Lab Validation Report

Quest Workspace Desktop Virtualization with Microsoft Hyper-V and System Center

Affordably Scalable Virtual Desktop Infrastructure from Microsoft and Quest

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Contents

Contents 2
Introduction 3
The Road Ahead for Virtualization 3
Overcoming Virtualization Concerns 5
Desktop Virtualization Deployments 6
Windows Server 2008 R2 Hyper-V 7
System Center 2012 7
Quest Workspace Desktop Virtualization 7
ESG Lab Validation 8
Getting Started 8
Manageability 10
Scalability and Performance 11
Savings 14
ESG Lab Validation Highlights 16
Issues to Consider 16
The Bigger Truth 17
Appendix 18

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 Microsoft.

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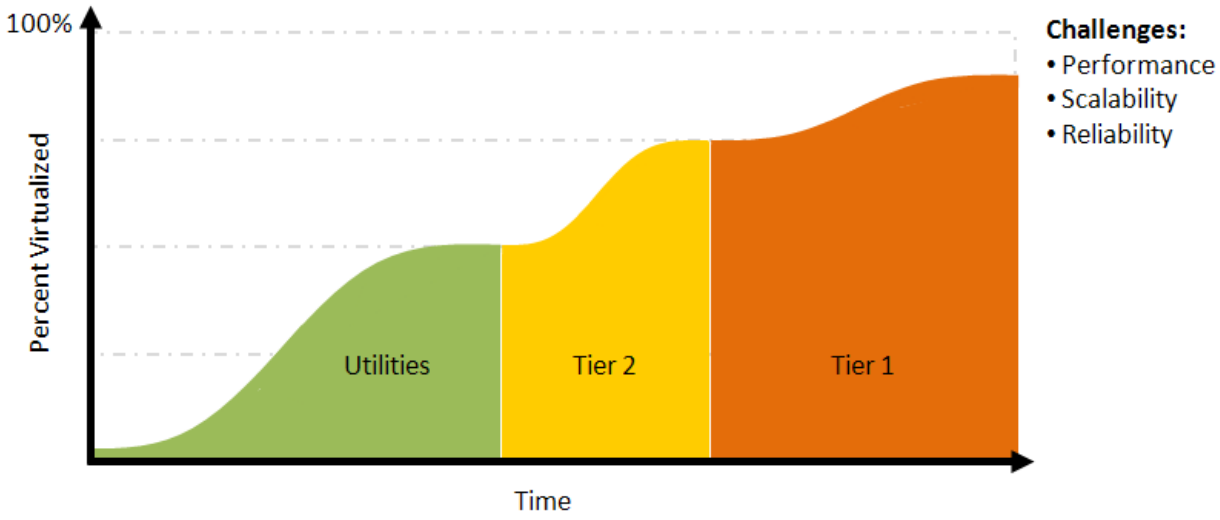
Introduction

This report summarizes the results of testing of the performance, scalability and manageability of Microsoft Windows Server 2008 R2 SP1 with Hyper-V server virtualization technology and Quest Workspace Desktop Virtualization (formerly vWorkspace). The report explores the manageability, performance and cost effective scalability that's enabled by Quest integration with System Center 2012 and Hyper-V.

The Road Ahead for Virtualization

Many organizations are reaping the benefits of server virtualization, including lower IT capital and operational costs; greater IT efficiency; and improved application provisioning, maintenance, availability, and backup/recovery processes. The benefits of server virtualization appear to come in waves that are closely correlated with organizational experience and confidence with virtualization technology. As Figure 1 shows, organizations tend to move through three phases over time as they deploy server virtualization technology.

Figure 1. The Virtualization Timeline



Source: Enterprise Strategy Group, 2012.

The first phase focuses on virtualizing IT-owned utilities and applications such as file and print services. The goals of phase one are to reduce costs, simplify management, and consolidate resources. In the next phase, organizations begin to virtualize tier-2 applications such as Active Directory.

As administrators gain confidence in virtualization technologies, they strive to improve agility and enhance the availability of IT services. However, as the organizations move toward being 100% virtualized, the performance, scalability, and reliability requirements of mission-critical tier-1 applications can inhibit virtualization growth.

ESG research confirms that hesitation. According to research conducted with IT professionals, 59% of organizations have not yet virtualized their tier-1 applications, and they cite performance as a major reason. ESG recently conducted a survey asking respondents what factors were preventing their organizations from using virtualization technology more pervasively. As Figure 2 shows, the key concerns were budget and performance; of the 440 respondents, 23% stated lack of budget, while 22% remain concerned with performance issues.[1]

[1] Source: This data comes from a custom research project conducted by ESG on behalf of Microsoft on the topic of virtualization and private cloud trends in May 2012.

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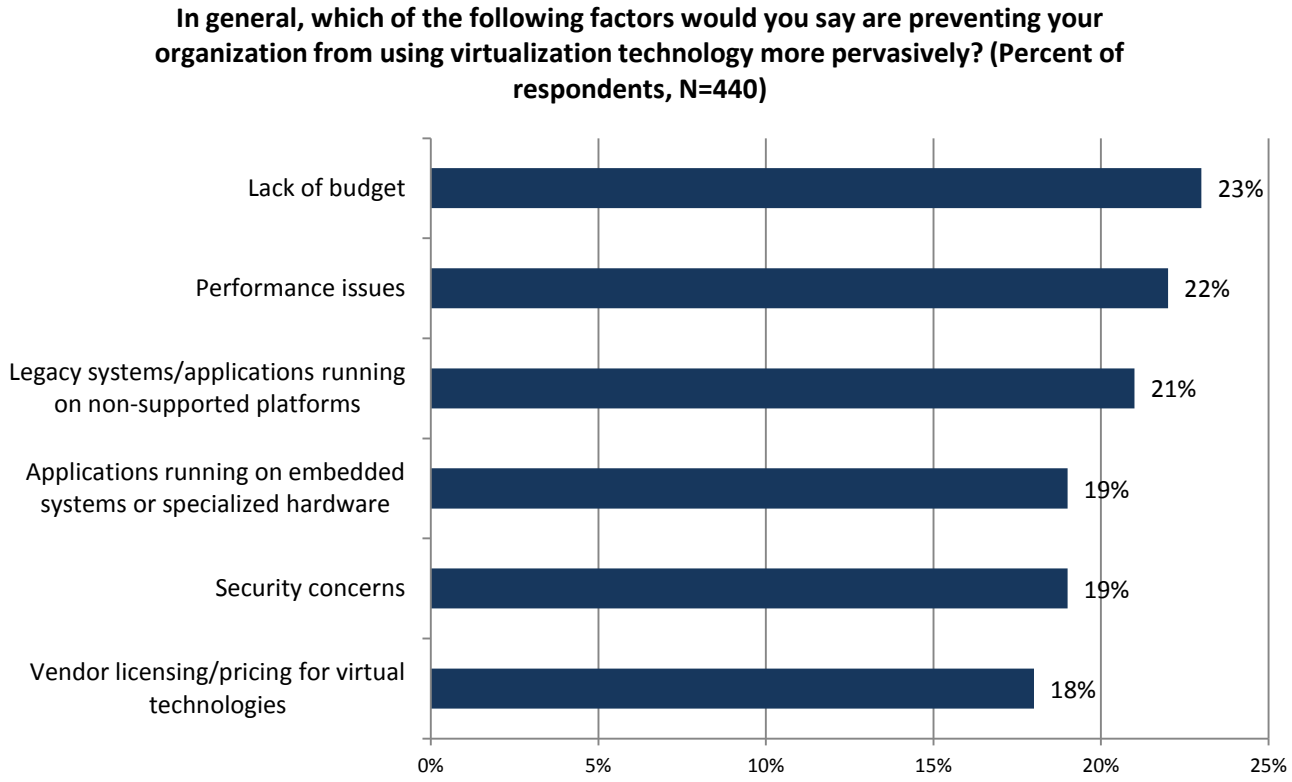
Figure 2. Top Factors Preventing More Pervasive Virtualization Technology Usage



Source: Enterprise Strategy Group, 2012.

In addition to performance, multi-user applications present some additional challenges for virtualization, such as:

- Will the virtualized infrastructure scale as needs grow?
- Can we ensure that performance SLAs for virtualized business-critical applications will be met?

Despite these virtualization challenges, experienced organizations with more mature virtualization deployments are rapidly moving beyond the initial benefits of consolidation, finding that more extensive use of virtualization can help improve application backup/recovery, bolster application availability, and automate IT processes. They have come to realize that the critical metrics in a virtual environment are those focused on availability and performance, and they measure the success of their virtualization efforts not only by their ability to reduce costs and increase efficiency, but also by their ability to meet application performance requirements. Because the benefits of virtualization are extremely compelling, ESG expects to see an increasing number of organizations looking for ways to leverage the technology for their tier-1 applications.

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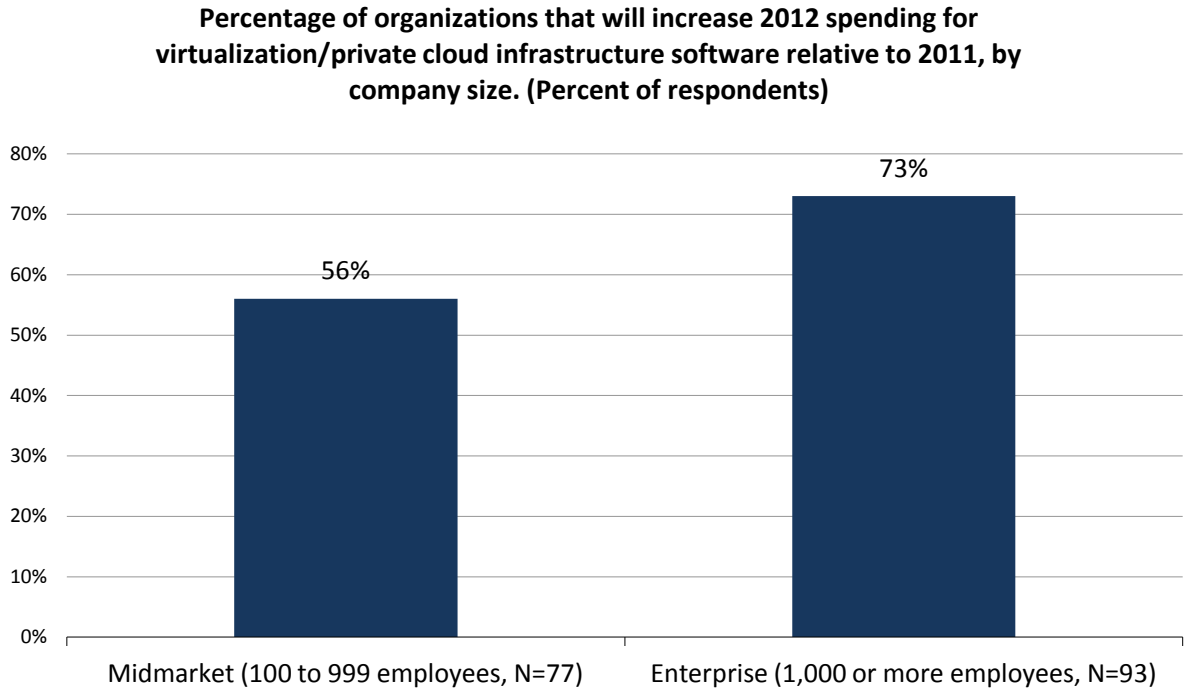
Overcoming Virtualization Concerns

ESG's data confirms that a massive wave of server virtualization expansion is well underway. For example, while 58% of organizations have virtualized 30% or less of their total population of servers today, 58% of organizations expect to have virtualized more than 40% of their servers 24 months from now. The data also indicates that more of these new virtual servers will be run in production environments. On average, the percentage of VMs run in production will increase from 39% today to 58% within two years.

Figure 3 shows the results of a recent ESG survey that asked respondents to identify the extent to which their organization's 2012 spending for virtualization/private cloud infrastructure software will change relative to 2011. More than half (56%) of midmarket organizations expect their 2012 spending levels for virtualization technology to increase, while nearly three-quarters (73%) of their enterprise counterparts anticipate higher budget allocations for the technology compared with 2011.The consistent increases in budgetary funds allocated for virtualization spending reflect the continued growth in both usage and adoption as organizations—regardless of size—look to take advantage of the benefits offered by the technology.[2]

Figure 3. 2012 Virtualization Spending Increases, by Company Size



Source: Enterprise Strategy Group, 2012.

[2] Source: ESG Research Report, *2012 IT Spending Intentions Survey*, January 2012.

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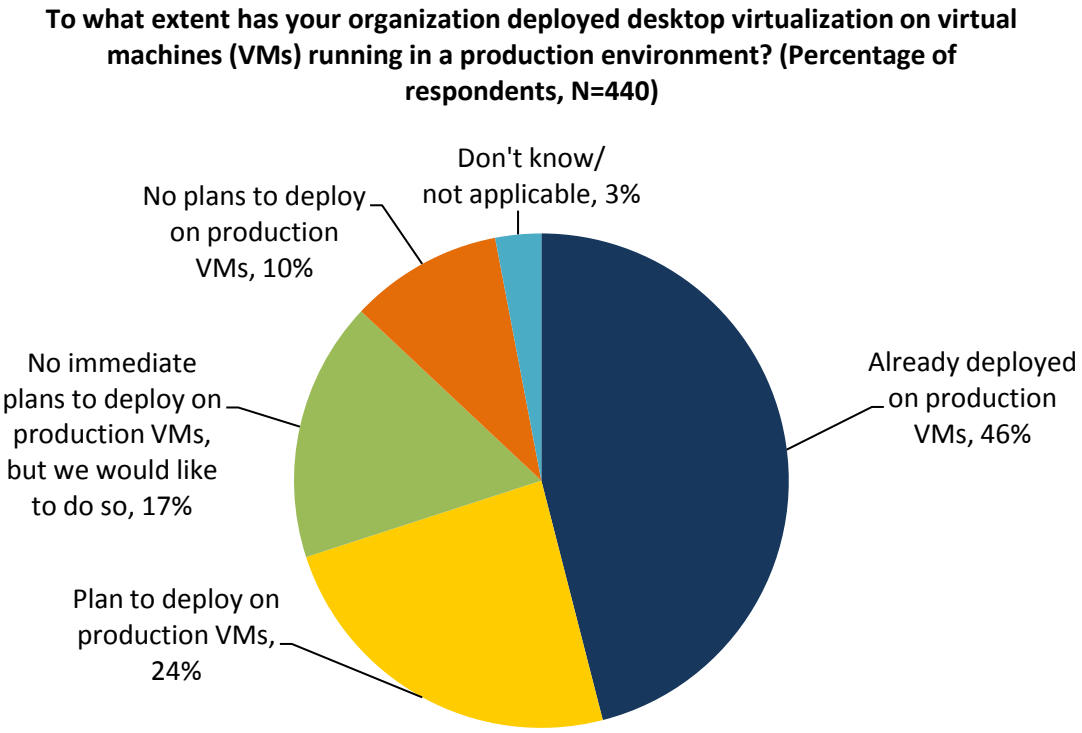
Desktop Virtualization Deployments

The use of server virtualization to consolidate server infrastructure, reduce data center floor space, and maximize utilization of existing assets has seen phenomenal growth over the past decade, but server virtualization's considerable success is dwarfed by the potential of desktop virtualization. A number of factors are conspiring to make desktop management a daunting task for even the most skilled IT organizations; these factors include the increasing variety and numbers of client device types, the mobilization of the workforce, "always-on" expectations for corporate IT services, evolving regulatory compliance mandates, tightening security policies, and a driving need to increase operational efficiency.

A growing number of organizations are using virtual desktop infrastructure (VDI) technology to reduce the cost, complexity, and risks associated with desktop management while providing a high-quality, predictable, and productive computing environment. Respondents to a recent ESG survey were asked to what extent their organization has deployed desktop virtualization on virtual machines in a production environment. Of the 440 respondents, 46% had already deployed desktop virtualization on production VMs, with 24% planning to in the near future (see Figure 4). [3]

Figure 4. Production Environment Desktop Virtualization Deployments



Source: Enterprise Strategy Group, 2012.

Of the more mature organizations surveyed that have deployed and are currently deploying desktop virtualization, application uptime and performance are the two most important metrics in gauging the success of their virtualization deployments. Many of these early-adopters have now virtualized entire infrastructures, including business-critical tier-1 applications. In other words, application performance is a top criterion for virtualization success that is being addressed by the early adopters who have fully embraced server and desktop virtualization.

[3] Source: This data comes from a custom research project conducted by ESG on behalf of Microsoft on the topic of virtualization and private cloud trends in May 2012.

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Windows Server 2008 R2 Hyper-V

Hyper-V is a bare-metal hypervisor that enables hosting of multiple virtual machines on the same physical server. The supported virtual machines can be a mixture of almost all Microsoft (server and desktop) platforms in addition to several Linux platforms.

Hyper-V first became available as a role within Windows Server 2008 and was subsequently released as a free, standalone download, Hyper-V Server 2008. Using familiar interfaces and wizards, Hyper-V lets companies take advantage of existing Microsoft skill sets, training programs, and certifications. An updated R2 release was launched in July 2009. It provided a number of enhancements that improved performance, scalability, and agility of virtualized application workloads through features such as Live Migration, Cluster Shared Volumes, and increased scale-out/scale-up workload support. The Service Pack 1 update, released in February 2011, added new capabilities to enhance the density and scale of virtual server environments (e.g., Dynamic Memory) along a solution for enhanced graphics capabilities in virtual desktops, known as RemoteFX.

System Center 2012

System Center 2012 is a cloud and data center management solution providing common toolsets to manage both private and public cloud applications and deployments. System Center 2012 combines knowledge about systems, policies, processes, and best practices to aid in complete infrastructure optimization, helping to reduce costs, improve application availability, and enhance service delivery.

Quest Workspace Desktop Virtualization

Quest Workspace Desktop Virtualization (QWDV) combines multiple desktop virtualization technologies in one easy-to-use, integrated system for rapid, secure administration. It allows for deploying a blended model—pairing the appropriate technologies to appropriate users based on their unique needs, while keeping the average cost per virtual desktop to a minimum (see Figure 5).

Figure 5. Hyper-V Enabled Desktop Virtualization

Leveraging deep integration with Hyper-V and System Center 2012, QWDV automates the creation and management of virtual desktops and terminal service/remote desktop session hosts (TS/RDSH). With the solution presented in this report, virtual desktop environments of any size can be deployed in minutes using the Hyper-V virtualization technology that's built into Windows Server 2008 R2 at no additional charge. HyperCache, a powerful new feature that was introduced in the latest version of the Quest VDI solution, can be deployed on a Hyper-V host with direct attached storage (DAS) to create a fast, scalable and cost-effective alternative to storage area network (SAN) and solid-state storage infrastructures supporting thousands of users.

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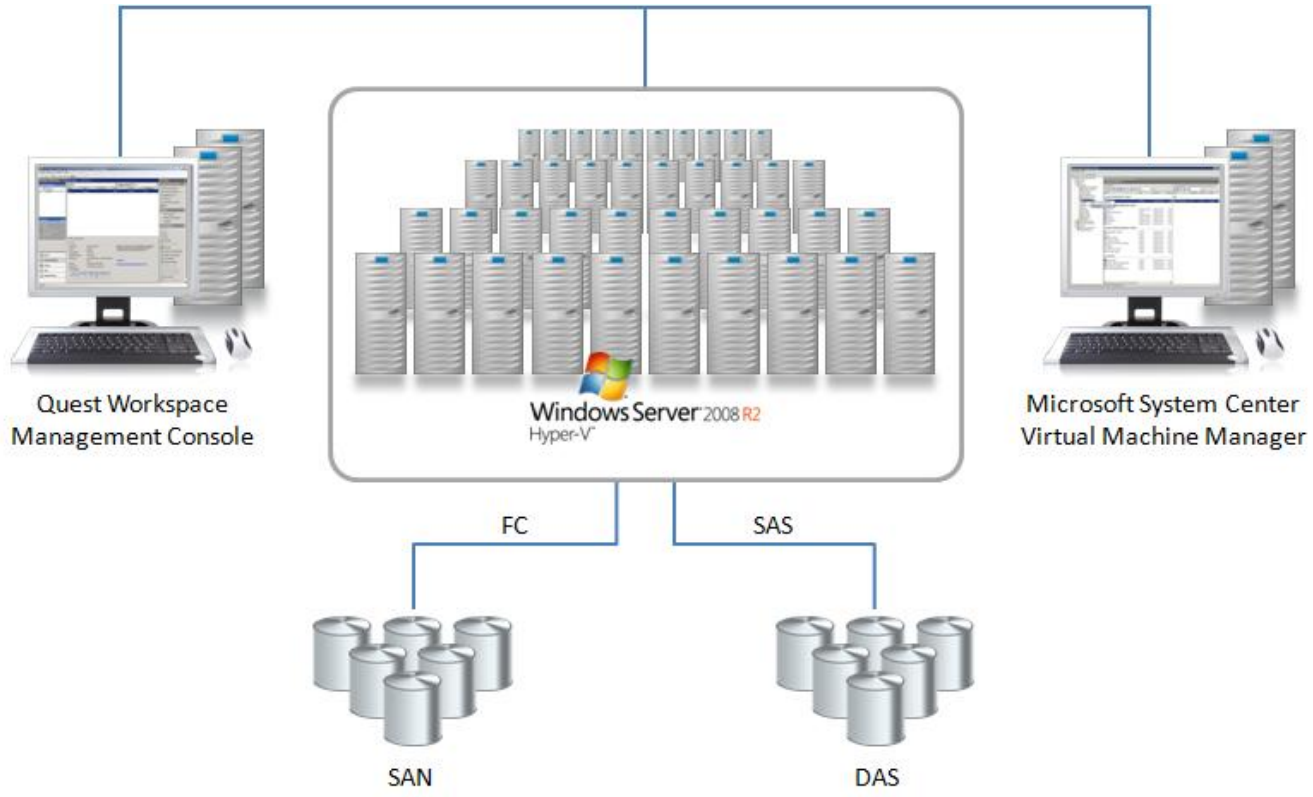
ESG Lab Validation

ESG Lab audited the hands-on evaluation and testing of QWDV at Microsoft's EEC facility in Redmond, Washington. Testing was designed to demonstrate the manageability, performance, and cost-effective scalability enabled by the integration of QWDV with System Center 2012 and Hyper-V.

Getting Started

Figure 6 shows an overview of the test bed that was used for the ESG Lab Validation. Redundant servers for both QWDV and System Center 2012 Virtual Machine Manager (VMM) were each connected to 40 Dell R710 physical servers running Windows Server 2008 R2 SP1 with Hyper-V. The first 20 servers utilized Intel Xeon Hex Core 2.67 GHz X5650 processors with 96GB of RAM. They were connected via Fibre Channel to a SAN composed of SSD and SAS drives. The last 20 servers used the same processor but had the faster clock speed of 2.93 GHz and had 72GB of RAM. This set of servers was connected via SAS to local direct attached storage(DAS) comprised of six RAID 0 disk drives, to demonstrate the viability of using a less-expensive storage solution with the goal of yielding similar results as the servers connected through the SAN.

Figure 6. ESG Lab Test Bed



Each of the physical servers was used to provision a portion of the 3,000 virtual desktops. This 3,000 virtual desktop test was used to validate the capability of QWDV, as well as the integration with Hyper-V and System Center 2012 Virtual Machine Manager to efficiently provision and manage a high-performing, scalable VDI deployment.

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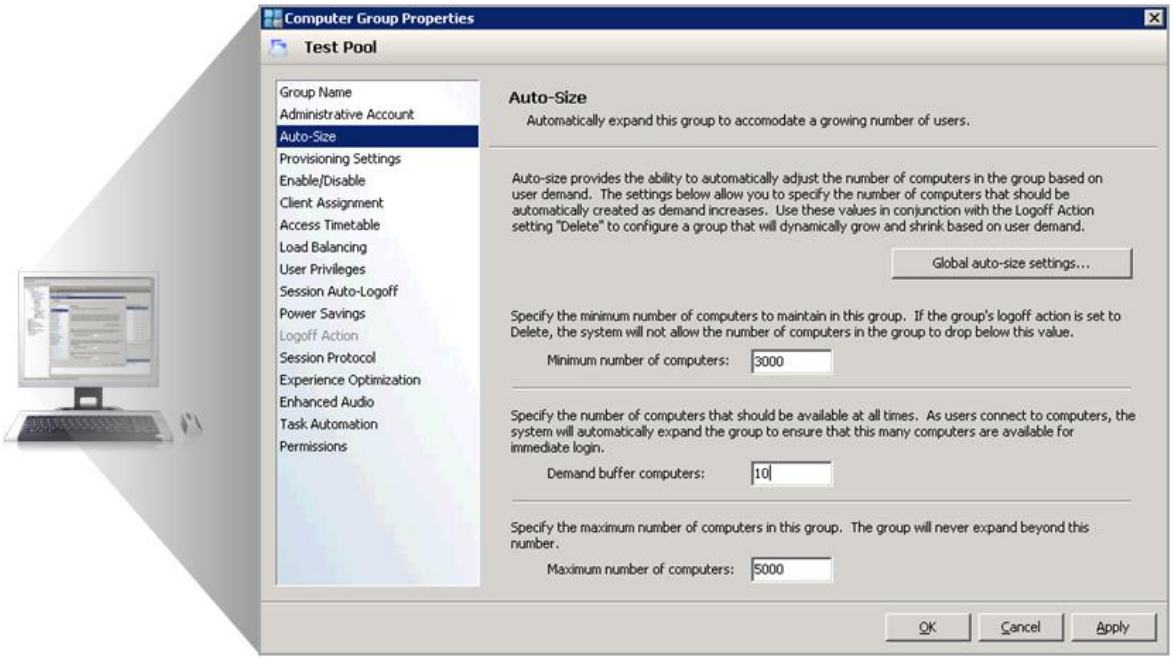
ESG Lab Testing

Quest used Parent-Child technology for provisioning. This means that there is a parent virtual disk (VHD), and any subsequent desktops provisioned have read-only access to that parent and store changes in their own child VHD. This means they are typically a fraction of the original size, which reduces storage costs and speeds provisioning.

Figure 7 highlights the auto-sizing step used to configure a pool of desktops. The setting allowed for a desktop pool of 3,000 VMs, with a maximum of 5,000 VMs and a 10-VM buffer. In other words, if there are currently 3,000 virtual desktops in use, Quest software automatically detects that fact and actually creates 10 additional VMs that are available for login. Later, if five more VMs start being used, five more will be created.

Figure 7. Simplified, Policy-based Provisioning



Why This Matters

ESG research indicates that simplified deployments and upgrades are among the top drivers of virtual desktop infrastructure implementations; more than 60% of IT managers using or planning to use desktop virtualization technology indicated that OS or application deployments and upgrades were the driving factors in their decision to implement desktop virtualization.

The benefit of integrating QWDV software with Hyper-V was immediately apparent through the policy-based provisioning introduced for configuring a desktop pool. These settings allow administrators to create a flexible process for a virtual desktop infrastructure deployment. Creating virtual desktops was simplified due to this deep integration with Hyper-V that allowed for automated provisioning and adjustments to meet the constantly changing requirements of the business.

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Manageability

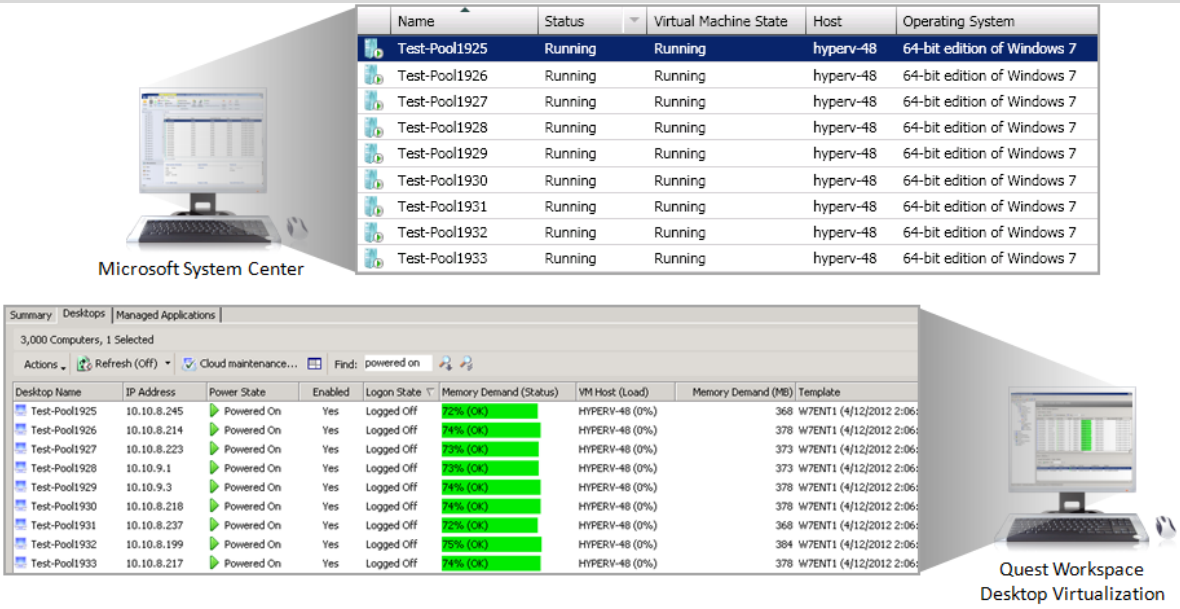
With a comprehensive set of solutions that extend the powerful capabilities of System Center 2012, Quest enables System Center 2012 to be the single end-to-end platform for managing desktops, servers, and devices in both physical and virtual environments. This integration allows IT administrators to manage VDI, Terminal Services and blade PC sessions from a single console while improving user experiences over WAN and LAN Deployments.

ESG Lab Testing

After creating the provisioning policy for 3,000+ desktops, ESG Lab reviewed the management capabilities of a Quest VDI deployment exploring the deep integration with Microsoft System Center. The integration between Quest and VMM passes common virtual machine commands (provision, power on, power off, delete, re-provision, shut down) from Quest's software to VMM through an API. Then, VMM issues the commands to the relevant VM on a particular Hyper-V server. This new integration made the process faster: Now, the commands are issued directly from the Quest software to the physical Hyper-V server.

Figure 8 shows the same management view of a VDI deployment from VMM (top) and Quest Workspace (bottom). Both views show the same physical server, HyperV-48, as well as nine of the 3,000 currently deployed virtual desktops. Each virtual desktop is ready for use, indicated by the fact that they are powered on, but in a logged-off state.

Figure 8. Integrated Management with System Center



Why This Matters

Management complexity continues to grow as user data and deployed applications proliferate within organizations. IT managers are being asked to address the situation (with IT budgets that are flat or declining), while continuing to support high service levels for growing organizations. A pressing need for better server management capabilities, including tightly integrated management tools for both physical and virtual environments, has never been more apparent.

ESG Lab has confirmed that the tight integration between QWDV and System Center 2012 provides two powerful options that can assist IT in managing and monitoring a large VDI deployment. Management views from both Quest Workspace and VMM are always consistent; the choice of which to use can be made on a case by case basis enabling the organization to align staff proficiency and create a cost-effective solution.

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Scalability and Performance

Provisioning of virtual desktops includes the creation, boot, sysprep, domain join, reboot, and installation of the Quest Data Collector, as well as a check that each virtual desktop is fully configured and available. With the introduction of Quest HyperCache, the provisioning and deployment of virtual desktops gets a boost in speed. HyperCache enables the caching of the most-used blocks of a golden image to memory, meaning that virtual desktops need to retrieve requested data from disk only when the data is not found in cache.

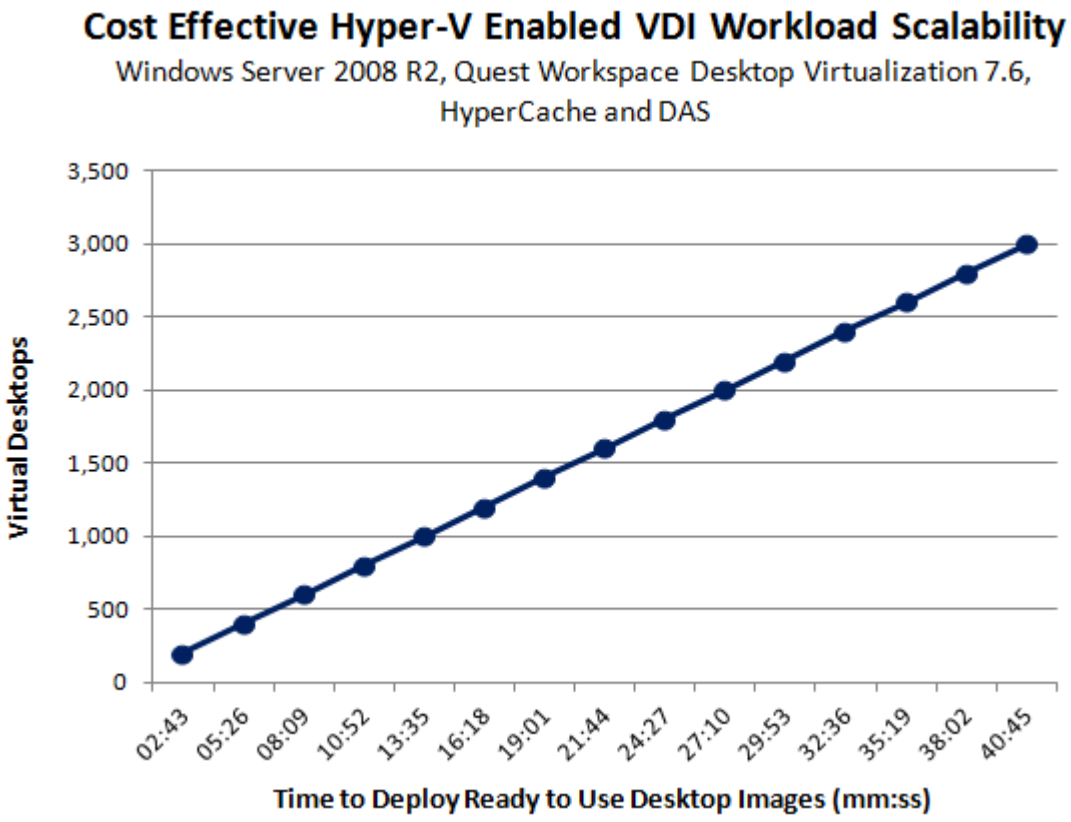
ESG Lab Testing

ESG Lab was interested in the speed of deployment for a Quest VDI solution. More specifically, this test focused on how long it would take to fully bring up a large-scale deployment of up to 3,000 virtual desktops. The ESG Lab test bed (see appendix) contained 40 physical servers, half of them utilizing a SAN, and the other utilizing DAS. Each physical server was responsible for bringing up 75 virtual desktops. The first 1,500 virtual desktops deployed used only the SAN, followed by the next 1,500 virtual desktops that used only DAS. This served as a "test within a test" because if the duration of virtual desktop creation scaled linearly, it would mean that both SAN and DAS perform the same related to virtual desktop deployment.

Figure 10 shows the scalability results of the 3,000 virtual desktop deployments that leveraged Hyper-V with Quest's HyperCache technology. Deployment time scaled linearly from start to finish as an additional 200 virtual desktops continued to be added until the limit of 3,000 was reached. In just over 40 minutes, 3,000 virtual desktops were deployed, meaning that each desktop was domain-joined, operational, and ready for immediate use.

Not only can the duration of a virtual desktop deployment be predicted, but also, DAS performed the same as SAN. As discussed in the next section of this paper, this approach offers a cost-effective alternative to a SAN solution.

Figure 9. Scaling Virtual Desktop Deployment



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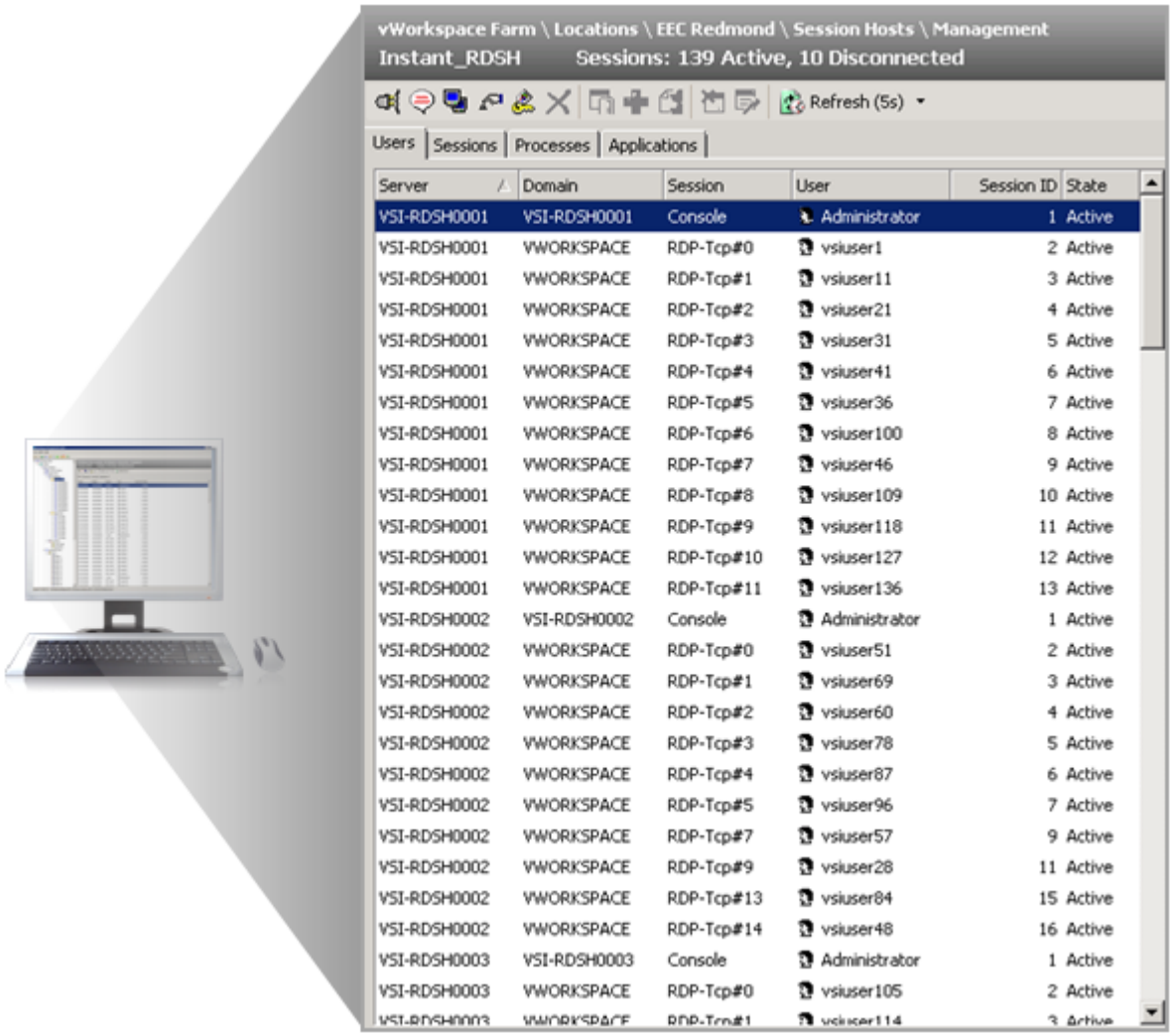
The next test focused on the use of Windows Server 2008 R2 Remote Desktop Session Hosts (RDSHs) in conjunction with QWDV and HyperCache. Figure 11 depicts the RDSH environment during a scalability test, showing the operational view from Quest Workspace running a group of VSI users. Ten RDSH servers were running within a single physical Hyper-V server. The figure shows 139 sessions that were currently active during the scalability test, and each session was logged in by a single unique VSI user. This number of sessions was just a subset of the final and eventual RDSH scalability goal of 250 active sessions.

Figure 10. Quest Workspace Operational View of an RDSH Environment



Server	Domain	Session	User	Session ID	State
VSI-RDSH0001	VSI-RDSH0001	Console	Administrator	1	Active
VSI-RDSH0001	VWORKSPACE	RDP-Tcp#0	vsiuser1	2	Active
VSI-RDSH0001	VWORKSPACE	RDP-Tcp#1	vsiuser11	3	Active
VSI-RDSH0001	VWORKSPACE	RDP-Tcp#2	vsiuser21	4	Active
VSI-RDSH0001	VWORKSPACE	RDP-Tcp#3	vsiuser31	5	Active
VSI-RDSH0001	VWORKSPACE	RDP-Tcp#4	vsiuser41	6	Active
VSI-RDSH0001	VWORKSPACE	RDP-Tcp#5	vsiuser36	7	Active
VSI-RDSH0001	VWORKSPACE	RDP-Tcp#6	vsiuser100	8	Active
VSI-RDSH0001	VWORKSPACE	RDP-Tcp#7	vsiuser46	9	Active
VSI-RDSH0001	VWORKSPACE	RDP-Tcp#8	vsiuser109	10	Active
VSI-RDSH0001	VWORKSPACE	RDP-Tcp#9	vsiuser118	11	Active
VSI-RDSH0001	VWORKSPACE	RDP-Tcp#10	vsiuser127	12	Active
VSI-RDSH0001	VWORKSPACE	RDP-Tcp#11	vsiuser136	13	Active
VSI-RDSH0002	VSI-RDSH0002	Console	Administrator	1	Active
VSI-RDSH0002	VWORKSPACE	RDP-Tcp#0	vsiuser51	2	Active
VSI-RDSH0002	VWORKSPACE	RDP-Tcp#1	vsiuser69	3	Active
VSI-RDSH0002	VWORKSPACE	RDP-Tcp#2	vsiuser60	4	Active
VSI-RDSH0002	VWORKSPACE	RDP-Tcp#3	vsiuser78	5	Active
VSI-RDSH0002	VWORKSPACE	RDP-Tcp#4	vsiuser87	6	Active
VSI-RDSH0002	VWORKSPACE	RDP-Tcp#5	vsiuser96	7	Active
VSI-RDSH0002	VWORKSPACE	RDP-Tcp#7	vsiuser57	9	Active
VSI-RDSH0002	VWORKSPACE	RDP-Tcp#9	vsiuser28	11	Active
VSI-RDSH0002	VWORKSPACE	RDP-Tcp#13	vsiuser84	15	Active
VSI-RDSH0002	VWORKSPACE	RDP-Tcp#14	vsiuser48	16	Active
VSI-RDSH0003	VSI-RDSH0003	Console	Administrator	1	Active
VSI-RDSH0003	VWORKSPACE	RDP-Tcp#0	vsiuser105	2	Active
VSI-RDSH0003	VWORKSPACE	RDP-Tcp#1	vsiuser114	3	Active

To ESG Lab, the most impressive part about the RDSH configuration was that each physical Hyper-V server had only 1GB of RAM allocated for HyperCache. ESG Lab was interested to learn more about HyperCache effectiveness, and to do so, it expanded the number of physical servers to two and monitored the HyperCache effectiveness during a VSI login session.

Figure 12 shows more of the integration with Hyper-V, displaying a list of deployed physical Hyper-V servers. The two physical servers being tested are highlighted; they show the cache effectiveness observed. HyperV-15 cache effectiveness of 80.7%, and HyperV-16 had a HyperCache effectiveness of 83%. These numbers are outstanding for the varied RDSH workload under test. The maximum cache size of 1GB can also be seen directly under the HyperCache effectiveness.

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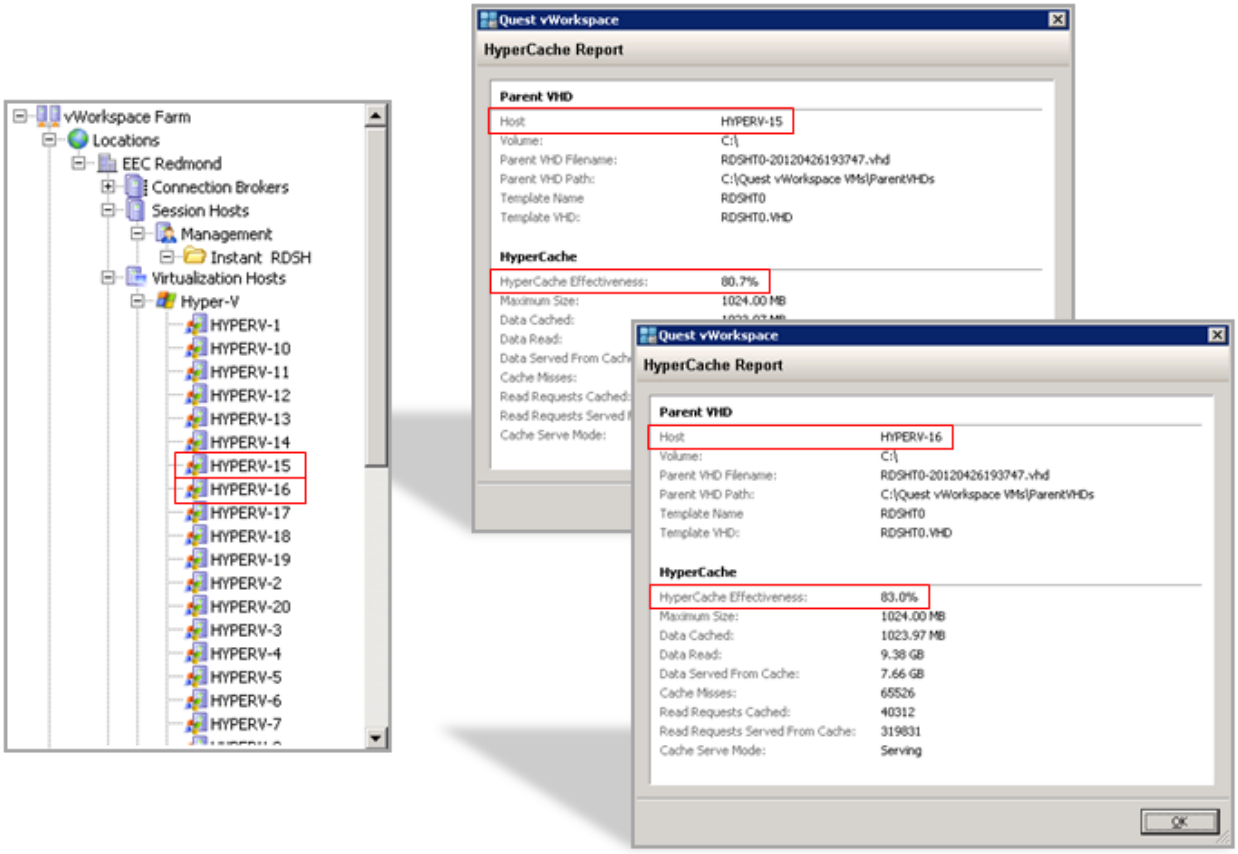
Figure 11. HyperCache Effectiveness in an RDSH Environment



It is important to note that throughout scalability testing, Dynamic Memory was configured to most efficiently utilize physical memory. With Dynamic Memory, Hyper-V provided a virtual machine with more or less memory dynamically in response to changes in the amount of memory required by the workloads or applications running in the virtual machine. For example, one physical server with 72GB of RAM serviced up 75 virtual desktops, meaning memory allocation needed to remain flexible to meet the necessary requirements.

Why This Matters

ESG research indicates that performance is a top concern with virtual desktop infrastructures. In fact, IT managers surveyed ranked performance as their second largest challenge when it comes to implementing desktop virtualization. Predictable performance scalability is a critical concern when multiple users are running diverse applications on a shared VDI infrastructure. A burst of I/O activity from one desktop (e.g., a user logging on) can lead to poor response times and lost productivity for other users. To get the most of their VDI investments, IT managers are looking for a scalable VDI solution that's easy to deploy and manage as it cost-effectively scales to the meet the performance needs of thousands of VDI users.

ESG Lab has confirmed that the performance and scalability of Hyper-V can be used to create a cost-effective IT infrastructure that's ideally suited for large-scale VDI deployments. QWDV software, which automated the policy-based deployment of virtual desktop and TS/RDSH sessions running in a Hyper-V enabled cluster of industry-standard servers with direct-attached storage, was used to deploy 3,000 virtual desktops in just over 40 minutes. Performance scaled linearly on a Hyper-V enabled VDI infrastructure managed with System Center 2012. The effectiveness of Quest HyperCache was also quite impressive in an RDSH environment, with more than 80% of the allocated 1GB HyperCache being effectively utilized.

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Savings

Quest HyperCache, a powerful new feature that was introduced in the latest version of the Quest VDI solution, can be deployed in a Hyper-V server with direct-attached storage (DAS) to create a fast, scalable and cost-effective alternative to storage area network (SAN) and solid-state storage infrastructures supporting thousands of users.

ESG Lab Testing

After observing the impressive performance results, ESG Lab was interested to learn about the new advantages of HyperCache. The main purpose of HyperCache is to drive down IOPS requirements for both VDI and RDSH users. Though Parent-Child technology yields significant savings relating to provisioning time and storage capacity requirements, the challenge of IOPS is not addressed.

The goal was to compare an extremely cost-effective solution using HyperCache with DAS to a more costly SAN option without HyperCache. ESG Lab used perfmon data over a 45-minute period to analyze the IOPS consumption during a deployment of 1,000 virtual desktops. Figures 13 and 14 compare the disk write and read transfers per second with and without HyperCache. Both write and read IOPS with HyperCache and DAS show a significant reduction in IOPS, providing notable savings when compared with a SAN without HyperCache. Write IOPS were reduced by up to 73%, and read IOPS were reduced by up to 99%.

Figure 12. The HyperCache Effect—Write IOPS

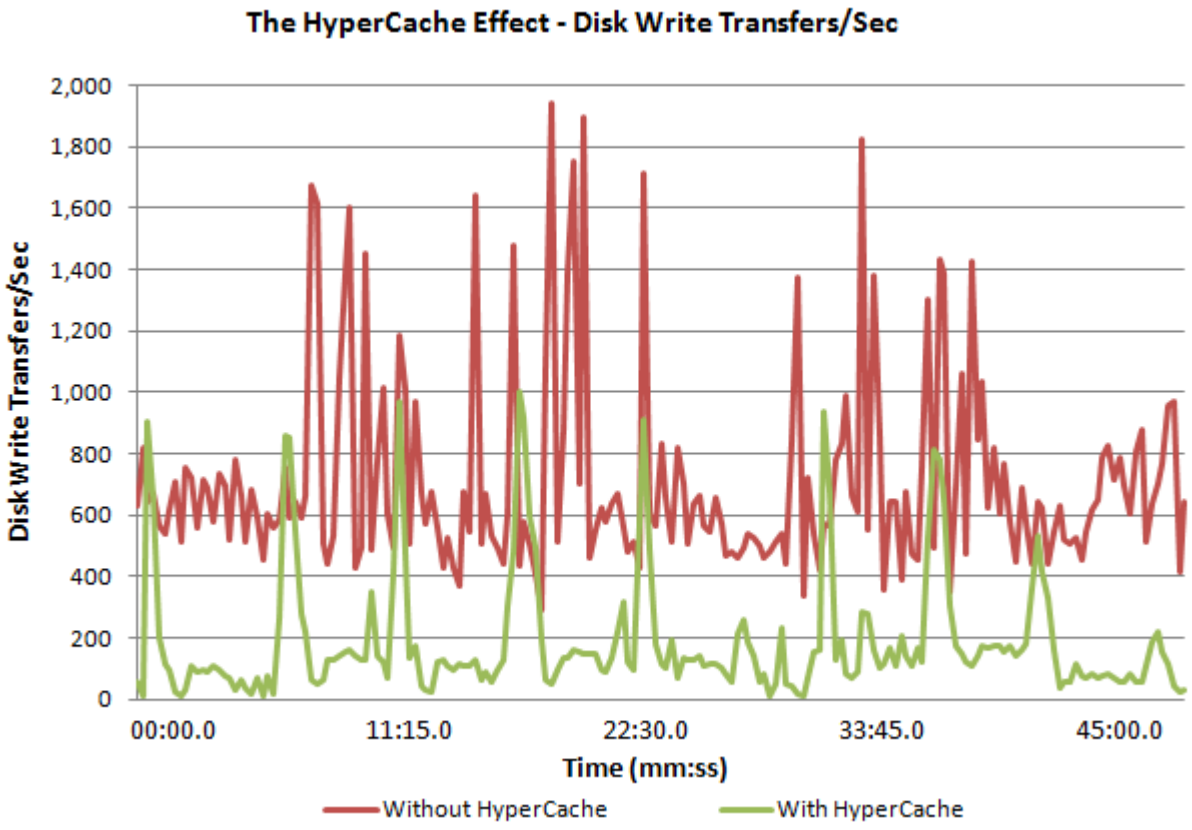

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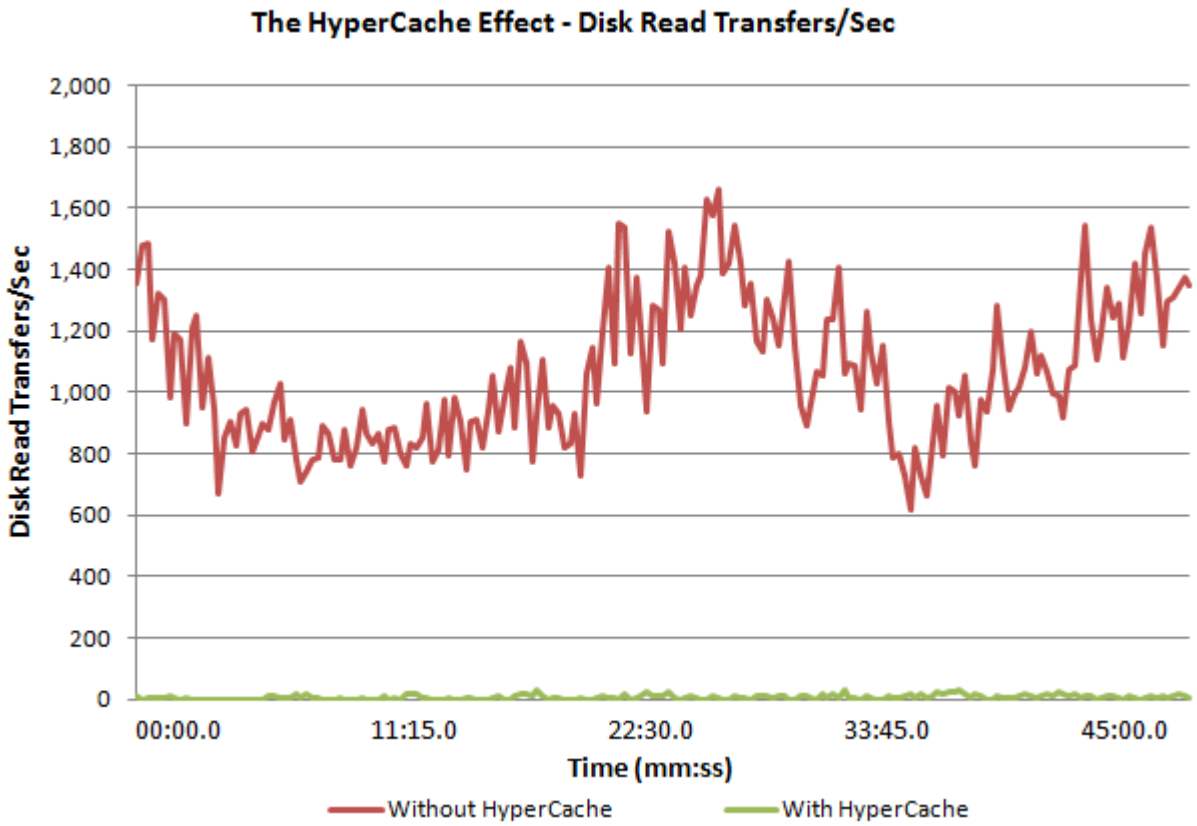
Figure 13. The HyperCache Effect—Read IOPS



As shown, a change occurs relating to the amount of disk read IOPS vs. disk write IOPS. Without HyperCache, many more disk reads than writes occur. After enabling HyperCache, this behavior is swapped. This is due to the ability of HyperCache to reduce the number of read requests for commonly used data, which tends towards operating system and application data that's shared by users in a consolidated VDI environment.

By leveraging the freely available Hyper-V combined with HyperCache, the savings are outstanding. Organizations are now able to use less storage and more cost-effective storage (DAS) without sacrificing performance. Because of the impressive reduction in disk I/O, resource consumption is also reduced and sometimes completely eliminated, allowing IT administrators to do more with less.

Why This Matters

IOPS is one of the most challenging resources in a hosted desktop environment. When combined with a SAN, resource contention and (more importantly) cost can quickly cause administrative headaches. The expenses of storage and management software are important cost-related factors. 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.

ESG Lab confirmed that Hyper-V, combined at no extra cost with Quest technology, is easily able to provide savings at both a resource and cost level. The use of HyperCache significantly reduced I/O requirements in a Hyper-V enabled VDI infrastructure. Using an extremely cost-effective combination of HyperCache with DAS, performance improved radically when compared with a more costly SAN. The HyperCache technology reduced the consumption of IOPS by up to 99% for reads and 73% for writes.

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ESG Lab Validation Highlights

- ☑ QWDV and Windows Server 2008 R2 with Hyper-V running on 40 industry-standard servers (each with 12 CPU cores, up to 96GB of RAM, and cost-effective 10K RPM DAS) was used to deploy 3,000 fully functioning virtual desktops that were ready for logon in about 41 minutes.
- ☑ Performance scaled in a perfectly linear fashion as the number of virtual desktops was scaled from 200 to 3,000.
- ☑ ESG Lab verified an impressive reduction in average total IOPS of up to 86% when provisioning desktops in a Hyper-V enabled virtual desktop environment with Quest HyperCache and cost-effective DAS compared with a similarly configured SAN-attached test bed without HyperCache.
- ☑ Quest integration with System Center Virtual Machine Manager 2012 simplified the policy-based provisioning and management of virtual desktops and terminal server/Remote Desktop Session Hosts
- ☑ The combination of Quest HyperCache, direct-attached storage, System Center 2012, and the Hyper-V virtualization layer that's built into Windows Server 2008 R2 at no additional charge, was used to create an extremely scalable and cost-effective alternative to more expensive VDI solutions that rely on SAN and solid-state storage technologies.

Issues to Consider

- ☑ While ESG Lab has quantified the storage acceleration benefits of Quest HyperCache in a DAS environment powered by Windows Server 2008 R2 Hyper-V, other factors including the CPU, memory, and network configuration can have a significant impact on performance and the end-user VDI experience. IT managers should work with Microsoft and its partners to determine best practices and the optimal configuration for their environment.
- ☑ Though ESG Lab was impressed with the performance of HyperCache using DAS, careful consideration should go into choosing how and where to deploy this solution. Though DAS is more cost effective, the capabilities of instant failover and constant uptime are lost. If a small amount of possible downtime is acceptable, DAS can fit your needs. But for more mission-critical applications that do not allow for any downtime, a SAN environment is recommended.

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The Bigger Truth

While the benefits of server virtualization are widely known, the benefits of desktop virtualization can have an equal or greater impact in today's business environment. Ever-increasing numbers of client device types, the mobilization of the workforce, a new generation of employees with different expectations for corporate IT services, changing regulatory compliance mandates, tightened security policies, and a continued desire to increase operational efficiency all combine to make current desktop management a daunting task. Consequently, IT is mired in a constant battle to provide a high-quality, predictable, and productive computing environment—all while attempting to control operational costs and hardware expenses.

Virtualizing VDI workloads with Hyper-V enables businesses to overcome scalability and performance concerns as they reduce costs and increase the agility and availability of a consolidated IT infrastructure. With the performance and scalability of Hyper-V built into Windows Server 2008 R2, IT organizations can lower costs and benefit from existing skill sets using tools with which their staff is already familiar. With QWDV, which automates the policy-based deployment of virtual desktops, and Quest HyperCache, which reduces storage costs and makes DAS a viable option for VDI, IT organizations can dramatically reduce the costs of deploying and managing a VDI infrastructure. By providing two management options with System Center 2012 Virtual Machine Manager and QWDV, common virtual machine tasks can be completed using the option that best serves the organization, improving organizational agility and flexibility.

Taken together, these results demonstrate that that Hyper-V, included at no additional charge in Microsoft's Windows Server 2008 R2, can be used to cost-effectively virtualize VDI workloads with confidence.

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Appendix

Table 1. ESG Lab Test Bed

Microsoft Hyper-V Servers
Server: 20 x Dell R710 Operating System: Windows 2008 R2 Enterprise SP1 Processor: 2 x Intel Xeon Hex Core X5650 @ 2.67 GHz Memory: 96GB OS Storage: 2 x SAS 15K 450GB RAID 1 Data Drive: SAN
Server: 20 x Dell R710 Operating System: Windows 2008 R2 Enterprise SP1 Processor: 2 x Intel Xeon Hex Core X5670 @ 2.93 GHz Memory: 72GB OS Storage: 2 x SAS 10K 300GB RAID 1 Data Drive: 6 x SAS 10K 300GB RAID 0
Microsoft System Center 2012
Server: 2 x Dell PowerEdge 2970 Operating System: Windows 2008 R2 Enterprise SP1 Processor: 2 x Dual-Core AMD Opteron Processor 2222 SE @ 3.00 GHz Memory: 32GB OS Storage: 2 x SAS 10K 146GB RAID 1 Data Drive: 6 x SAS 10K 146GB RAID 10 Software Version: SCVMM version 3.0.6005.0, with Hotfix KB2663959 and KB2663960
Quest Workspace Desktop Virtualization
Server: 2 x Dell PowerEdge 2970 Operating System: Windows 2008 R2 Enterprise SP1 Processor: 2 x Dual-Core AMD Opteron Processor 2222 SE @ 3.00 GHz Memory: 32GB OS Storage: 2 x SAS 10K 300GB RAID 1 Data Drive: 6 x SAS 10K 300GB RAID 0 Software Version: Quest Workspace Desktop Virtualization 7.6
Virtual Desktops
Operating System: Windows 7 Enterprise Service Pack 1 Dynamic Memory: Startup memory 512MB, Maximum memory 2,048MB, Memory Buffer 20%
SAN
Type: Compellent Number of Drives: 120 12 x 200GB SSD 48 x 1TB SAS 60 x 600GB SAS Cache Size: 12GB Front-end Ports: 4 x 8GFC ports

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