Technology Insight Paper

Storage for Virtualized Workloads

By Russ Fellows

October, 2012

Evaluator Group

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Executive Summary

Server virtualization is a rapidly growing trend due to its ability to decrease computer hardware costs, while improving application availability and flexibility. However, server virtualization has a significant effect on storage systems, creating performance issues for environments that are not designed for these workloads.

In talking with our IT clients, Evaluator Group found that a significant number of virtualization and VDI projects have failed or stalled due to storage performance issues.

A combination of storage features and design elements are critical to achieving performance, efficiency and ease of management while still delivering the application availability demanded by application owners. In this paper, we will examine some of the features and design elements that are important in order to deliver the efficiency and performance levels demanded by applications running in virtual environments.

Applications with Virtual Servers

Efficiency is an important concept for all businesses; one of the most important assessments of a company's efficiency is measuring utilization of capital. With IT becoming an increasingly important part of all companies, improving IT utilization has immediate and substantial effects on overall business efficiency.

Computer systems have grown substantially more powerful with the advent of multi-core processors, delivering more hardware than many applications can consume. As a result, IT departments can run more applications on fewer servers, while maintaining independence and high availability. Server virtualization has proven to be one of the most effective tools to achieve this goal, driving its use across businesses of all sizes and industries.

Additional demands on storage include high performance while retaining flexibility and availability. Flexibility in this context specifically refers to the ability to change workloads without significant reconfiguration or performance impact.

Storage efficiency is critical to maintaining application performance and availability without increasing the costs necessary to deliver these features. Capacity is perhaps the largest driver of storage costs and maintaining storage efficiency is critical to delivering on these goals.

Finally, data protection continues to be a concern for IT and application owners. Storage system based data protection enables the creation of efficient data protection points through point in time snapshots and replication. However, the use of storage based protection must be coordinated with applications

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running on virtualized server instances. Coordination between the application, hypervisor and storage are critical to delivering the recovery point and recovery time objectives desired.

All of these facts are driving the demand for a new type of storage system, designed to deliver high performance with space efficiency in virtual environments.

Storage Requirements for Virtualized Workloads

Offload for Key Functions

VMware, a leading server virtualization vendor, has recognized that storage plays a critical role in delivering application performance. The VMware API's for Array Integration (VAAI) was created to help address these issues. By enabling intelligent storage systems to offload critical functions, the overall use of IT resources is reduced significantly, while also reducing administrative overhead and application impact. There are four primary features that VAAI enables storage systems to offload in order to maintain performance and efficiency. These include:

- Offloaded Clone
- Offloaded Block Zero
- Hardware Assisted Locking
- Thin Provisioning Stun and Block Free

Another important feature that storage systems can provide is their ability to enhance hypervisor based replication and failover in cases of IT outage or a disaster. The VMware Site Recovery Manager (or SRM) provides the ability for an entire IT infrastructure to be directed to fail-over to an alternate location in cases of outage.

A key piece of moving applications is that an application consistent copy of data resides at the alternate site. Coordinated failover is a complex and error prone process to perform manually. VMware's SRM in conjunction with a storage array interface known as a Storage Recovery Adapter (or SRA), are critical to enable transparent failover.

As shown, VAAI and SRM integration are key features storage systems can provide that help enhance storage efficiency and performance for applications running in virtual server environments.

IT Management of Virtual Environments

The ability to manage storage from a hypervisor console is a feature that IT administrators find beneficial. With the rise of IT generalists who perform the majority of their infrastructure management from a hypervisor console, integration of management is important. While knowledgeable across

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domains including servers, networking and storage, these administrators do not have the time or training to become proficient on multiple point products. The ability to provision and monitor IT resources from a single console enables IT generalists to work more efficiently.

Designed for Virtualization

In addition to the items for hypervisor integration listed previously, there are several additional features that are important for delivering performance to applications in these environments. Due to how server virtualization operates, storage I/O commands are interleaved, resulting in access that appears completely random to storage systems.

These design aspects do not require integration with a specific hypervisor, but are general concepts that enhance performance and efficiency regardless of the server virtualization in use. These elements are difficult to retrofit or add to older products. If storage systems are not designed for virtualized workloads, attempting to add these features only complicates the design, further reducing their efficiency and performance.

Features that can help improve performance in random environments include the following features summarized below in Table 1.

Feature	Benefit
Wide Striping	Enhances I/O performance, particularly for random workloads
Auto Tiering	Automated storage optimization enhances application performance without administrative intervention
Pooled Capacity	Eliminates islands of excess storage capacity by consolidating spare capacity
Hypervisor Offload	Reduces server overhead, enabling administration without application performance concerns

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Thin Provisioning	Increased capacity utilization, resulting in lower capital costs while meeting application demands
Efficient Data Protection	Efficient snapshots enable capturing frequent data protection points without negative impact

Table 1: Storage Features for Virtual Applications

Dot Hill's AssuredSAN™ Pro 5000

In order to deliver the performance demanded, storage systems must be designed for virtual environments. By offloading key features such as cloning, storage initialization and isolation to storage systems through VAAI, some of the impact can be reduced. Design elements such as automated movement of data to a high performance tier, along with dispersing data across a high number of storage devices, are also critical for achieving performance for virtual applications.

Dot Hill's Pro 5000 features for virtual server workloads:

- RealPool – System wide pool with automated wide striping across all devices
- RealTier – Capability to automate movement of hot data to SSD tier in near real-time
- RealThin – Enhances capacity utilization through thin provisioning
- RealQuick – Rapid rebuild of media reduces performance impact while improving overall system availability
- VAAI Integration – Enables offload of hypervisor features to storage system
- AssuredRemote– Provides VMware SRA adapter to enable integration with VMware failover facilities

Perhaps more important than a list of features, the Pro 5000 is part of a new class of storage systems designed specifically to support applications running on virtual servers. Dot Hill's Pro 5000 systems are designed for virtualization, with wide striping, pooling and fast healing designed in. The addition of critical VMware VAAI and SRA capabilities enable IT generalists to deliver performance and reliability efficiently.

Closing Thoughts

Virtualization of computing systems has had a significant effect on every aspect of IT. Server virtualization has proven effective in improving utilization of servers while increasing application

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flexibility and availability. However, virtualization has placed increased demands on the storage infrastructure, transforming applications into even more demanding random workloads.

Delivering the features necessary to achieve business efficiency and performance objectives is an important step. However, many of the most critical storage features must be designed into systems, not added as an afterthought to decade old designs. As a result, a significant number of IT organizations are evaluating their traditional mid-range systems.

Today's IT generalists understand that server virtualization can help them deliver the application availability desired at more effective price / performance levels. However, doing so places an increased burden on the underlying storage systems. As a result, it is imperative to choose a storage system designed for virtual workloads, along with hypervisor integration features to enable efficient storage utilization while delivering the performance and availability levels business units demand.

Dot Hill's new AssuredSAN Pro 5000 is a storage system designed to operate in virtual server environments, with the features necessary to deliver performance cost effectively.

About Evaluator Group

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