QUEST SOFTWARE®

Monitoring Physical Storage Beneath the Virtual Infrastructure

It's a Virtual World Powered by Physical Storage

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TECHNICAL BRIEF

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Introduction

Storage has historically been a primary culprit of poor application performance. Issues such as insufficient bandwidth and throughput, disk hot spots, and I/O bottlenecks have made storage monitoring and optimization a very difficult process.

The introduction of server virtualization platforms makes it even more challenging to monitor and optimize storage. Virtual infrastructures add layers of abstraction that hide key physical storage performance information. When virtual machines (VMs) or entire virtual infrastructures begin to perform poorly, virtual administrators can't see beyond logical datastores to determine if physical storage components (i.e. switches, LUNs, arrays and filers) are actually causing the problem. Conversely, traditional storage administrators can't see which VMs are overloading their physical storage devices, making it difficult to properly balance storage resources across entire virtual infrastructures.

Newly virtualized applications can dramatically reduce hardware, power, and cooling costs and deliver vastly improved data protection capabilities. However, they are still powered by physical storage and its inherent weaknesses. Successful server virtualization projects require that traditional physical storage performance issues are properly addressed to meet key SLA objectives and ensure acceptable application performance.

Achieving True Storage Transparency

The only way to properly tune virtualized applications is to understand their relationships to the physical storage fabric beneath their assigned datastores. Unfortunately, traditional hypervisor management tools do not include physical storage into their performance monitoring reports and topology/architectural diagrams. Simply put, this means that virtualization administrators do not know whether poorly performing VMs are the result of underlying network connectivity or storage problems or both. Rather, they must rely on storage administrators to research the I/O issues affecting their VMs, virtual hosts, and entire virtual infrastructures.

Storage administrators, however, find it difficult to select and share physical storage devices throughout virtual infrastructures. Why? Because they know little about the I/O requirements of virtualized applications. Figure 1 shows a barrier between virtualization administrators and storage administrators, preventing them from seeing a key part of the larger picture.

Consequently, to ensure optimal virtual infrastructure performance, IT organizations must achieve *storage transparency*. This means enabling virtual administrators and storage administrators to see the entire picture. Virtualization administrators must see which hosts, VMs and datastores are experiencing performance problems due to physical storage device issues. Storage administrators must identify which virtual applications and VMs are using their storage devices most often. Storage transparency does not eliminate either of these key job responsibilities. Rather, it ensures that virtualization and storage administrators can identify the root causes of performance problems faster and work together to resolve these issues sooner.

Storage transparency can be achieved in two ways: 1) Improve communication between virtualization and storage administrators as to specific virtual asset I/O requirements, and/or 2) Purchase a vendor solution that can provide key performance metrics on VMs right down to their physical storage spindles – and everything else in between.

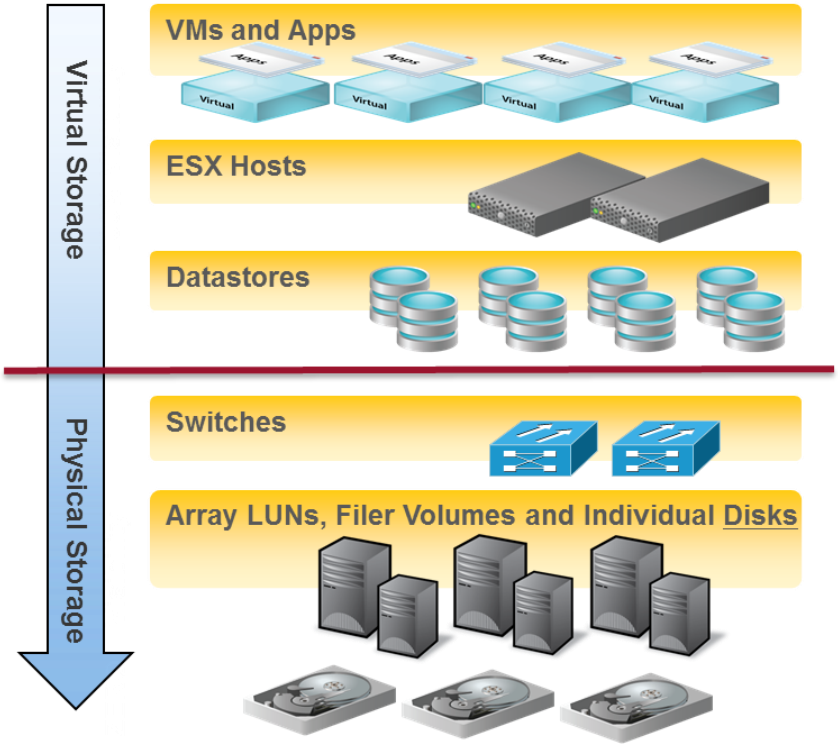

Figure 1 – Diagram of virtual infrastructure and its underlying physical storage

Key Virtual Storage Monitoring Challenges

Once virtualization and storage administrators achieve storage transparency, there are three storage performance problem areas that should be examined carefully.

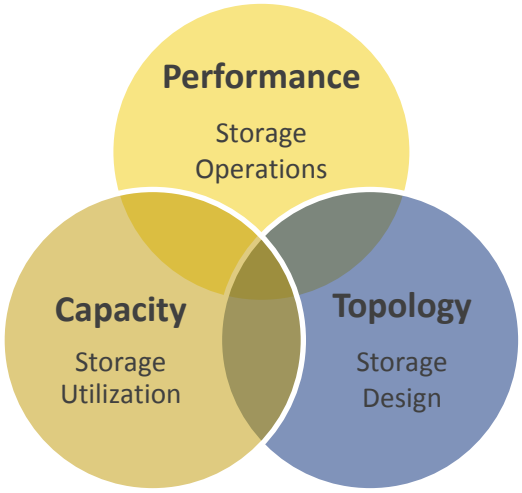

Figure 2 – Key virtual storage monitoring challenges

Performance

Storage performance refers to how well network and storage devices support I/O requests for VMs, hosts and entire virtual infrastructures. To properly optimize virtual infrastructure performance, consider the following questions:

- Which virtual datastores are being used most often and by whom?
- Are highly accessed datastores properly supported by enough physical storage devices and spindles?
- Are physical storage performance problems being caused by time-driven I/O events such as nightly snapshots or backups?
- Which individual VMs are being affected by poor storage device performance?
- Why is I/O performance suffering (I/O bottlenecks, disk hot spots, LUN latency, etc.)?

Capacity

Storage capacity determines the efficiency of storage space and its ability to prevent problems caused by poor storage provisioning practices. Questions to consider include:

- Are over-allocated VMs wasting excessive physical storage?
- Are VMs and datastores large enough to avoid running out of storage and experiencing costly outages?
- Are datastores over-subscribed and potentially facing cascading VM failures?

Topology

Storage topology involves identifying all components along an I/O path that are causing performance issues or connectivity problems. Questions to consider include:

- What is the complete I/O path from a VM down to actual physical storage spindles?
- Which I/O path components are causing VM performance degradation?
- Was the optimal type of storage (NAS, SAN) and structure (RAID, striping, replication, etc.) selected for each I/O path?
- Which VMs and virtualized applications are being affected by poor physical storage performance?

Taking Control: Monitoring Physical Storage beneath the Virtual Infrastructure

vFoglight Storage is a comprehensive monitoring solution that provides key performance, capacity, and topology information on both virtual storage and the physical storage fabric beneath it. vFoglight Storage uses an agentless architecture to gather this information as seen in Figure 3.

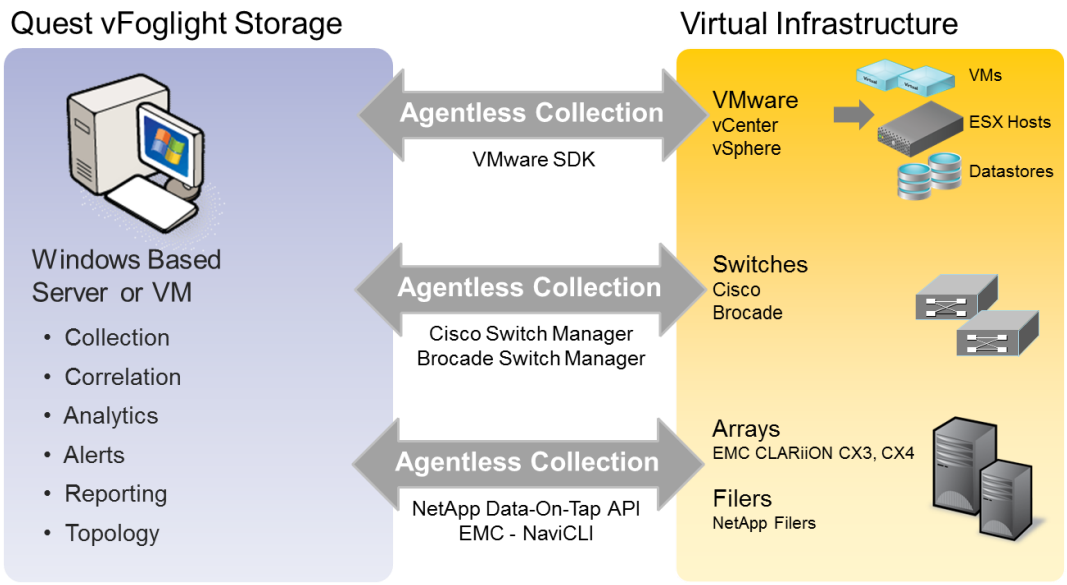

Figure 3 – vFoglight Storage agentless architecture overview

vFoglight Storage gathers extensive performance metrics and presents this data within a rich graphical interface utilizing architectural diagrams, graphs, alerts, and drill-down screens to quickly identify virtual and physical storage problems. It's fully integrated with VMware vCenter / vSphere, allowing users to browse through their virtual infrastructure to identify storage performance, capacity or topology problems.

As seen in Figure 4, virtualization administrators now have complete storage transparency at their fingertips and can immediately identify hosts, VMs, and datastores experiencing performance problems caused by underlying physical storage and network components. For example, they can select a VM experiencing performance problems (note the red circle "x" icon), see the entire I/O path right down to the actual storage spindles, and then click on any storage component to see detailed performance metrics and associated object state information.

vFoglight Storage also provides the ability to look back in time to determine how the virtual and physical storage environment was performing at any point over a 30-day period. This enables virtualization and storage administrators to determine when and why problems occurred.

Figure 4 – vFoglight Storage vCenter explorer window and performance alarm display

vFoglight Storage accelerates the process of identifying virtual storage capacity issues. Both virtualization and storage administrators can now locate datastores in danger of running out of storage (under allocated) and prevent painful VM outages from occurring unexpectedly. They can also locate datastores wasting excessive amounts of physical storage (over allocated) where space can be freed up for use by other applications. Reclaiming wasted storage can help prevent expensive storage acquisitions.

Figure 5 shows the vFoglight Storage Datastore Capacity panel and its ability to provide detailed space utilization information for entire virtual infrastructures.

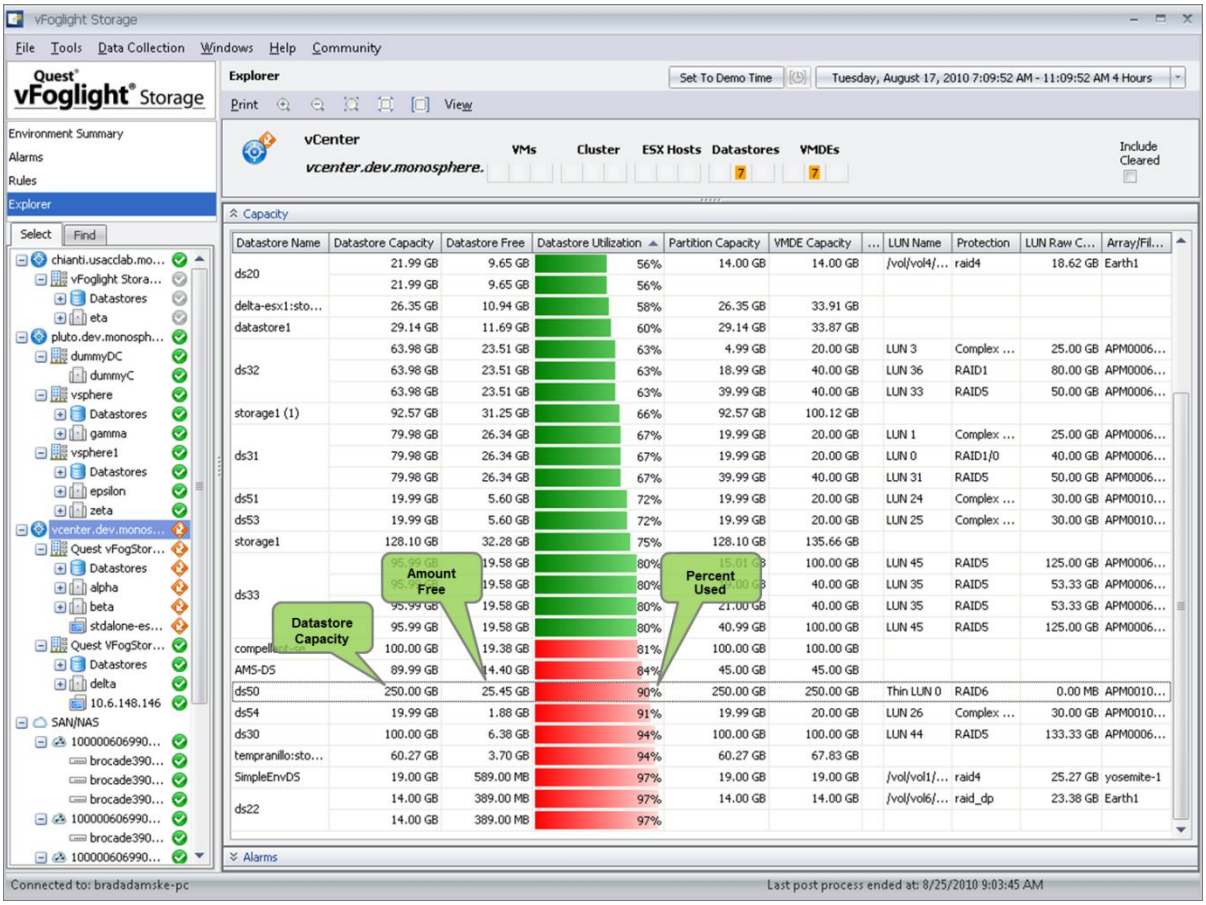

Figure 5 – vFoglight Storage datastore capacity display

vFoglight Storage also delivers comprehensive topology reports which detail all I/O paths and all components on each I/O path from VMs down to their assigned physical storage devices. These reports assist in determining where actual performance or connectivity problems are occurring during I/O requests – something which is not possible using traditional virtual infrastructure management tools.

Topology reports are useful to ensure that optimal storage types have been selected for each virtualized application based on their I/O requirements. They are also valuable in verifying that competing I/O paths are developing between virtual applications, since these can cause I/O bottlenecks and disk hotspots on physical storage.

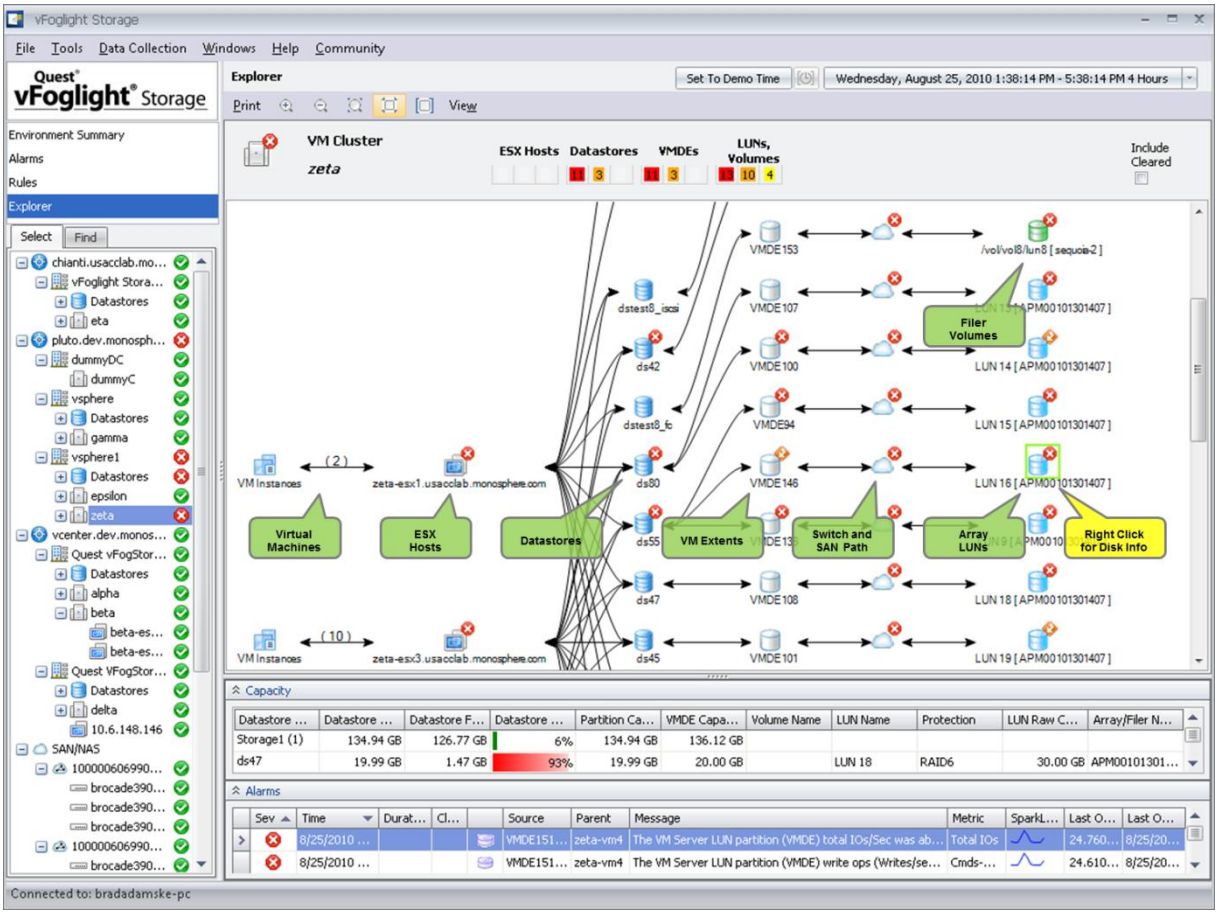

Figure 6 – vFoglight Storage topology display

Conclusion

Successful server virtualization initiatives depend on IT organizations providing acceptable performance for newly virtualized applications. A critical component of virtual application performance optimization is being able to monitor and tune the physical storage beneath virtual infrastructures.

vFoglight Storage provides complete storage transparency and gathers the key storage performance, capacity, and topology information necessary to optimize I/O operations for individual VMs and entire virtual infrastructures. vFoglight Storage delivers this storage transparency to IT organizations in minutes and hours – not weeks or months. Virtualization and storage administrators can now work together effectively to ensure that virtual storage performance problems do not negate the significant savings realized by server virtualization.

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