Lab Validation Report

DataCore SANsymphony-V

Compelling Storage Virtualization Software

By Tony Palmer

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## ESG Lab Reports

The goal of ESG Lab reports is to educate IT professionals about emerging technologies and products in the storage, data management and information security industries. 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 DataCore.
Introduction

Decades of growth of applications, storage, and complexity have delivered unprecedented economic, operational, and flexibility challenges to the world of IT. To meet these demands today's IT is turning to virtualization, not just of systems and applications, but in every facet of IT. When broadly and carefully deployed, virtualization has the ability to ensure that management focus is where it should be: on applications and organizational results rather than on hardware choices. This ESG Lab Validation documents the results of hands on testing of DataCore SANsymphony-V R8 Storage Virtualization Software. ESG Lab evaluated SANsymphony-V with an eye on assessing the value of infrastructure-wide storage virtualization including centralized management, ease of use, capacity efficiency, data mobility, and performance. The enhanced high availability and disaster recovery capabilities of synchronous mirroring within campuses or metropolitan areas and long distance asynchronous remote replication are also presented.

Background

ESG recently conducted a survey of 463 IT professionals in enterprise (i.e., 1,000 or more employees) and large midmarket (i.e., 500 to 999 employees) organizations. Respondents were asked to identify what they would consider to be important IT initiatives over the next 12-24 months. As one might expect from a captive audience of server virtualization users, there was significant focus on consolidation efforts (cited by 31% of respondents), creating an internal or "private cloud" infrastructure (24%), and increased IT automation (23%). Perhaps of greatest interest and significance, however, is that desktop virtualization (36%) ranked as the top IT initiative selected by respondents, as seen in Figure 1.1

Figure 1. Important IT Initiatives, 2011-2012

Which of the following would you consider to be important IT initiatives for your organization over the next 12-24 months? (Percent of respondents, N=463, multiple responses accepted)

- Desktop virtualization: 36%
- Data center consolidation: 31%
- Data center migration: 25%
- Building our own "private cloud": 24%
- Automating routine IT tasks utilizing server virtualization technology: 23%


The data center as we know it is in the midst of a significant transformation; the data center of tomorrow is virtualized. Server virtualization, while still maturing its overall capabilities, is here to stay. Desktop virtualization is on the same trajectory. Both are logical and compelling, operationally and financially, and both make business sense. IT is beginning to accelerate virtualization of its server and desktop infrastructure. The more advanced an organization in terms of virtualization deployments, the greater the level of benefit and value that organization can expect. With systems virtualization becoming ubiquitous, storage, at least storage as it has been deployed and used for decades, can be a significant obstacle that is slowing or stalling the successful and optimal advance of IT. And yet the tools exist to capably address the issue—with the virtualization of storage being a crucial element.²

**DataCore Software**

DataCore has been providing software-based storage virtualization for over 13 years with more than 6,000 customers and over 20,000 licenses deployed. DataCore’s mission is to enhance the value of the storage hardware users prefer to own.

Their software-based virtualization approach works across all popular brands and models of disk and storage arrays, providing an integrated and consistent set of provisioning, data protection and performance acceleration functions on an infrastructure-wide basis, regardless of device and without requiring the purchase of expensive add-on software for each array in an environment.

**SANsymphony-V**

DataCore SANsymphony-V is designed as a flexible software platform which runs on physical or virtual industry standard x86-64 Windows servers. The product is agnostic with regard to the underlying storage hardware and can effectively virtualize whatever storage is on a user’s floor, whether direct-attached or SAN-connected. Running on industry standard server hardware and Windows Server 2008 R2 enables SANsymphony-V to support a wide array of storage devices and SAN connectivity options, including iSCSI, Fibre Channel and Fibre Channel over Ethernet (FCoE) determined by the HBA’s or NICs installed in the DataCore nodes.

SANsymphony-V can be installed on dedicated servers to manage very large multi-petabyte, physical storage pools, or scaled down for smaller environments by co-residing in the same physical server hosting the virtual machines. Since SANsymphony-V is a native Windows application, it can be installed directly on Hyper-V, without having to live inside a virtual machine.

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SANsymphony-V is built with business- and mission-critical applications in mind. The system is designed to enable users to provision, share, reconfigure, migrate, replicate, expand and upgrade storage without downtime or performance impact.

SANsymphony-V offers users a rich set of enterprise-class functionality, with workflow-oriented wizards to ease administration and management. High-speed caching, synchronous mirroring, snapshots, continuous data protection (CDP) rollback, online migration and upgrades, asynchronous replication with compression, (for bi-directional remote site recovery), and thin provisioning all can span heterogeneous storage because SANsymphony-V sits between the storage hardware and hosts. The goal of the balance of this Lab Validation report is to examine exactly how DataCore SANsymphony-V virtualizes storage and provides compelling business value to users.
ESG Lab Validation

ESG Lab performed hands-on evaluation and testing of SANsymphony-V R8 at DataCore’s Fort Lauderdale, Florida Headquarters. Testing was designed to demonstrate the ease of deployment and management of SANsymphony-V, while providing an efficient, highly available, fully virtualized storage environment. ESG also validated DataCore software’s ability, in conjunction with a hypervisor, to significantly reduce the cost and effort to gracefully transition from a physical to a virtual environment by repurposing industry standard servers and storage already in place.

Getting Started

Figure 3 illustrates the test bed used by ESG Lab for this Validation report. Six physical servers were utilized, all running Microsoft Windows Server 2008 R2. Four servers were configured as Hyper V R2 hosts and two servers were configured as SANsymphony-V R8 storage virtualization nodes.

Figure 3. The ESG Lab Test Bed

The Hyper-V servers were attached via Gigabit Ethernet iSCSI SAN to the SANsymphony-V nodes. Fibre Channel is also available, as is any SAN protocol supported by the host. The SANsymphony-V nodes aggregated raw storage from the directly attached disks and presented shared virtual disks to the attached servers. The SANsymphony-V management console (which can be run local or remotely) provided a centralized management interface that was used to perform all configuration, management and monitoring tasks.

ESG Lab Testing

The SANsymphony-V Management Console, shown in Figure 4, presents a customizable view of the user’s environment with areas on the left side of the screen that populate as the system is configured and resources are added. Users drill down into individual components and entities from high level categories to manage all aspects of their virtualized storage environment.
ESG Lab began with the Getting Started wizard, and followed the steps a new administrator would execute to virtualize and serve storage to hosts using SANsymphony-V.

Figure 4. The SANsymphony-V Management Console

First, a user 'ITAdmin' was registered and given full read-write privileges on the system. Next, the available SAN ports on the DataCore server (node) were assigned to specific roles, as shown in Figure 5. Front-end ports present virtual disks to hosts, back end ports talk to disks or storage arrays, while mirror ports are used for local (synchronous) mirroring between DataCore nodes.

Figure 5. Assigning Port Roles
The next step was to create a disk pool. In these tests, disk pools were built from direct-attached drives, but a disk pool could also contain LUNs on SAN-attached storage arrays. Figure 6 shows a disk pool being created from four 36 GB physical disks. Additional multi-terabyte pools were also created. Storage tiers could also be set up by creating disk pools with devices having different price/performance characteristics including basic SATA drives, SAS or FibreChannel drives, and Solid State Disks (SSDs).

Figure 6. Creating a Disk Pool

Next ESG Lab registered a host, selecting a virtual machine on one of the four Hyper-v servers.

Figure 7. Quick Serve a New Virtual Disk
The final step was to serve a disk to the host. ESG Lab right-clicked on the host and selected ‘Quick Serve New virtual Disk’, as seen in Figure 7. The only parameter required was the capacity desired for the disk.

Thin provisioning, cache management, synchronous mirroring between DataCore nodes, as well as preferred and alternate paths to the virtual disk resources are all configured automatically by SANsymphony-V.

Figure 8. A New 1TB Volume Mounted

![Figure 8](image)

Figure 8 shows the new 1TB volume mounted by the virtual machine ‘Exchange-Host’. Note that the 1 TB disk is automatically thin provisioned and generated from a much smaller physical disk pool.

Why This Matters

As virtualized IT environments grow, the ability to easily and quickly provision and manage capacity in those environments is essential if organizations are to provide cost-effective services to applications and users. With IT departments being asked to do more with fewer resources, providing simple tools for administrators to manage storage helps save both time and money.

DataCore SANsymphony-V R8 was very quick and easy to set up and manage. ESG Lab set up a two node, high-availability SANsymphony-V environment and was serving storage to virtual machines in minutes using an integrated getting started wizard that walked the administrator through all aspects of configuration.

With one click of a mouse, ESG Lab was able to serve a 1TB virtual disk to a Windows server in less than a minute. SANsymphony-V automatically took care of the entire behind-the-scenes configuration which in traditional storage environments is the responsibility of specialized storage administrators. The volume was thin provisioned, mirrored for high-availability, and preferred and alternate paths to storage resources were set without administrator intervention. ESG Lab was impressed with the speed, simplicity, and completeness of the configuration.
Fully Virtualized and Highly Efficient

DataCore SANsymphony-V is designed to reduce the number of servers and storage devices required in a given environment by intelligently and securely sharing heterogeneous resources among them, even when the disks and arrays are of dissimilar models and brands. ESG Lab’s goal in these tests was to demonstrate how SANsymphony-V can be used to transition from an underutilized physical environment to a flexible, fully virtualized environment using existing equipment and resources. Figure 9 shows the physical server environment before testing began: Six Windows Server 2008 systems, with a single application installed on each server and direct attached SATA hard drives.

Figure 9. Physical Server Environment

Server virtualization software, like Microsoft Hyper-V, VMware vSphere, and Citrix XenServer, enables users to consolidate physical servers by moving applications into virtual machines, and allowing multiple applications to run on a single physical server. In order to leverage advanced capabilities like Live Migration or vMotion, the ability to move virtual machines between physical servers while running, requires that the physical servers have access to shared storage. Since, the direct attached storage inside each server is not shareable, customers who desire the benefits of virtual machine mobility must purchase new external SAN arrays.

DataCore software enables customers to share access to their direct-attached drives without having to replace them. DataCore passes through the original disk contents to the hosts once incorporated into the virtualized pool.
Figure 10 shows the test environment, fully virtualized. Note that the same six physical servers were redeployed into new roles and are now able to provide enterprise-class capabilities. Hyper-V enables all six applications to run on two clustered servers in the main datacenter, with one Hyper-V server running in the disaster recovery site as a standby for the production servers.

SANsymphony-V was installed on the remaining three servers, turning them into DataCore storage virtualization nodes. Although they are represented with different symbols in this diagram, those are the same physical servers that were hosting isolated applications shown in Figure 9. The original direct-attached physical disks were spread among the three DataCore storage virtualization nodes. The DataCore software makes the disk space shareable over a SAN.

The two synchronously mirrored DataCore nodes in the main data center provide high availability. They can be located up to 100 kilometers apart to split the main datacenter within a metropolitan area, avoiding disruption due to facility issues. Critical virtual disks are replicated asynchronously to the third node at the disaster recovery site to protect against regional disasters and outages. This adds the flexibility to grow the entire storage environment, on the fly, using any storage.

In the following test, ESG Lab imported a physical File Server’s live data volume into SANsymphony-V and converted it to a fully virtualized, thin provisioned volume.
ESG Lab Testing

First, a virtual disk was created to act as a logical pass-through device for the imported file server volume. As seen in Figure 11, the virtual disk was created with mirroring disabled.

Figure 11. Importing an External Disk

In the next step, ESG Lab selected the DataCore server and specified the file server’s data drive as a pass-through disk, as seen in Figure 12.

Figure 12. Creating the pass-through disk

Figure 13 shows the virtual disk being served to a host (a virtual machine in the Hyper-V server), at which point the volume was brought online.
Once the volume was served to the host, its contents were mirrored to a virtual disk on the other DataCore server, as seen in Figure 14. The original disk drive was then fully virtualized in the background to take advantage of thin provisioning and other capabilities while its mirrored copy provided uninterrupted access. The original drive was then non-disruptively replaced.

The entire process, from start to finish, was accomplished with eight mouse clicks and no outages after the pass-through disk was served to the host.

**Why This Matters**

ESG Lab found that virtualizing storage with DataCore SANsymphony-V R8 was intuitive and straightforward. An existing drive being used by a live file server was changed into a DataCore pass-through virtual disk in a matter of minutes with just eight mouse clicks. Once under DataCore’s control, volumes can be cached, mirrored, expanded, migrated, copied, and even replicated to a remote site—seamlessly and painlessly—while applications remain online and available.
Fast

DataCore uses advanced caching techniques to accelerate I/O response in much the same way as modern high-end storage subsystems do, with three significant differences:

- The caching software is infrastructure-wide, rather than confined to one device.
- Cache can reside on the same servers as the virtual machines.
- Server RAM is typically less expensive than dedicated storage array cache, so organizations can get more performance enhancement for their money.

DataCore's cache operates across all disks in the storage pool including heterogeneous storage systems. It exploits the relatively low-cost memory in the commercial server platforms on which it runs, converting their RAM into high performance, scalable storage cache.

SANsymphony-V's cache resides between the operating system on the hosts and the physical storage. Like other sophisticated caching techniques, it provides a variety of performance acceleration services including read-ahead (pre-fetch), write-behind (where IO is acknowledged as soon as it is written to redundant caches), and write-coalescing, which enables SANsymphony-V to organize the sequence of writes so that multiple writes can be executed in a single operation.

SANsymphony-V's caching acceleration applies to all storage devices configured throughout a user's SAN. The ability to allocate up to 1 TB of cache per node can significantly enhance the performance of both low-end storage devices and high-end storage systems.

ESG Lab Testing

ESG Lab used the Iometer workload generation tool to emulate a mix of real-world applications (Exchange, SQL Server, file server, media server), to simulate an I/O mix that's typical of multi-user business productivity applications.³ The objective was to determine the impact on performance when DataCore software is added into an existing hardware environment.

ESG lab ran a mix of four workloads on four individual physical servers with 2 internal SATA drives each under Windows Server 2008 R2. Next, the same workloads were run on four virtual machines in a single physical server running Hyper-v R2. The four virtual machines were running against a single disk pool made up of eight SATA drives, to keep the hardware identical between the physical and virtual environments.

³ Workload characterizations are listed in the Appendix.
Figure 15 shows the performance benefit SANsymphony-V delivered.

**Figure 15. Performance Comparison, Physical vs. Virtual**

Table 1 lists the detailed results obtained in our lab testing.

**Table 1. Physical vs. DataCore SANsymphony-V Virtualized Performance Data**

<table>
<thead>
<tr>
<th>Workload</th>
<th>Physical Server, Physical Disks</th>
<th>Virtual Servers, Virtualized Disks</th>
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<tbody>
<tr>
<td>SQL Server</td>
<td>119 IOPS</td>
<td>531 IOPS</td>
</tr>
<tr>
<td>Exchange 2007</td>
<td>124 IOPS</td>
<td>576 IOPS</td>
</tr>
<tr>
<td>File Server</td>
<td>115 IOPS</td>
<td>734 IOPS</td>
</tr>
<tr>
<td>Streaming Media</td>
<td>193 MB/sec</td>
<td>280 MB/sec</td>
</tr>
</tbody>
</table>

**What the Numbers Mean**

- Performance improved significantly for every workload with the File Server workload posting the most significant improvement, more than 6x.
- The Exchange 2007 workload showed a 5x improvement. The physical server with DAS was able to support 322 heavy users, while the virtualized system showed the ability to support more than 1,500 users.\(^4\)

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\(^4\) Exchange 2007 User profiles are listed in the Appendix.
Why This Matters

ESG research indicates that performance is a key concern when deploying mission critical applications in a highly consolidated environment. With multiple application servers relying on a shared storage infrastructure, there is a worry that performance requirements can’t be met affordably. As a matter of fact, 31% of ESG survey respondents reported that performance was their most significant server virtualization challenge, followed closely by capital costs.\(^5\)

Through hands-on testing, ESG Lab has verified that DataCore SANsymphony-V software can be deployed to cost-effectively provide easy-to-configure, performance enhanced, storage virtualization, offering affordable scalability, and performance acceleration for virtualized servers and applications. As storage environments continue to grow in size and complexity, and virtualization becomes more widespread, storage virtualization software and consolidation will become a requirement in more user environments in order to achieve these benefits and operational efficiencies.

Highly Available

DataCore takes business continuity very seriously and offers multiple, complementary methods to ensure that hosts’ virtual machine images and their associated data on disk remain accessible despite hardware faults, human error, and environmental disruptions. SANsymphony offers N+1 redundancy to eliminate single points of failure in a datacenter. A DataCore node and/or its storage resources can be taken out-of-service for repairs, upgrades, expansion and replacement without interrupting applications, and then put seamlessly back into full use.

This level of high availability is provided via synchronous mirroring between nodes and multiple I/O paths from hosts to nodes. DataCore recommends that customers place redundant nodes with their respective disk pools in separate rooms, ideally in separate buildings on a campus where a water leak or air conditioning problem, for example, can only disturb one of the nodes while the other transparently absorbs its load. Larger customers often operate distributed datacenters split between hot sites as far as 100 kilometers apart.

Data layer protection is provided via snapshots (full clones or copy-on-first write differentials) as well as true Continuous Data Protection (CDP). Either can be enabled for individual virtual disks. When a volume is protected with CDP, SANsymphony-V logs and time stamps all activity to the virtual disk so that users can create a rollback at any point in time within the rollback window.

To guard against regional disasters, DataCore offers asynchronous remote replication over conventional LANs and WANs using industry standard TCP/IP protocols. SANsymphony-V automatically compresses the replication stream to reduce bandwidth requirements, allowing customers to use lower cost links with narrower bandwidth.

Figure 16 shows the ESG Lab test bed used to validate synchronous mirroring and asynchronous remote replication.

**Figure 16. Synchronous Mirroring and Asynchronous Remote Replication**

**ESG Lab Testing**

ESG Lab tested synchronous mirroring using a simulated Exchange server. The server was running in a virtual machine on a Hyper-V server in the main datacenter, and its database and log volumes were being served by SANsymphony-V via the East Node, seen in Figure 16. Iometer was used to generate Exchange database and log workloads against the two volumes.

ESG lab disabled the East Node while the workloads were running, and verified that the node was indeed down, as shown in Figure 17. Iometer continued to run without interruption, transparently failing over to the West Node.
ESG Lab restarted the East Node and verified through the SANsymphony-V management console that all disk access was still being serviced through the West Node, as shown in Figure 18.

After the SANsymphony log recovery process completed, the volume failed back to the East Node, again automatically and without interruption.
Next, ESG Lab enabled Continuous Data Protection on the disk ‘Exch Log’, highlighted in Figure 19. A batch file was run in a continuous loop, creating a series of small text files, one per second to simulate continuous writes to a log file.

**Figure 19. Enabling Data Protection**

Next, ESG Lab simulated an accidental file deletion event and stopped the batch file. To recover, a rollback point was created, at 2:12:02 PM, as seen in Figure 20.

**Figure 20. Creating a Rollback**

Finally, ESG un-served the volume from the Exchange server, and reverted to the rollback. After serving the volume back to the Exchange server, the text files created with the batch file were confirmed to have been restored back to the 2:12:02 PM point-in-time of the rollback.
Next, ESG Lab tested asynchronous remote replication using a standard LAN connection and a WANem Wide Area Network simulator, which restricted bandwidth to a T1 equivalent (1.44 Mbps) and injected latency into the link, to simulate a real world connection between a main data center and a disaster recovery site 10 miles away.

A fixed 1 GB data set consisting of standard office files and digital photos was used to test replication. First, the `robocopy` command was used to copy the data set from a source volume on one side of the WAN Emulator to a target volume on the target side. As expected, the `robocopy` process took just under 2 hours to complete and delivered consistent throughput of approximately 1.4 Mbps.

**Figure 21. Configuring the Replication Source**

ESG Lab copied the data set to a virtual disk on SANsymphony-V and configured asynchronous replication between the sites. First, a replication buffer was defined. This step is only required once at the source. Replication buffers allow asynchronous replication to occur over slow or intermittent links by buffering changes to a local disk. Next, the virtual disk to be replicated was identified, which was named Replication Source, as seen in Figure 21.
Figure 22 shows the local and remote DataCore servers being partnered in a replication group.

**Figure 22. Partner With Replication Group**

Next, the replication session was set up for the source volume, as seen in Figure 23.

**Figure 23. Creating the Replication Session**

Next, replication was started and the start time was noted. Replication completed in 1 hour and 12 minutes, representing a virtual throughput of 2.84 Mbps, or about double the raw speed of the T1 link.
After replication was complete, a host at the disaster recovery (DR) site was able to mount the remote copy of the virtual disk and access the data to take over processing duties. To simulate updates occurring at the DR site while the main datacenter is offline, new files were copied to the remote virtual disk. Before resuming normal business operations at the primary datacenter, the changes were automatically transmitted back to the main datacenter using SANsymphony-V Advanced Site Recovery. This feature effectively reversed the order of replication to expedite the switch back.

**Why This Matters**

IT organizations running mission-critical applications need to guard against service interruptions. An interruption could be something common, such as a server failure, disk drive failure, software error, data corruption, a computer virus, or "pilot" error. Sometimes, interruptions may not be caused by failures at all, but instead routine equipment upgrades, firmware updates and hardware refreshes can require equipment to be taken out-of-service. In highly centralized, virtual environments these disruptions will cause major outages that impact numerous workloads and users.

It could also be something more disastrous, such as a fire, flood, natural disaster, pandemic, terrorism, or blackout. As a growing number of organizations standardize on the use of virtualized environments for mission-critical applications, rapid, manageable, reliable, and affordable business continuity and disaster recovery solutions are needed now more than ever.

Recovering from a disaster using traditional backup methods can take days. Organizations replicate and create snapshots of business critical data and applications because they cannot tolerate interrupted access to those applications before, during, or after a major failure in a production data center. In enterprise class environments, storage arrays' remote mirroring capabilities have been used to recover quickly from such disasters.

ESG lab validated that DataCore SANsymphony-V R8 provides an array of data protection capabilities that can cost-effectively satisfy the most stringent business continuity and disaster recovery requirements. Synchronous mirroring within metropolitan areas, snapshots, CDP, and asynchronous remote replication to distant disaster recovery sites can be used without being dependent on any specific model or brand of storage devices. For example, customers could take advantage of a less capable, more affordable, or existing storage systems at a remote site to immediately establish a contingency site while reducing the total cost of disaster avoidance.
ESG Lab Validation Highlights

- DataCore SANsymphony-V R8 was very quick and easy to set up and manage. ESG Lab set up a two node, high-availability SANsymphony-V environment and was serving storage to virtual machines in minutes.
- With one click of a mouse, ESG Lab was able to serve a thin provisioned, performance tuned, fully protected, synchronously mirrored 1TB virtual disk to a Windows server in less than a minute.
- Migrating and importing disk drives from a working physical server into the virtual disk pool was a quick and easy process. The DataCore software provided a seamless transition from physical to virtual infrastructure while actually enhancing performance and availability.
- DataCore synchronous mirroring provided hosts with continuous access to virtual disks through a node outage with zero downtime and no interruptions to service.
- DataCore Continuous Data Protection (CDP) was easy to configure and use, enabling rollback to a specific point in time without having to create multiple snapshots.
- DataCore asynchronous remote replication was also easy to configure; compression and multi-streaming provided a 2x throughput enhancement over a simulated T1 link.

Issues to Consider

- While remote replication was easy to set up and use, initial replication of a large data set could take a very long time over relatively slow IP connections. The ability of a customer to ‘seed’ a replication target, using tape or removable disk, would enable much quicker movement of the initial data set to the remote site. As of this writing, DataCore has informed ESG Lab that data seeding is typically a procedure performed by the solution provider. DataCore informed ESG Lab that more automated means of data seeding will be available in a future release of SANsymphony-V.
The Bigger Truth

As server virtualization has matured, storage management has become more complex, and the dependency on centralized shared storage is changing the storage landscape. With applications detached from physical systems, their workloads have become more dynamic and unpredictable. These trends drive the urgency to virtualize storage. Virtualization is one of the few IT tools with a genuine ability to significantly address the challenge of unabated demand for a limited supply of the resources to deliver IT services and the tools to manage them.

Virtualization was a "nice-to-have" five or ten years ago but is now rapidly becoming a hard requirement for many production environments. IT has no choice but to virtualize. Much as the experience and success of server virtualization has transitioned from initially supporting test and development to now being a software infrastructure for data center architectures. Storage virtualization has to be a part of that virtual IT infrastructure.

SANsymphony-V R8 is DataCore’s newest release based on more than a decade of experience, and DataCore has thousands of users that will attest to its ability to deliver both quality and business value. The company now finds itself with incredibly relevant capabilities that truly matter to users. ESG lab tested DataCore SANsymphony-V and found the software easy to implement and to manage, virtualizing any storage infrastructure with enterprise class features and functionality while enhancing performance. DataCore SANsymphony-V kept data available and online through both planned and unplanned outages flawlessly.

The quest for realistic and affordable options to deal with the challenges inherent in IT virtualization and consolidation is daunting. Storage administrators are increasingly being retired and replaced or re-invented as network and virtualization administrators; storage management in a modern IT environment has to be simple and practical as well as functional as users will eventually be compelled to virtualize everything. The only variable will be timing; ESG Lab firmly believes that it would benefit any organization considering or implementing an IT virtualization project to take a long look at DataCore SANsymphony-V R8 storage virtualization software.

It is robust, flexible, and responsive and it can deliver major value in terms of utilization, economics, improved response times, high availability (HA), and easy administration.
## Appendix

### Table 2. ESG Lab Test Bed

<table>
<thead>
<tr>
<th>Storage Virtualization Software</th>
<th>Version</th>
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<tr>
<td>DataCore SANsymphony-V</td>
<td>R8</td>
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<table>
<thead>
<tr>
<th>Hardware</th>
<th>OS &amp; Hypervisor</th>
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<tbody>
<tr>
<td>6x Dell R510 Servers</td>
<td>Windows Server 2008 R2</td>
</tr>
<tr>
<td>2.66 GHz Quad Core Xeon CPU</td>
<td>with Hyper-V</td>
</tr>
<tr>
<td>16GB RAM, 2x 1TB SATA HDD (Each Server)</td>
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<table>
<thead>
<tr>
<th>Other Test Software</th>
<th>Version</th>
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<tbody>
<tr>
<td>WANem (WAN emulator)</td>
<td>2.2</td>
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<tr>
<td>1.544 Mbps, 10 ms Latency</td>
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<tr>
<th>Workload Generation</th>
<th>Workload Characterizations</th>
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<td>Iometer 2006.07.27</td>
<td>SQL Server</td>
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<tr>
<td></td>
<td>8KB IO 100% random, 67% read</td>
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<tr>
<td>Exchange 2007</td>
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<td>8KB IO 100% random, 73% read</td>
<td></td>
</tr>
<tr>
<td>File Server</td>
<td></td>
</tr>
<tr>
<td>Mixed IO size, 100% random, 100% read</td>
<td></td>
</tr>
<tr>
<td>Streaming Media</td>
<td></td>
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<tr>
<td>512 KB IO 0% random, 100% read</td>
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