their offerings.

- Data retention policy

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More advanced capabilities that could be provided in more sophisticated VVOL compatible arrays include:

- The ability to perform remote data replication to a second, possibly to a geographically distant storage array to provide enhanced DR
- The ability to seamlessly failover to a second array providing continuous availability of data
- Automatic service quality tiering (e.g. Premium, Gold, Basic) to reduce the need for your VM admins to grapple with questions of IO and latency
- Sophisticated data replication to minimise data transmission and storage requirements of snapshots / replicas etc.
- Automatic space reclamation at end of life of VMs

If your organisation has business drivers that make such capabilities desirable, it would be prudent for you to search for storage arrays that provide not only basic VVOL interoperability but which offer the additional workload characteristics or high availability capabilities you need.

The bottom line

Mainstream business applications are already moving to operate in Virtual Machine environments that provide greater flexibility and enhanced availability when compared with traditional physical server systems. Applications and services classified as business critical are also moving to VM operations.

Until now storage technology has struggled to keep pace with these developments. With the arrival of VMware VVOL the routine deployment of VMs onto storage systems becomes far more straightforward and rapid. Storage vendors are already committed to building arrays that support VVOL functionality.

The development of additional storage management capabilities designed by some vendors explicitly to further enhance VM operations should ensure that service levels supplied by VMs will be able to meet even rapidly changing business demands without exhausting the IT teams running them or requiring ever greater levels of storage skills.

The arrival of VVOL does not mean that your storage specialists will no longer be required. It simply means they will be able to spend more time looking at higher value business requirements rather than allocating storage to an ever growing number of VMs. Your VM team will be able to do that for themselves without the intervention of a storage admin, and ultimately will be able to automate many routine, but essential, daily storage related operations.

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