Lab Validation Report

Gridstore 3.0

Optimized Storage for Microsoft Windows Server and Hyper-V

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ESG Lab Reports

The goal of ESG Lab reports is to educate IT professionals about data center technology products for companies of all types and sizes. ESG Lab reports are not meant to replace the evaluation process that should be conducted before making purchasing decisions, but rather to provide insight into these emerging technologies. Our objective is to go over some of the more valuable feature/functions of products, show how they can be used to solve real customer problems and identify any areas needing improvement. ESG Lab's expert third-party perspective is based on our own hands-on testing as well as on interviews with customers who use these products in production environments. This ESG Lab report was sponsored by Gridstore.

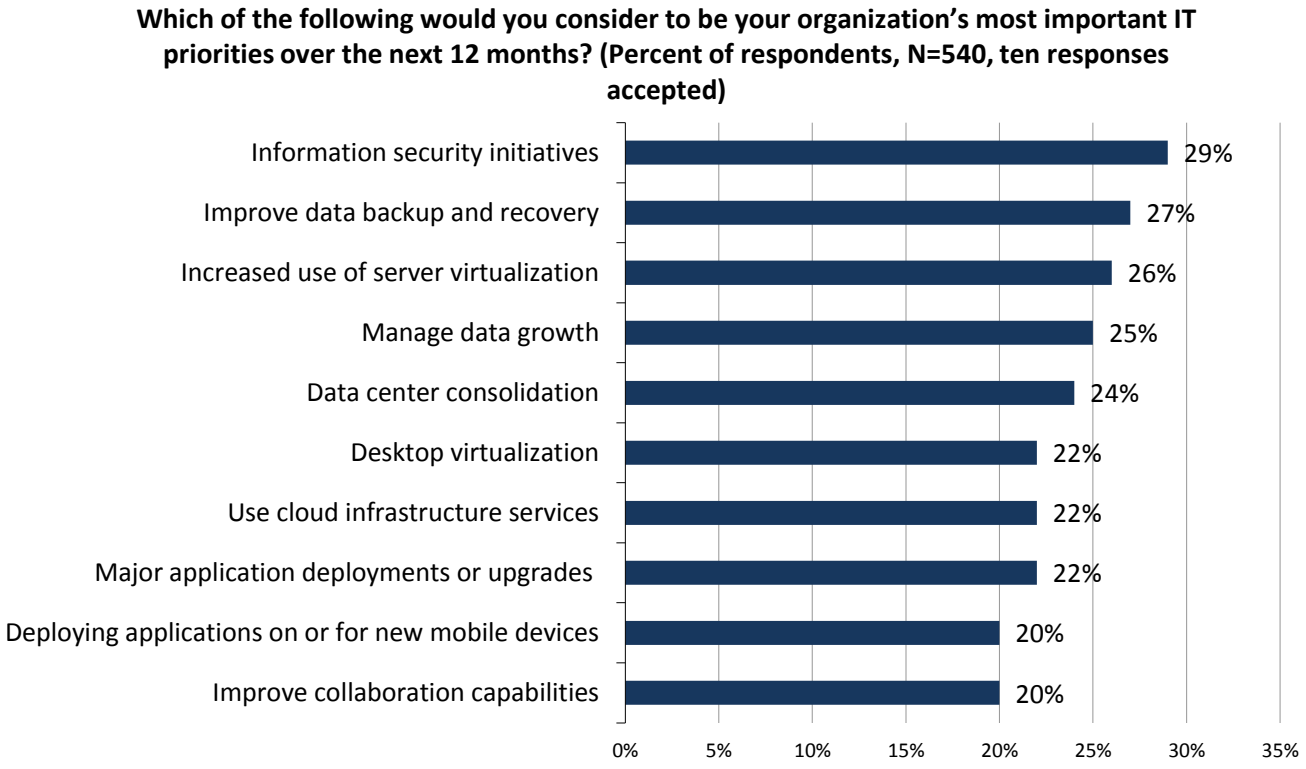
Introduction

This ESG Lab Validation Report presents the hands-on evaluation and testing results of Gridstore storage. ESG Lab focused on key areas of interest to midsized businesses and distributed enterprises. ESG Lab set out to validate the flexible simplicity, performance, scalability, availability, and data protection of the grid-based Gridstore storage system.

Background

IT management, along with senior executives and line-of-business stakeholders, continue to look for ways to improve resource efficiency and ROI. Combined with the continuous advancements in technology, organizations around the globe are challenged with managing the ever-increasing complexity of IT infrastructures. The challenge is exacerbated by the adoption of modern cloud and virtualization technology and a shortage of professionals with the proper skill sets. As a result, managing data growth, increased use of server and desktop virtualization, and cloud infrastructure services all rank in the top ten IT priorities most cited by respondents to ESG's *2013 IT Spending Intentions Survey* (see Figure 1).[1] These responses indicate that IT is facing increasing pressure to improve efficiency while delivering always-on application and data access.

Figure 1. Top Ten Most Important IT Priorities for 2013



Source: Enterprise Strategy Group, 2013.

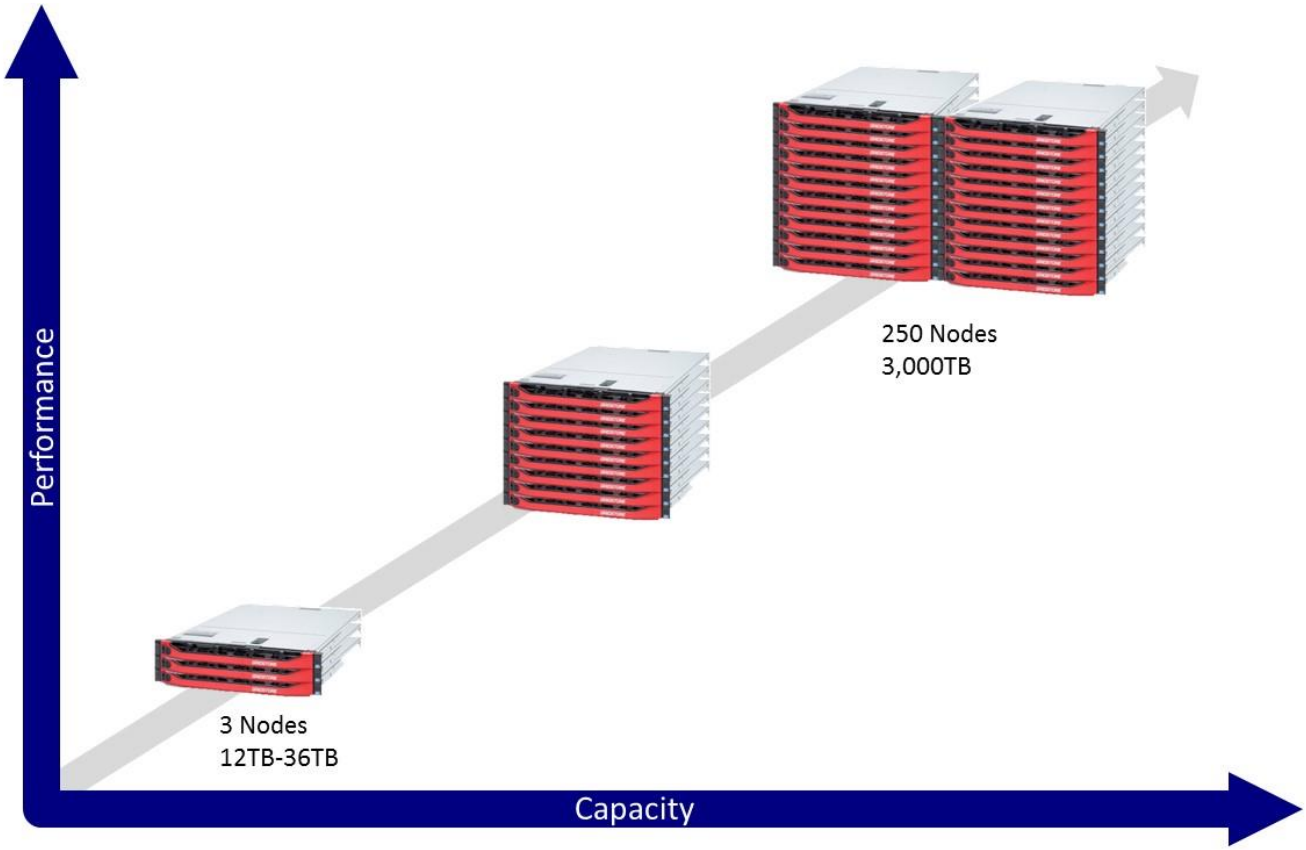
Achieving these efficiency objectives is a challenge intensified by the load put on traditional storage by virtual environments. Burgeoning virtualized environments place high IOPS demands on storage systems that have been met with expensive 15K SAS drives or all flash systems. This meets the performance needs of application users, but with management complexity and prices that make it unreasonable to scale the storage systems to meet many organizations' goals of greater use of virtualization.

[1] Source: ESG Research Report, *2013 IT Spending Intentions Survey*, January 2013.

Gridstore Storage

Gridstore is a software-defined storage solution designed to deliver application performance for virtual environments. Gridstore 3.0 is block storage that has been specifically built for Hyper-V environments. Gridstore uses Server-side Virtual Controller Technology (SVCT) installed on physical Windows Servers or Hyper-V Hosts to isolate I/O requests for each virtual machine, enable VM specific dynamic I/O optimization, deliver end-to-end QoS, and provide performance and capacity scalability using up to 250 simple storage building blocks. Gridstore focuses on delivering a rapid implementation experience along with management simplicity, providing optimized storage for Microsoft Server and Hyper-V environments.

Figure 2. Gridstore Storage



Gridstore offers pay-as-you-grow economics to meet the needs of mid-size to enterprise organizations. Using industry-standard server hardware, each capacity node provides either 4TB or 12TB of storage. High-performance hybrid nodes accelerate performance with PCIe based flash storage and additional Ethernet bandwidth to complement 12TB of capacity on NL SAS disks. Nodes can be added to the grid at any time with no disruption in storage services. The base configuration starts at three nodes, providing either 12TB or 36TB of capacity. This can be expanded to 250 nodes with approximately 3PB of capacity.

The server-side vController connects each Windows server host to the storage grid, and presents virtual LUNs. In a Hyper-V environment, there is no need to install the vController into each guest VM. This controller is composed of a virtual control plane enabling self-provisioning of storage per-VM, a virtual data plane enabling optimization of each VM, and virtual data services enabling per-VM control. The vController isolates I/O requests, creates a virtual channel between each server and the storage grid, and dynamically optimizes each channel's I/O. With a virtual storage channel for each machine comes the ability to control quality of service across all machines. Three predefined QoS levels are available and provide the ability to control bandwidth and IOPS. QoS is measured and maintained end to end, from the source VM to the storage grid and back again, reducing the impact of low-priority VMs on critical infrastructure.

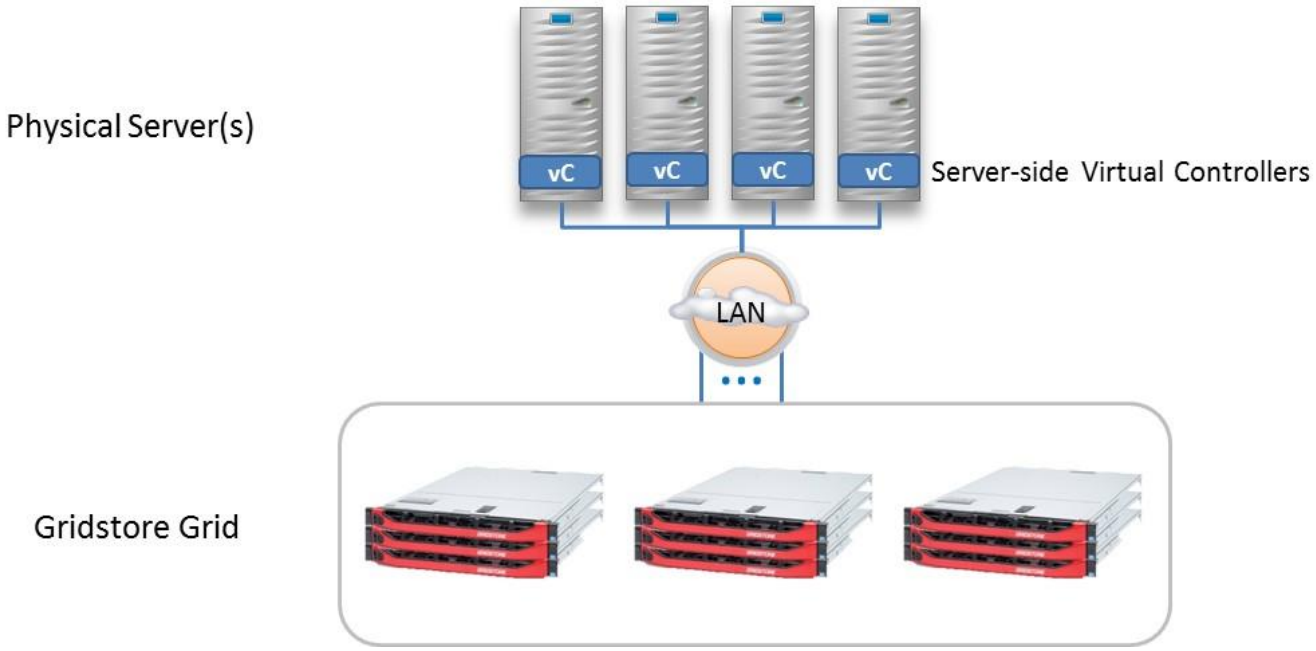
ESG Lab Validation

ESG Lab performed hands-on evaluation and testing of Gridstore storage at Gridstore's facility in Mountain View, California. Testing was designed to demonstrate performance and scalability using industry-standard tools and methodologies. Virtual desktop, e-mail, and interactive database workloads were tested at high levels of concurrent activity. Also of interest were ease of use and management as well as data protection and availability functionality.

Implementation and Management

ESG started with a pre-staged test bed as shown in Figure 3. Four industry-standard x64 servers were connected via a 10GbE switch to a Gridstore storage grid composed of nine Gridstore GS-H2100-12 hybrid storage nodes.[2] Each node contained 12TB of 7200 rpm NL-SAS drives along with a 550GB PCIe flash card. Each industry-standard x64 server was running Microsoft Windows Server 2012.

Figure 3. ESG Lab Test Bed



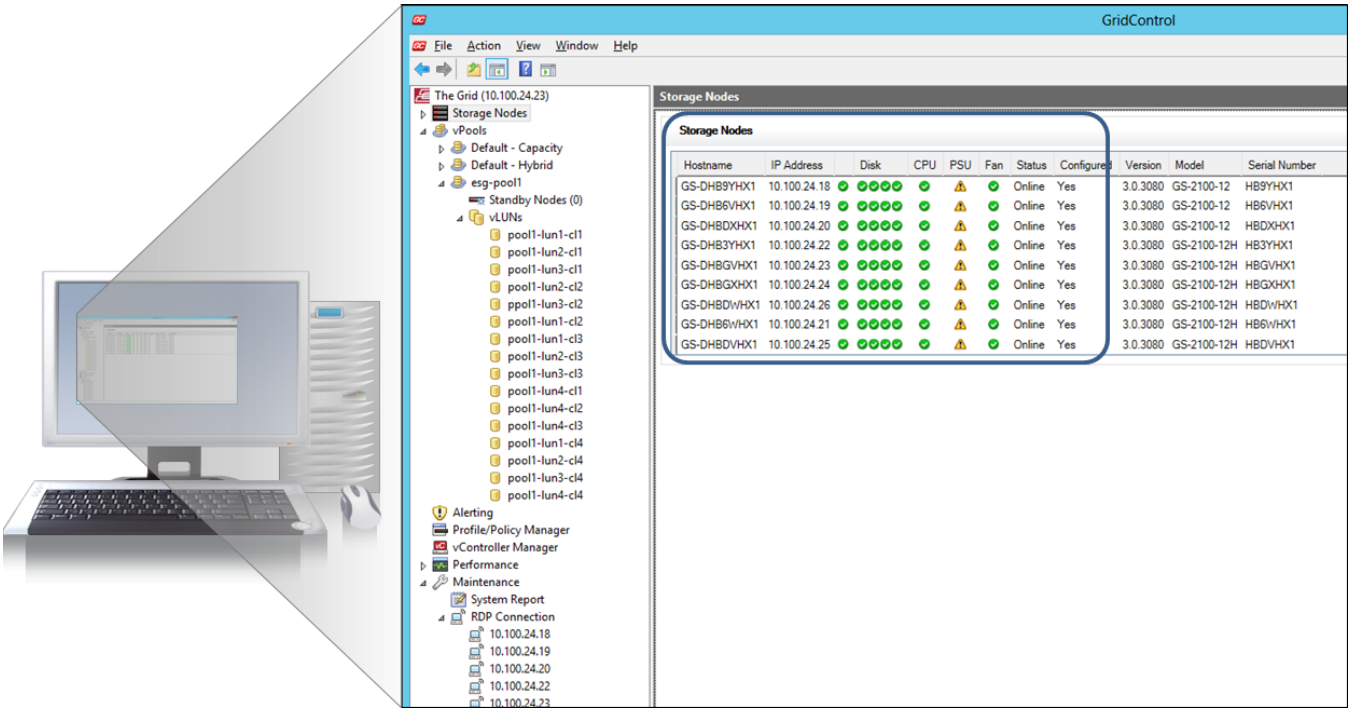
ESG Lab Testing

ESG Lab began by using GridControl, Gridstore's MMC Snap-in management tool, to review the existing configuration of the storage grid. As Figure 4 shows, GridControl provides a comprehensive overview of the configuration and the ability to manage all aspects of the grid. On the left hand hierarchical pane are entries for the main views of the system. Administrators can view storage nodes, virtual storage pools, performance metrics, and maintenance controls. All management activities can be executed from the GridControl console.

The right hand pane provides the details for the selected item on the left. In this case, ESG Lab selected to view details of each storage node in the grid. GridControl provides the node name, IP Address, and at-a-glance status indicators for the overall health of the node along with all critical components including disk, CPU, power supplies, and fans.

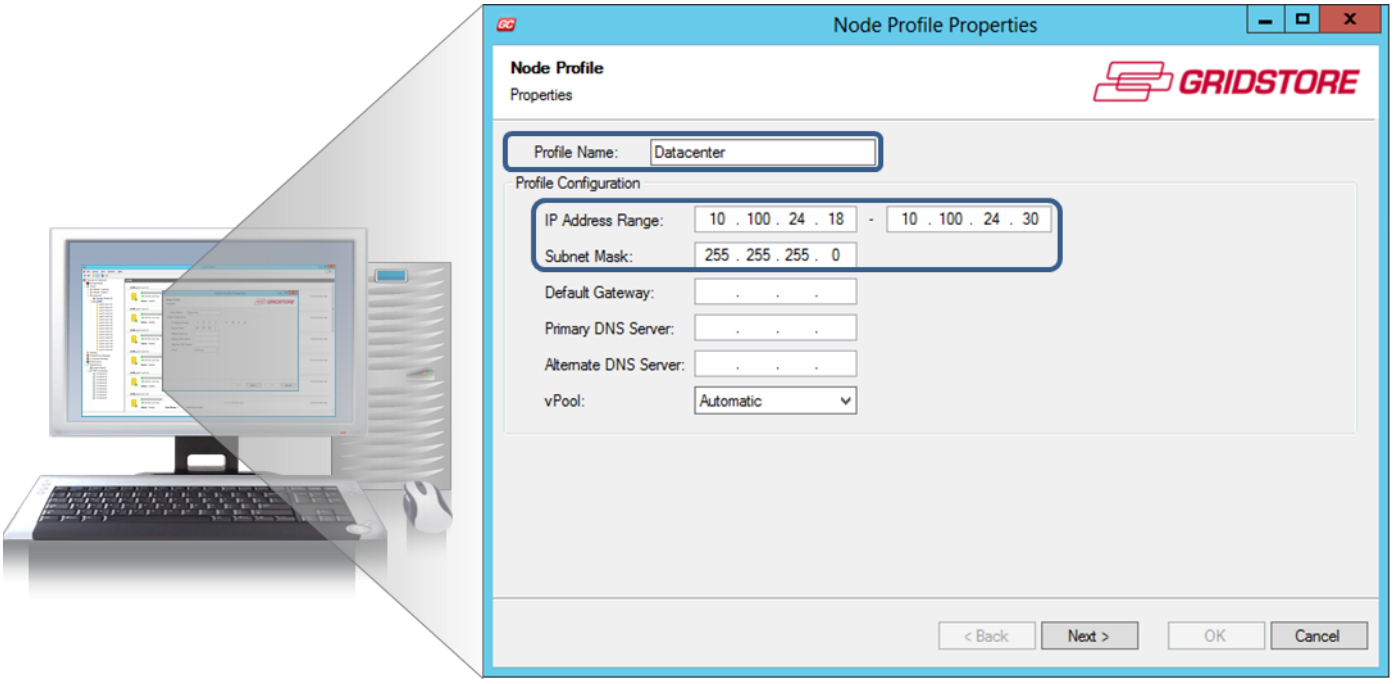
[2] Configuration details can be found in the Appendix.

Figure 4. Gridstore Storage Manager



As shown in Figure 5, GridControl provides the administrator with the ability to create profiles for use by both existing and new nodes in the grid. An administrator can pre-configure networking and storage pool information in advance so that when the grid is expanded, new nodes are automatically configured without administrator intervention.

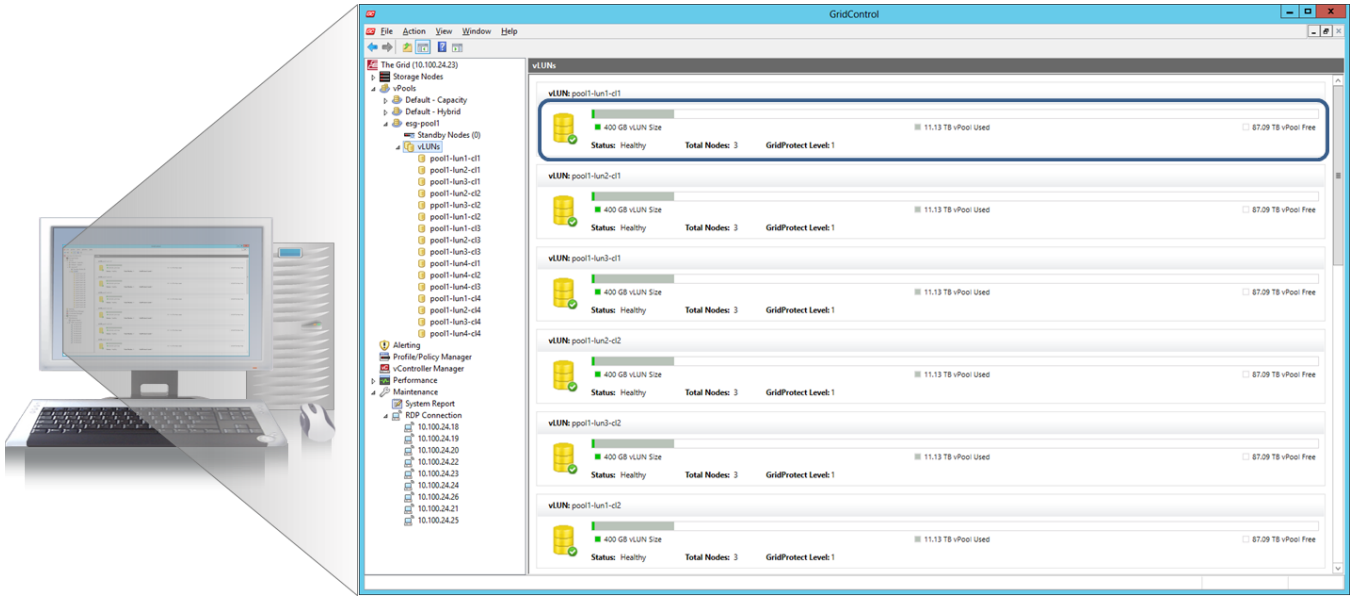
Figure 5. Grid Profiles



ESG Lab continued to explore the configuration of the grid, examining the details of each vLUN in the storage pool. In Figure 6, GridControl provides at-a-glance health indicators for the vLUN as well as a graphical representation of

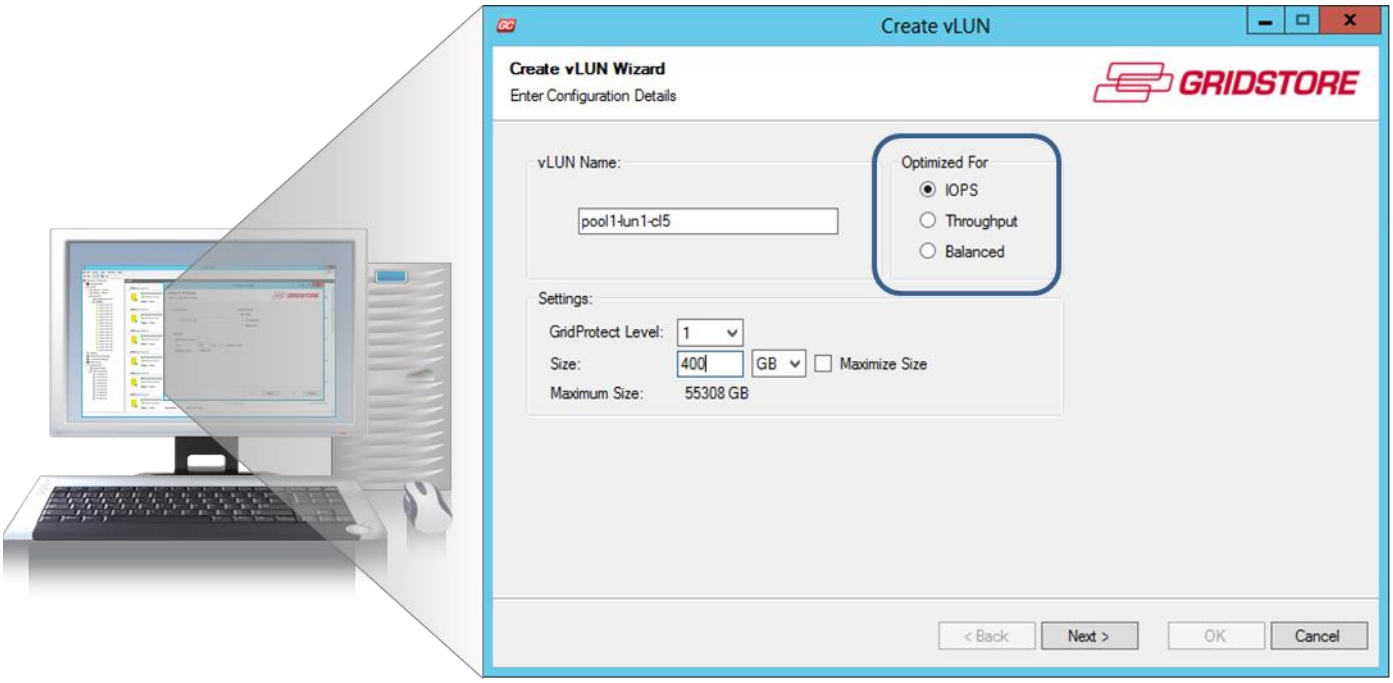
the amount of storage allocated and used from the storage pool, the number of nodes used by the pool, and the protection level.

Figure 6. vLUN Status and Configuration



ESG Lab next created an additional vLUN through the two-step creation wizard. Administrators can name the vLUN, choose how much storage to allocate, and set the protection level. Administrators are also provided with controls to optimize the performance of the vLUN, choosing between IOPS, bandwidth, or a balance between the two.

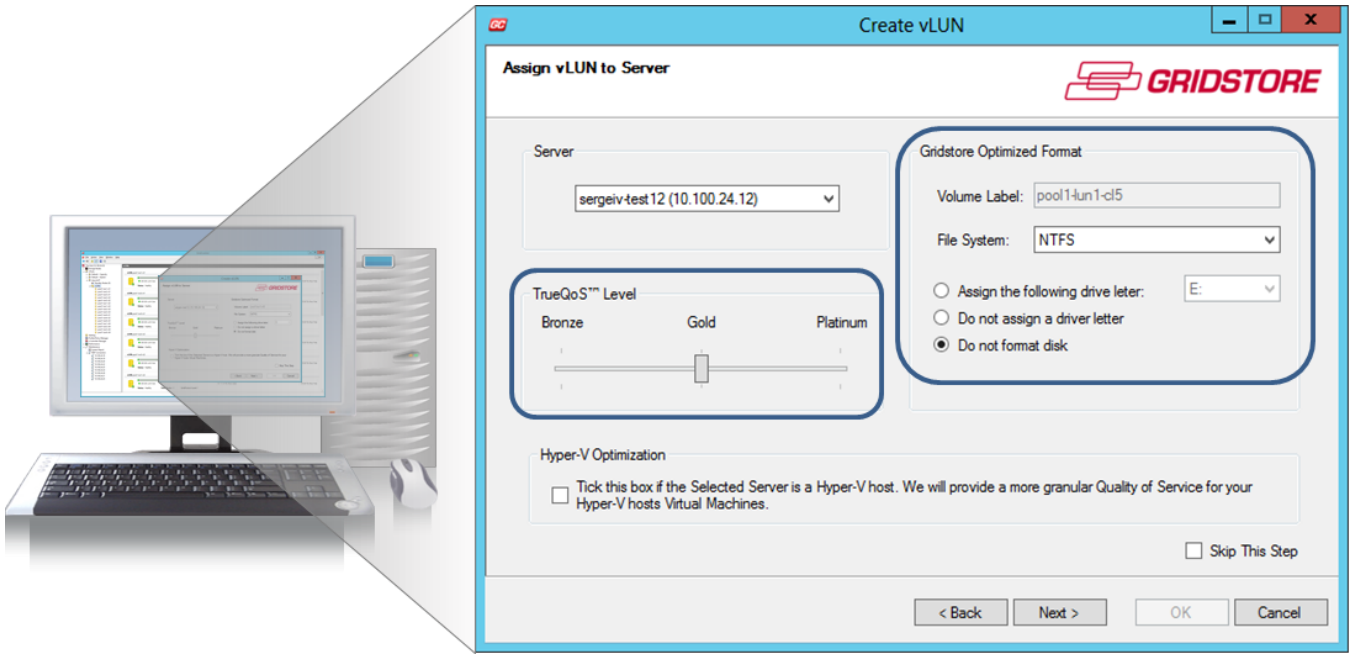
Figure 7. Create a vLUN



In the second step, the vLUN is assigned to a server, and the quality of service (QoS) is set for the physical server, or, if the physical server is a Hyper-V host, QoS can be set per Hyper-V VM. Administrators are given a choice of three levels of service: Bronze, Gold, or Platinum. When the vLUN is assigned to the physical server or Hyper-V host,

it is automatically formatted with the NTFS file system, so there is no need to invoke Disk Manager on the server to complete the task.

Figure 8. vLUN Server Assignment



Why This Matters

ESG research has found that more than one-third (35%) of surveyed organizations expect that supporting server virtualization implementations will significantly impact their storage spending and the same percentage (35%) believe that technology refreshes will have the same effect. Four of the five top-cited storage challenges reported by respondent organizations referenced aspects of the management of storage and data.[3]

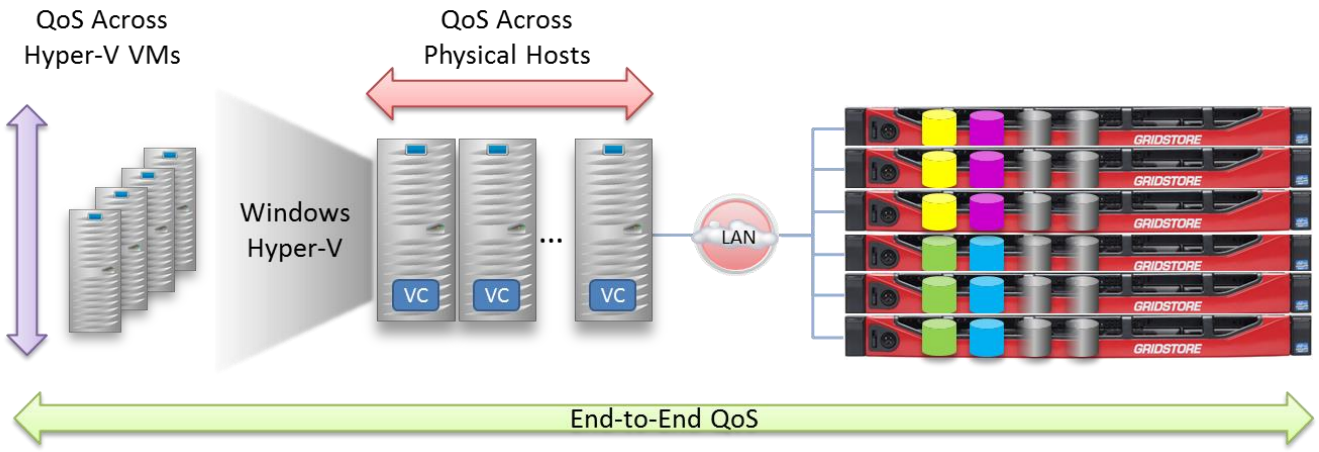
The Gridstore storage system was fast and easy to configure and manage. ESG Lab created profiles in advance to make expanding the system quick and painless. The administrator console provided a self-contained wizard that enabled ESG Lab to create, configure, format, and export volumes to hosts in less than a minute with just a few mouse clicks. Status and management of individual components as well as the entire storage grid was easy to understand and quick to access. Gridstore's administrator interface was complete and robust, enabling total management of storage infrastructure directly from the GridControl console.

[3] Source: ESG Research Report, *2012 Storage Market Survey*, November 2012.

Isolate, Optimize, and Prioritize

In order to provide end-to-end quality of service (QoS), I/O optimization, and performance and capacity scalability as storage nodes are added, Gridstore's vController is installed on the host to isolate, optimize, and prioritize storage traffic throughout the infrastructure, as shown in Figure 9.

Figure 9. Gridstore Server-side Virtual Controllers and QoS



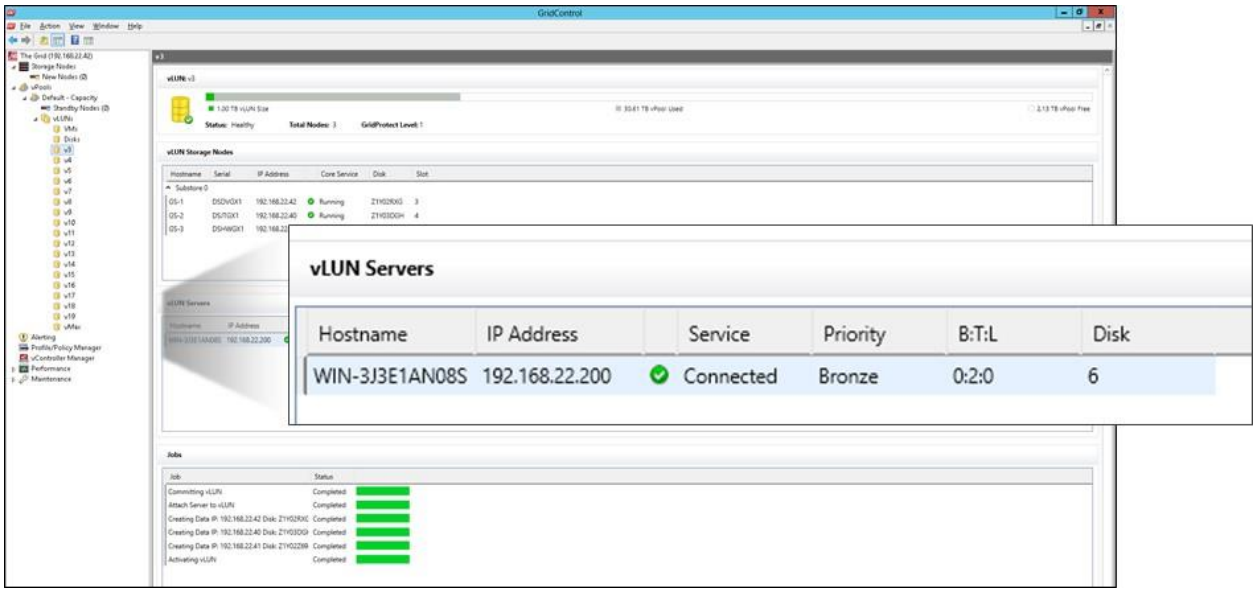
The virtual controller, working in conjunction with other virtual controllers on other hosts and with the storage grid, is then able to provide end-to-end storage QoS:

- **Per Hyper-V VM** – With Windows Server 2012 R2, Microsoft enforces per-VM IOPS limits; the Gridstore vController is then able to provide minimum IOPS reserves.
- **Per Physical Server** – QoS levels can be assigned to each physical server, to help administrators limit storage resource contention.

ESG Lab Testing

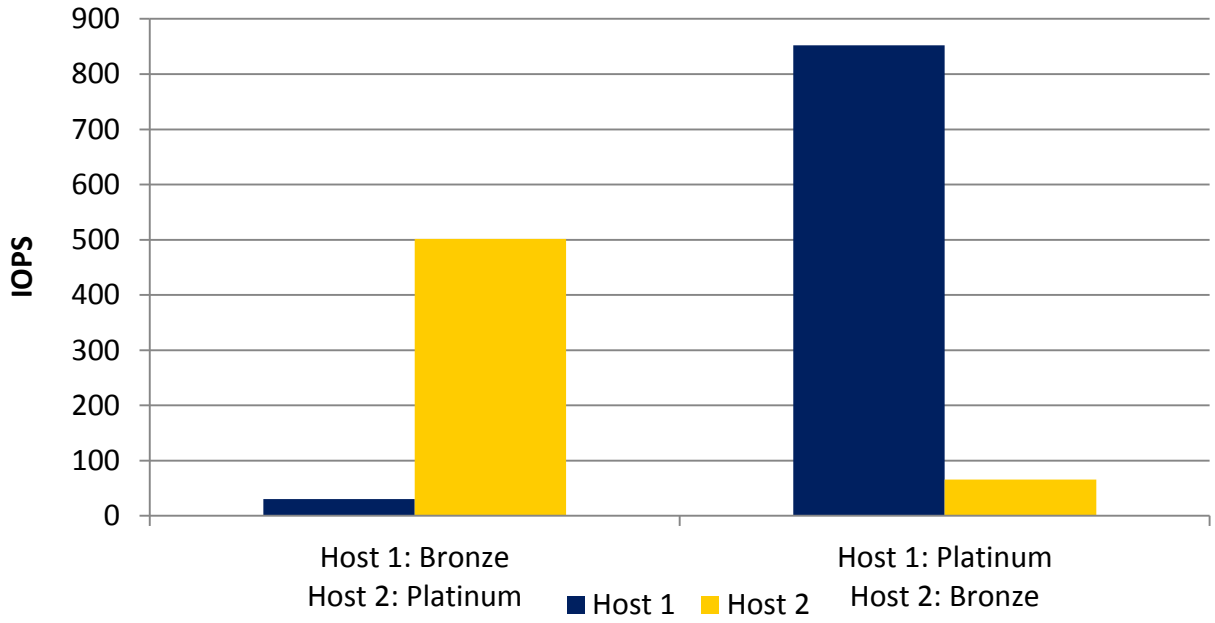
ESG Lab first examined Gridstore's TrueQoS feature using two virtual machines, designated Host 1 and Host 2. Using the GridControl console, the QoS level of Host 1 was set to Bronze, and the QoS level of Host 2 was set to Platinum, as seen in Figure 10.

Figure 10. Server QoS



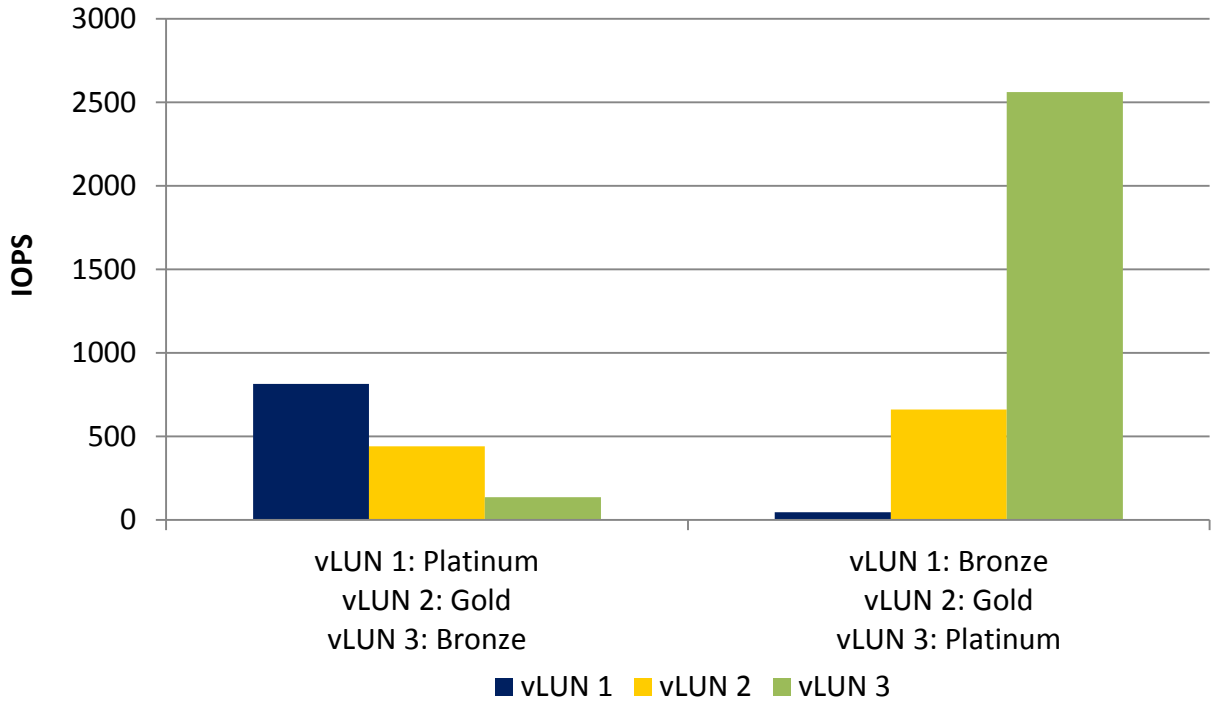
ESG Lab used Iometer to generate a transactional workload to the storage system. While the workload was running, a few mouse clicks in the GridControl console changed Host 1 QoS from Bronze to Platinum, and Host 2 QoS from Platinum to Bronze. As seen in Figure 11, Gridstore limited the IOPS for the Host that was assigned the Bronze QoS level, while allowing the host assigned the Platinum QoS level to consume more resources.

Figure 11. Effect of Server QoS Changes



Next, ESG Lab examined QoS at the vLUN level. Again, tests were run using the Iometer utility under Windows. This time, however, QoS levels were adjusted on two of three separate vLUNs. vLUN 1 was assigned the Platinum level of QoS, vLUN 2 was assigned Gold, and vLUN 3 was assigned Bronze. While the workload was running, using a few mouse clicks in the GridControl console, vLUN 1's QoS level was changed from Platinum to Bronze, and vLUN 3 was changed from Bronze to Platinum. Figure 12 shows the results. As soon as the QoS levels were changed, the vLUN assigned to the Platinum level was able to consume the most resources, with the Gold level remaining about the same and the vLUN set to Bronze consuming the least amount of resources.

Figure 12. Effect of vLUN QoS Changes



Why This Matters

Both server and desktop virtualization are perennially cited as top IT priorities for organizations surveyed by ESG.[4] Predictable performance is a critical concern when systems running diverse applications share a storage system. A burst of I/O activity from one user can lead to poor response times and lost productivity for other users. A highly virtualized environment potentially presents one of the most diverse and challenging mixes of application types and I/O access patterns to a storage system.

Companies face enormous challenges when tasked with cost-effectively meeting service level agreements for business-critical applications, especially for I/O-intensive OLTP and VDI deployments with strict performance requirements. Traditional disk-based storage architectures over-provision to meet peak performance demands—this is not just a waste of money and resources: a failure to meet performance requirements can result in a costly loss of productivity.

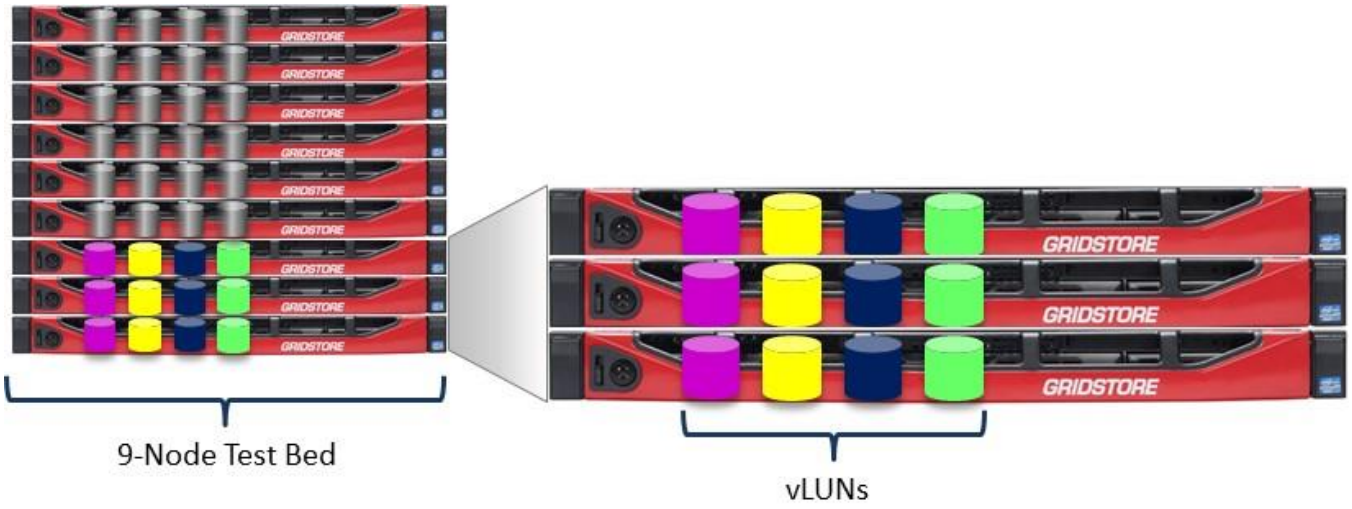
Gridstore storage systems offer end-to-end quality of service to provide predictable and controllable performance with a variety of applications. Gridstore's virtual controller technology enables QoS control across LUNs and across hosts and Hyper-V virtual machines. ESG Lab testing has validated that the QoS controls are simple to implement, provide easy-to-understand and predictable levels of service, and can confidently be used to support performance-sensitive real-world applications deployed in highly virtualized environments.

[4] Source: ESG Research Report, *2013 IT Spending Intentions Survey*, January 2013.

Scalability and Performance

The Gridstore architecture is designed to enable IT to scale out performance for demanding workloads. Gridstore scales processing power and capacity together, as shown in Figure 2. As shown in Figure 13, vLUNs are striped across both disks and nodes, providing performance and availability. ESG Lab used a 2+1 protection scheme to facilitate testing with a three-node entry-level grid, then expanded to a nine-node grid. Gridstore supports a variety of levels of N+M protection, providing options for protection against loss of multiple disks or nodes.

Figure 13. Node to vLUN Mapping



ESG Lab's storage-focused benchmarking uses multiple servers attached to a single storage system. Rather than running application-level benchmarks, which stress the CPU and memory of the server, lower level industry-standard benchmarks are used with a goal of measuring the mixed workload capabilities of a single storage system. The industry-standard Iometer utility was used to generate raw IOPS and throughput as well as emulate the I/O activity of four common business-critical application workloads.[5]

- **IOPS:** I/O per second, or IOPS, is a measure of the number of operations that a storage system can perform. When a system is able to move a lot of IOPS, it will tend to be able to service more applications and users in parallel. Much like the horsepower rating for a car engine, the IOPS rating for a storage array can be used as an indicator of the power of a storage system engine. A 100% read, 100% random 8KB I/O workload was generated with Iometer.
- **OLTP Database:** The Iometer utility was used to generate response-time-sensitive online transaction processing (OLTP) database traffic. A 70% read, 30% write OLTP workload was driven using 100% random 4KB database I/O and 32KB 100% sequential log I/O.
- **Exchange 2013:** The Iometer utility was used to generate storage traffic modeled after the I/O patterns produced by the Microsoft Jetstress and Loadsim utilities. ESG Lab used Iometer to simulate the activity of typical Microsoft Exchange users as they send and read e-mails, make appointments, and manage to-do lists. The Iometer utility is, however, a more lightweight utility than either Jetstress or Loadsim, designed to focus solely on storage performance.
- **Virtual Desktop Infrastructure (VDI):** The industry-standard Iometer utility was used to generate simulated VDI traffic. The I/O characterization is composed of 100% random, 80% writes in mixed block sizes with an average size of 16KB.

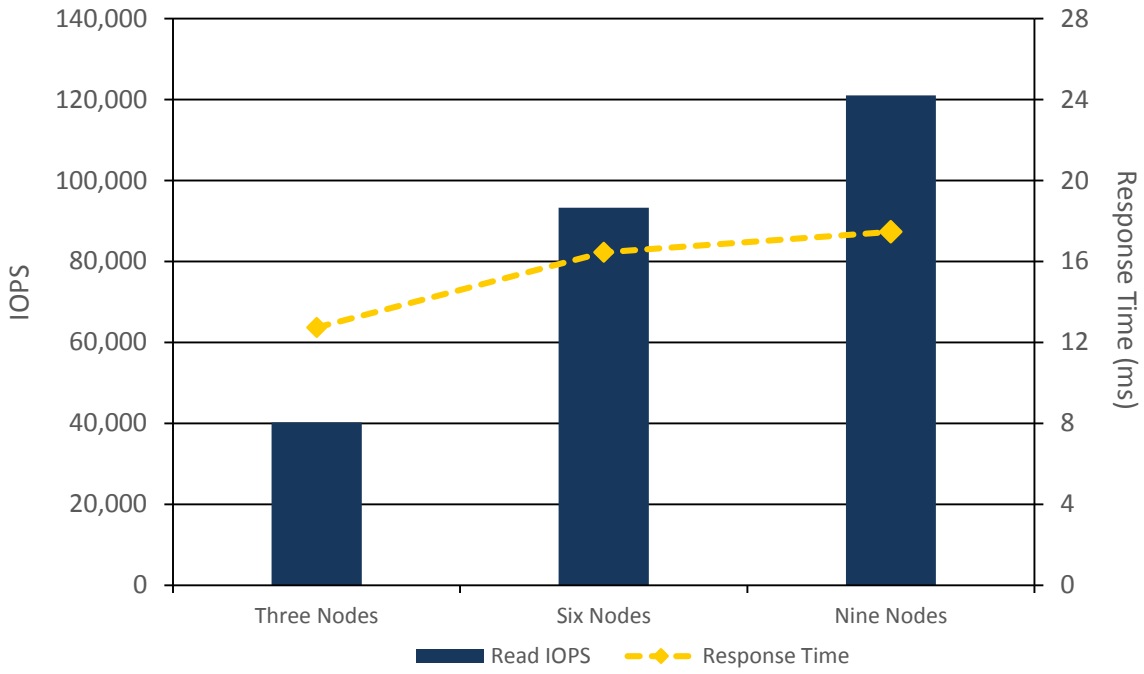
[5] http://sourceforge.net/projects/iometer/

- **File Server:** This I/O characterization was composed of 80% random reads of various block sizes. The file server Iometer profile used for this test was originally distributed by Intel, the author of Iometer. Iometer has since become an open source project.

ESG Lab Testing

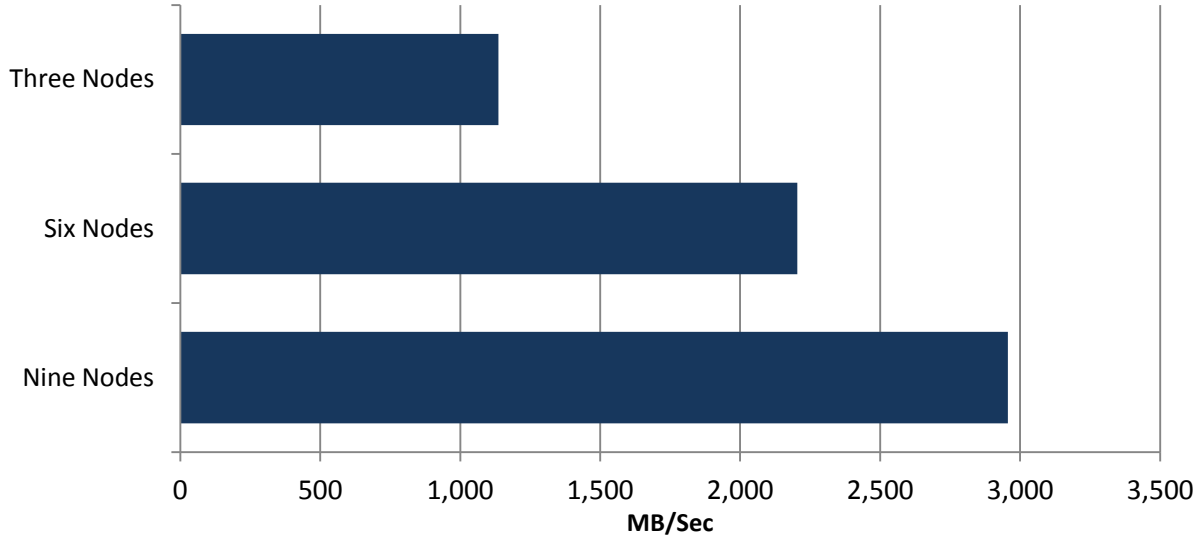
ESG Lab first measured 100% random 8KB read IOPS using the Iometer utility under Windows. Tests were run with multiple workers against three-, six-, and nine-node grid configurations. As seen in Figure 14, Gridstore scaled read IOPS nearly linearly, and as more nodes were added to the grid, response time stayed below 20ms.

Figure 14. Random IOPS



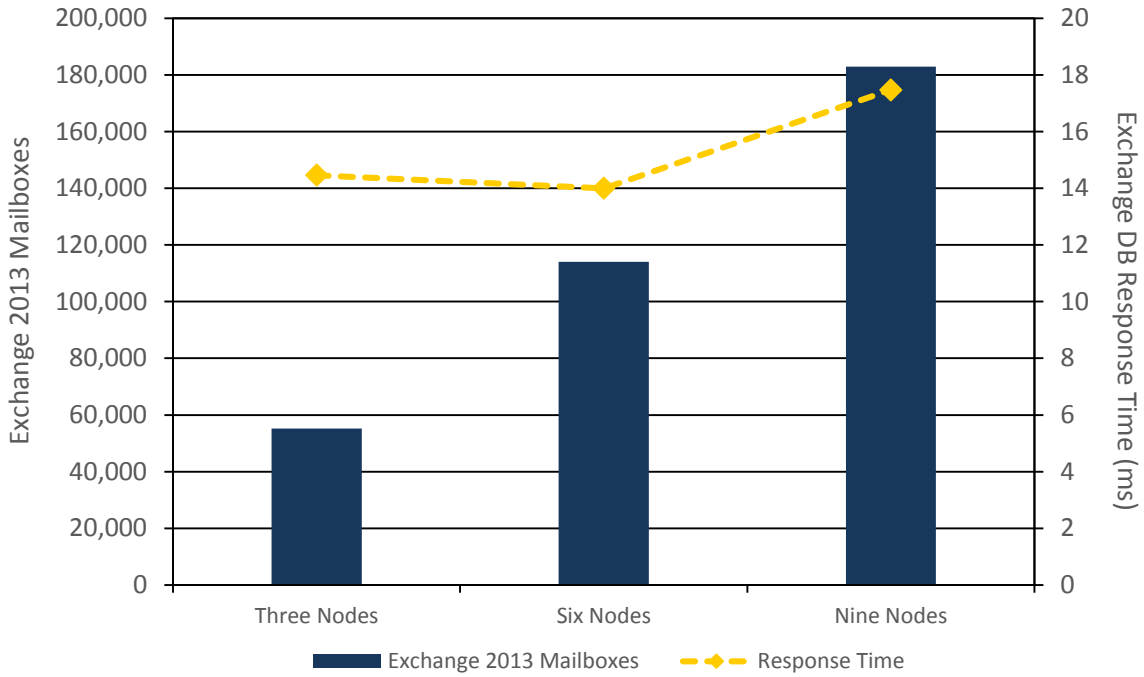
Next, ESG Lab tested 100% sequential 1MB writes to test the throughput capacity of the Gridstore grid. As Figure 15 shows, scaling was again nearly linear: Three nodes were able to drive just over 1,100 MB/sec, while the nine-node grid drove just under 3,000 MB/sec.

Figure 15. Write Throughput



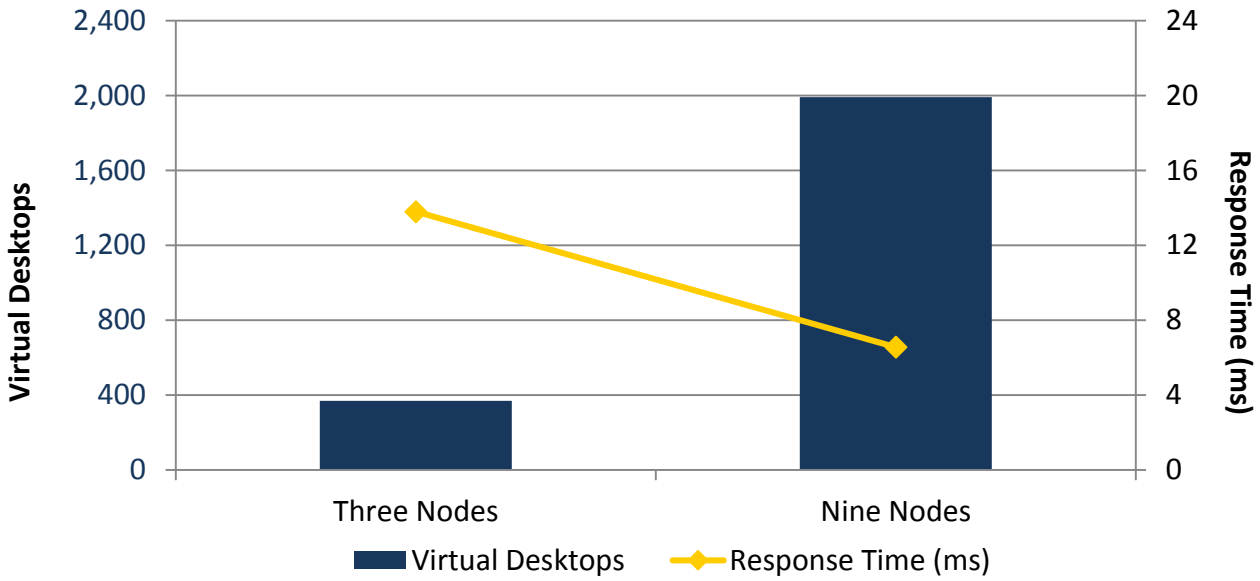
ESG Lab continued testing with common business workloads. An Exchange 2013 workload was generated against the same three configurations.

Figure 16. Exchange 2013 I/O



Again, performance scaled nearly linearly, with performance more than tripling overall and response time staying well under the Microsoft recommended 30ms limit for Exchange, seen in Figure 16. Virtual Desktop I/O was tested next, this time with three nodes, then again with nine.

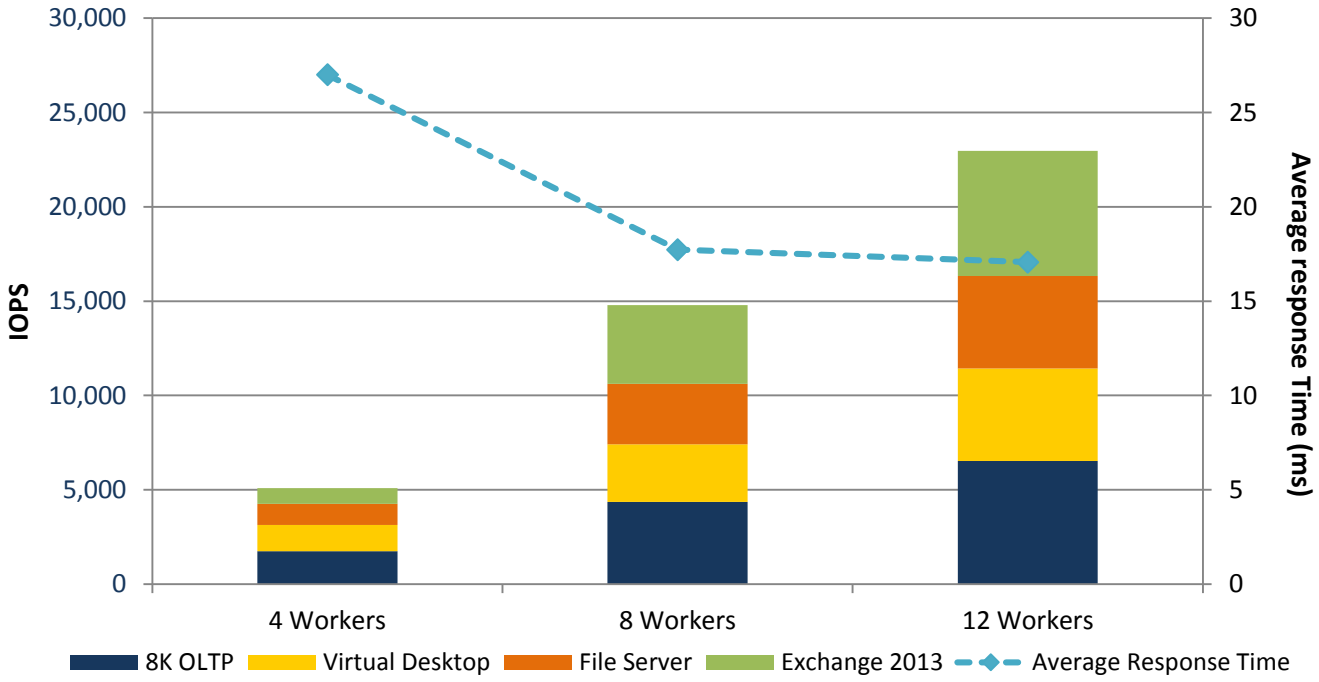
Figure 17. Virtual Desktop Simulation



As seen in Figure 17, a three-node grid was able to sustain a virtual desktop workload equivalent to just under 400 active desktops, with an average response time of just under 14ms. The nine-node configuration was able to sustain the workload of nearly 2,000 desktops, with response times of just over 6ms.

Finally, ESG Lab ran a mixed workload simulation, with each worker simulating one of the four business application workloads. The four-worker run was against a three-node grid, the eight-worker run used a six-node grid, and the 12-worker run used the full nine-node grid.

Figure 18. Mixed Workload Scaling



As seen in Figure 18, once again performance scaled nearly linearly as nodes were added to the grid. Detailed results are shown in Table 1.

Table 1. Performance Data

IOPS and Throughput			
Number of Nodes	8KB Random Read IOPS	Average Response Time (ms)	1MB Sequential Writes (MB/sec)
3	40,200	12.74	1,137
6	93,238	16.45	2,204
9	121,055	17.46	2,956

Individual Business Applications				
Number of Nodes	Exchange 2013 Mailboxes	Average Response Time (ms)	Virtual Desktops	Average Response Time (ms)
3	55,263	14.46	368	13.80
6	114,057	14.40	n/a	n/a
9	182,987	17.47	1,991	6.56

Mixed Workload Scaling					
Number of Nodes	8KB OLTP IOPS	Virtual Desktops	Exchange 2013 Mailboxes	File Server IOPS	Average Response Time (ms)
3	1,743	94	5,612	1,106	27.00
6	4,364	203	27,788	3,206	17.73
9	6,525	327	44,210	4,906	17.07

Why This Matters

Storage scalability, resilience, and performance are significant challenges as organizations embrace server virtualization technology in support of an IT-as-a-service, on-demand delivery model. Traditional storage solutions have relied on monolithic architectures requiring exotic custom hardware and over-provisioning to meet these challenges. More recently, vendors have offered scale-out and clustered solutions in an effort to reduce complexity and ease the pain of implementation and management.

Both server and desktop virtualization are top IT priorities for organizations surveyed by ESG.[6] Predictable performance scalability is a critical concern when systems running diverse applications share a storage system. A burst of I/O activity from one user can lead to poor response times and lost productivity for other users. A highly virtualized environment potentially presents one of the most diverse and challenging mixes of application types and I/O access patterns to a storage system.

ESG Lab has confirmed that Gridstore 3.0 storage offers predictable scalability with low response times while providing extremely scalable capacity using large format nearline drives. ESG Lab testing has validated that the efficiency and performance of the Gridstore architecture can be used to support diverse mixed real-world applications in highly virtualized environments with confidence.

[6] Source: ESG Research Report, *2013 IT Spending Intentions Survey*, January 2013.

Performance and Cost Efficiency

ESG Lab performed additional testing to demonstrate the performance readiness and cost effectiveness of Gridstore 3.0 hybrid storage nodes compared with two of today's common storage configurations: iSCSI and FC SANs. These configurations were tested:

- **Configuration 1** – Gridstore 3.0 using 10GbE networking
- **Configuration 2** – 10GbE iSCSI attached to hardware RAID provisioned storage
- **Configuration 3** – 8 Gbps FC attached to hardware RAID provisioned storage

ESG Lab configured Gridstore to use three Gridstore hybrid nodes. Each node supported four 3TB 7200 RPM NL-SAS drives and a 550GB PCIe Flash card, for a total of 36TB of raw storage. The iSCSI and FC storage configurations were provisioned with a goal of directly comparing the configurations with one another. Each of these configurations utilized the same storage array with 48 600GB 15K SAS drives for 28.8TB of raw storage. The workload was deployed on two, and then four Windows Server 2012 machines using the same x64-based host servers.

ESG Lab tested a virtualized tier-1 application workload that was designed to emulate the database activity of a typical online brokerage firm. Thirty-three percent of the I/O were writes (emulating database updates), and the remainder were reads. In all cases, the workload generated a high level of I/O activity with small access sizes. This, combined with a large cache resident working set, created a workload that was well suited for evaluating the efficiency and scalability of our tested storage solutions.

ESG Lab measured the performance of each of the storage solution scenarios by calculating the sum of the number of transactions processed per second as the virtual machines scaled from two to four. The OLTP workload and concurrent user counts remained constant for each test and each configuration. The results are summarized in Figure 19 and Table 2.

Figure 19. Storage Configuration Performance Comparison

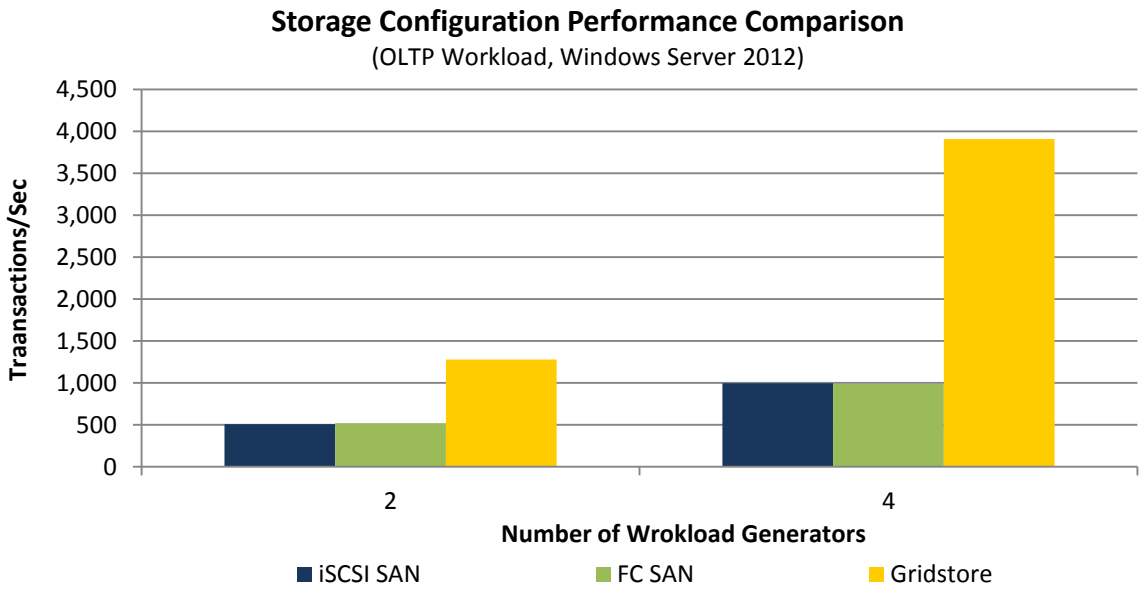


Table 2. Storage Configuration Performance Comparison – Transactions/sec

	Total Number of Transactions/sec		
Workload Generators	**Gridstore**	**iSCSI SAN**	**FC SAN**
2	1,278	508	518
4	3,910	997	989

What the Numbers Mean

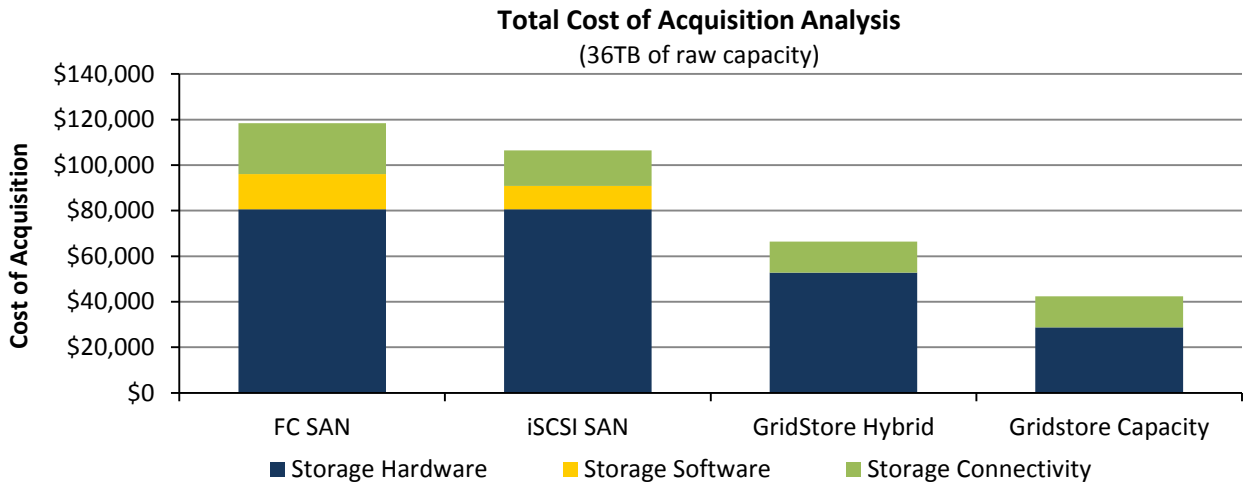
- Performance scaled nearly linearly as the number of workload generators increased from two to four.
- Compared to iSCSI and FC disk arrays, Gridstore delivered nearly four times the performance at just over half the cost of systems with similar capacity.
- By implementing a hybrid flash and disk solution, Gridstore storage achieved superior performance while utilizing 75% fewer physical disks.

With a goal of showing the cost effectiveness of Gridstore as compared with an iSCSI or FC SAN solution, ESG Lab modeled and analyzed the initial cost of acquisition for each of the storage solutions used for testing. A theoretical customer was modeled requiring approximately 36TB of block-based storage capacity to meet the needs of common business applications. ESG Lab compared three industry-leading vendor storage solutions and averaged the estimated acquisition costs for both the iSCSI and FC SAN solutions.

The ESG Lab analysis was quantitative in that it compared the cost of acquisition for three different pieces of the storage infrastructure: hardware, networking, and software. Storage hardware costs include all costs associated with controllers, enclosures, drives, and connectors. Each hardware configuration included the cost of two host connections across two PCI adapters for high availability. Storage networking costs include all costs associated with host adapters, switches, and cables. Storage software costs include all costs associated with base storage software that is included in the storage system. It is important to note that there are no storage software costs for configurations with Gridstore hybrid or capacity storage because it's built into the solution at no additional cost.

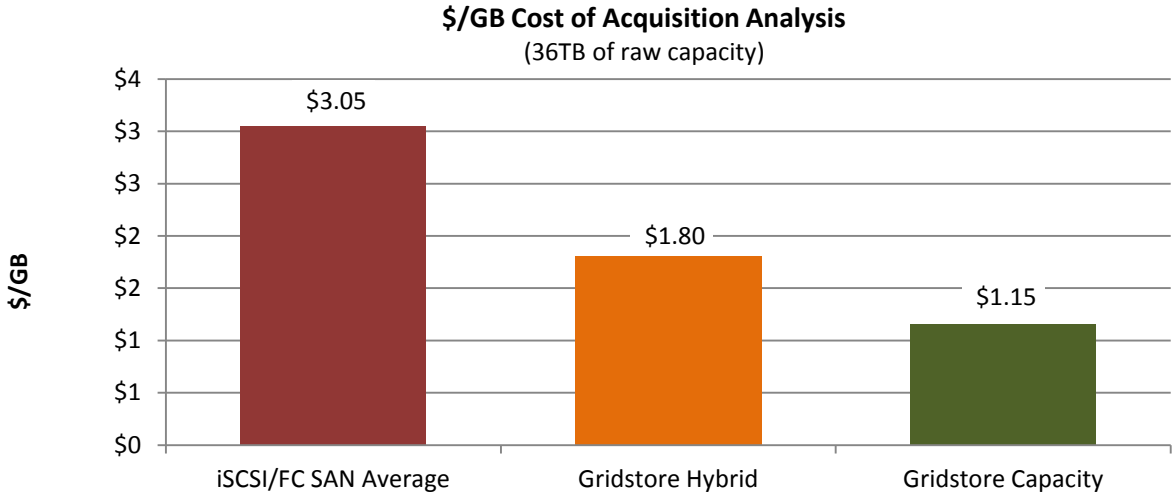
The comparison of the total cost of acquisition is shown in Figure 20.

Figure 20. Storage Configuration -- Total Cost of Acquisition



ESG Lab broke down the results further into a commonly viewed metric of $/GB. This was done by converting the raw capacity of TBs to GBs and dividing the total cost of acquisition by the GB value. The results are shown in Figure 21. Similarly to the overall cost of acquisition, iSCSI and FC SANs proved to be almost 1.7x the cost of the comparable Gridstore solution.

Figure 21. Storage Configuration – Total Cost per GB



Though ESG Lab did not factor in the cost of management and maintenance, the advantage of using Gridstore's storage solution approach compared with a SAN is quite clear. Many organizations have Microsoft and Windows experts, as well as storage experts. Many SAN IT vendors require vendor-specific storage specialists to provision, manage, and monitor the storage infrastructure. Gridstore eliminates that need by moving the storage management to Windows Server 2012. After installing the Gridstore virtual controller, the storage appears as a locally attached disk, and grid and node management is performed through an intuitive and simple user interface, allowing Microsoft and Windows administrators to quickly and easily manage their applications and storage.

Why This Matters

For the past three years, cost reduction has been consistently the most-cited factor affecting IT spending decisions at respondent organizations.[7] Affordability remains a top priority in the decision process when implementing new technology solutions. The expenses of storage and management software are important cost-related factors and, when combining the high costs and complexity of a SAN, administrative headaches can quickly arise. Now, more than ever, there is a need for a solution specifically designed to lower costs while fulfilling the ever-growing, ever-changing needs of a business.

Maintaining cost-effective performance with efficient scalability is both a priority and a challenge for most scale-out storage environments. ESG research indicates that improved scalability, improved performance, and lower cost of infrastructure rank as top drivers for respondents when they are considering implementing scale-out solutions.[8]

ESG Lab validated that Gridstore's cluster storage solution outperformed common iSCSI and FC SAN solutions when comparing an identical OLTP application workload. Using a hybrid solution of flash and spinning disks, Gridstore provided nearly four times the performance of the alternative solutions with 75% fewer disks, compared with the traditional solutions' use of large numbers of small, fast, and expensive disks to provide performance.

ESG Lab validated the cost-savings offered by Gridstore when compared with a common SAN solution. ESG Lab calculated the initial cost of acquisition and found that, as a result of the Gridstore hybrid architecture, organizations could expect savings of up to 50% deploying a Gridstore-based storage solution compared with a traditional SAN of similar capacity, while also achieving higher performance.

[7] Source: ESG Research Report, *2013 IT Spending Intentions Survey*, January 2013.
[8] Source: ESG Research Report, *Scale-out Storage Market Trends*, December 2010.

ESG Lab Validation Highlights

- ☑ ESG Lab found installation of Gridstore storage practically effortless, requiring minimal administrator interaction. And it was completed minutes after power-on with the storage immediately available for use.
- ☑ The grid was configured using the intuitive GridControl, an MMC snap-in that enabled complete provisioning, mounting, and formatting of vLUNS from the GridControl console.
- ☑ After defining a profile for the grid, all nodes were auto-discovered and automatically configured without administrator intervention.
- ☑ ESG Lab created virtual LUNs, which were recognized, formatted, and made available using standard Microsoft tools.
- ☑ With a few mouse clicks, ESG Lab assigned different QoS levels to different VMs running simulated application workloads and verified that QoS policies were enforced.
- ☑ Business workload performance scaled nearly linearly as nodes were added to the grid, with very low response times.
- ☑ Gridstore provided nearly four times the performance of traditional SAN solutions with 75% fewer disks.
- ☑ ESG Lab calculated the initial cost of acquisition and found that, as a result of the Gridstore hybrid architecture, organizations could expect acquisition cost savings of up to 50% deploying a Gridstore-based storage solution over a traditional SAN, while also achieving higher performance.

Issues to Consider

- ☑ Gridstore is architected to integrate directly with Microsoft Server and Hyper-V. Organizations running in heterogeneous hypervisor environments would install on the non-Microsoft hypervisors a Virtual Storage Appliance (VSA) that provides an iSCSI target to each of the hypervisors. The VSA contains a Gridstore Virtual Controller that connects to the grid for storage resources.

The Bigger Truth

Virtualization of servers and business applications increases both data storage requirements and complexity as IT strives to bring applications and services to traditional IT infrastructure dynamically and on demand. IT is facing increasing pressure to improve efficiency while delivering always-on application and data access. Organizations are challenged with managing the ever-increasing complexity of IT infrastructures while the adoption of modern cloud and virtualization technology is on the rise. ESG research respondents have cited managing data growth, increased use of server and desktop virtualization, and cloud infrastructure services as top IT priorities, possibly driven by the perpetual focus on improving resource efficiency and ROI.[9]

In addition, IT is feeling significant pressure to more effectively support the business, increase asset utilization, and improve information management and security—all while holding down costs across the board. As IT organizations virtualize server and storage infrastructure, they absolutely must be able to support applications' I/O requirements within and across systems, scale the infrastructure with the business, control both capital expenditures and asset lifecycle management costs, and provide highly available infrastructure for critical business applications.

ESG Lab was impressed with the easy installation and deployment of Gridstore Storage 3.0 and its tight integration with Microsoft Server and Hyper-V. QoS was also easy to set up and manage for servers as well as vLUNs. QoS changes were effective immediately, throttling I/O for low priority applications and freeing up resources for high-priority applications.

Gridstore 3.0 performance scaled nearly linearly in every test run by ESG Lab. Gridstore was able to support a diverse mix of business application I/O with excellent response times, scaling performance and capacity as nodes were added to the grid, with response times staying low. A grid composed of just nine hybrid nodes was able to sustain nearly 3GB/sec of write throughput.

By inverting traditional storage architecture and placing a virtual storage controller inside each physical server or Hyper-V Host, Gridstore isolates and optimizes the individual I/O streams between each server and the storage grid, optimizing I/O for all applications. The Server-side Virtual Controller Technology also enables multiple levels of quality of service per VM, alleviating the noisy-neighbor problem; isolating applications, servers, and tenants; and creating a private cloud experience with fine-grained optimization.

Gridstore storage is based on simple building blocks of capacity and performance storage nodes, which can be used to scale to over 3PB. The rapid deployment and simple, intuitive management, combined with I/O optimization and QoS provides a powerful approach to scalable storage. Organizations that have standardized on Microsoft Server or Hyper-V and are looking for a storage architecture that can cost-effectively scale while isolating and optimizing I/O to meet the needs of an expanding range of applications would be well served to take a closer look at Gridstore.

[9] Source: ESG Research Report, *2013 IT Spending Intentions Survey*, January 2013.

Appendix

Table 3. ESG Lab Test Bed

Storage	
9x Gridstore GS-H2100-12 Hybrid Nodes	4x 3TB HDD, 550GB PCIe Flash 4-core Intel Xeon processor 32GB RAM
Servers	
Physical and Virtual Machines	Windows Server 2012
Workload Generation	
Iometer	Version 2006.07.27
8KB I/O, 100% Random, 100% Read	
1MB I/O, 100% Sequential, 100% Write	
Exchange 2013: 32KB I/O, 100% Random, 73% Read	
VDI: Mixed I/O – 512B to 256KB, Average 16KB 100% Random, 80% Write	
8KB OLTP, 8KB I/O, 100% Random, 67% Read	
File Server: Mixed I/O, 4KB to 64KB 100% Random, 80% Read	

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