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## White Paper

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**Comparative Management Cost Study:**

**The Management Cost Penalty of  
Using Microsoft System Center to  
Manage VMware vSphere**



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## Executive Summary

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A growing number of enterprises have begun to consider multiple hypervisor virtualization solutions. Some vendors claim that they offer hypervisor-agnostic or heterogeneous hypervisor management solutions, as Microsoft Corporation does today with its Microsoft System Center 2012 suite.

Microsoft makes this claim for the latest release of its comprehensive System Center suite for systems management, with support not only for Microsoft's own Hyper-V hypervisor, but also for VMware vSphere and Citrix XenServer hypervisors.

The simple fact that a technological feat is possible does not necessarily make it worth trying in an actual business production environment. Managing hypervisors using tools that are not specifically optimized to control all aspects of their operations risks impairing reliability, elegance, and ease of management, with potential adverse impact on the bottom line. Creating a truly successful solution requires deep integration and expertise in development.

Edison sought to discover how Microsoft's System Center 2012 stacked up to managing VMware vSphere using VMware's own management capabilities, in terms of ease and efficiency of management.

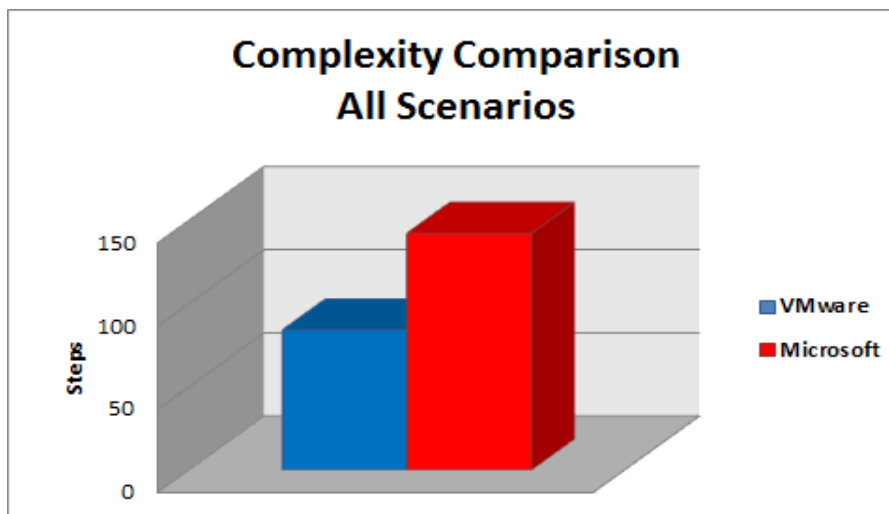
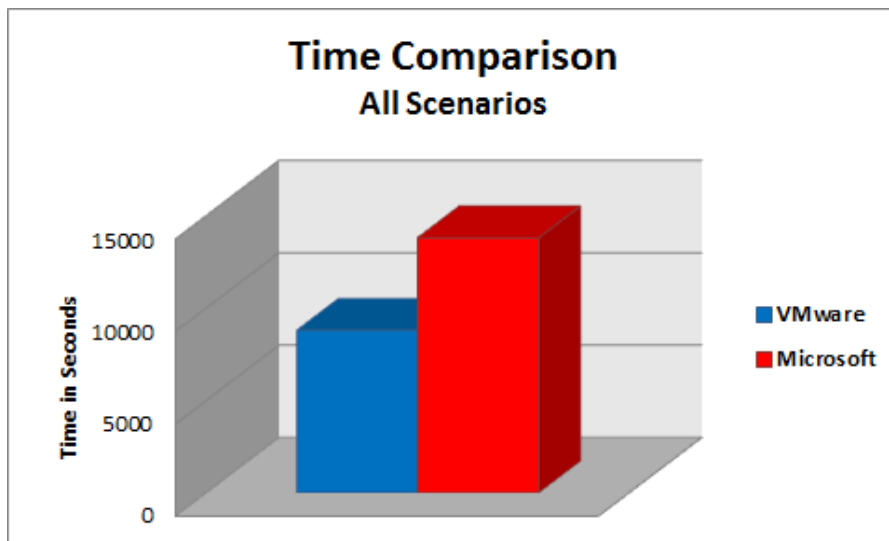
With this in mind, Edison Group assessed the advisability of introducing Microsoft's hypervisor management solution into data centers that have predominantly deployed a VMware virtualization and management platform.

Edison's Comparative Management Cost Study (CMCS) methodology was designed based on Edison's research over several years. It quantifies the complexity of enterprise IT products in a way that easily translates into operational expense. The present study applies this methodology to the management of VMware virtualization hypervisor platforms using Microsoft's Microsoft System Center 2012 suite, as compared to the management of a homogeneous VMware hypervisor environment using VMware management tools.

To emulate the goal-oriented multi-task approach administrators typically employ, Edison defined 11 common scenarios to evaluate. These were developed to illustrate administrative tasks typically performed on a regular basis in a virtualized environment. The tasks chosen and the frequencies assigned for each were based upon the experience of Edison engineers in consultation with VMware. The products in question are

compared against a set of task-oriented objective and subjective metrics to derive an accurate set of analytical results, with each task measured for time<sup>1</sup> and complexity.<sup>2</sup>

The results of Edison's research for this study show that administering a VMware vSphere virtualized IT environment using vCenter is 36 percent less time-consuming and 41 percent less complex than administering VMware vSphere using Microsoft System Center 2012 suite. These results are illustrated in the following graphs.



<sup>1</sup> Defined as the amount of time it takes to perform a given task. For a more in-depth discussion of the Edison CMCS methodology, see the appendix.

<sup>2</sup> The number of system-affecting steps it takes to complete a given task. For a more in-depth discussion of the Edison CMCS methodology, see the appendix.

These time savings can be evaluated in terms of operating expense (OPEX) savings. This assessment demonstrates a 36 percent greater<sup>3</sup> administrator efficiency using a VMware vSphere virtualization solution in a single-vendor virtualized IT environment, versus using VMware in a heterogeneous hypervisor environment managed with Microsoft System Center 2012 suite.

The efficiencies found in this study through the use of VMware vCenter to manage a vSphere environment can reduce costs compared to use of the Microsoft System Center 2012 suite as the primary management tool. The efficiency gains for this particular example can result in savings of more than \$32,552 per year in a 1,000-VM data center.

The dollar savings are likely to be roughly proportional to the number of VMs and hosts in use. Thus, a small business using virtualization will experience the same 36 percent savings as a larger company. The benefits of reducing complexity by using vCenter rather than Microsoft System Center in a VMware virtualized environment can be even greater for a smaller company, whose IT staff often has less depth and breadth than that of larger companies.

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<sup>3</sup> Presented in Table 3 of this report: *Managing VMware vSphere from vCenter vs. SCVMM 2012 Summary of Results*, on pg. 13.

## About This White Paper

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Vendors seeking to place their virtualization products in data centers dominated by VMware vSphere claim their hypervisor-agnostic solutions can administer heterogeneous hypervisor environments from a single point of management. This white paper assesses the manageability and complexity penalty when using Microsoft's heterogeneous hypervisor management tool to manage vSphere, based on a combination of hands-on evaluation, review of relevant published documents on data center cost of ownership, and reports on data center administrator salaries.

The study demonstrates the superior value of using vCenter to manage VMware vSphere. The study compared this to a vSphere environment where management is performed (to the extent possible) from Microsoft's System Center 2012 Virtual Machine Manager (SCVMM) using its heterogeneous hypervisor features.

### Who Should Read This White Paper

This white paper will be of benefit to CIOs, data center administrators, and anyone responsible for choosing or providing virtualization environments for their organizations or business clients.

### Methodology Overview

Edison has incorporated a variety of research methodologies in the development of this white paper, including hands-on product testing, review of many sources of publicly available information, review of VMware and Microsoft materials, and discussions with vendor personnel. The hands-on comparison was performed with Edison's Comparative Management Cost Study (CMCS) methodology, as well as other product testing and research, where appropriate.

Edison analysts performed the series of tasks described in the white paper on data center virtualization environments including VMware vSphere 4.1 (the latest vSphere version currently supported by SCVMM), Windows Server 2008 R2 SP1 host servers, Microsoft Hyper-V R2,<sup>4</sup> and Microsoft System Center 2012. The hardware and software evaluated is listed both within the body of the document and in appendices.

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<sup>4</sup> Edison was unable to conduct testing with Hyper-V 3 because Microsoft System Center 2012 does not support it.

## Contents of this White Paper

- **Executive Summary**—a summary of the context for and results of Edison’s research.
- **Background**—This section describes the cost of a single-vendor virtualized environment versus a mixed vendor virtualized environment. It includes a discussion of the importance of management tools in a virtual server environment, and descriptions of the management platforms from VMware and Microsoft. It also includes a high-level discussion of Edison's approach to measuring efficiencies and costs.
- **Methodology for This Study**—This section describes the methodology used for this study, including a description of the tasks evaluated in the study and a description of the hardware and software products tested. It includes an overview of Edison's *Comparative Management Cost Study* (CMCS) methodology, a discussion of factors that were not evaluated, and how they affect management costs and efficiencies. A discussion of how the results of this study should be used as part of the product evaluation process is also included.
- **Results Summary**—This section presents a summary of the results of the study. It includes overall and scenario-specific findings, presented using a combination of tables, charts, and analysis.
- **Conclusions and Recommendations**—This section summarizes why managing a VMware environment with VMware tools is more cost-effective and efficient than managing the same VMware environment with Microsoft System Center 2012 Virtual Machine Manager. The section also discusses Edison's observations of the research outcome and recommendations for the target audience.
- **Appendices**—These sections contain additional data and documentation, including the tables of all results, plus a more detailed description of Edison's CMCS and efficiency methodologies.



## Background

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While VMware is the acknowledged market leader and established standard for virtualization in enterprise data centers, some IT groups or departments have adopted or are considering other hypervisors, usually influenced by the applications they run. Those running XenDesktop, for example, might consider Citrix XenServer, while those running JBoss might consider KVM. While these alternate hypervisors today remain niche players in an arena thoroughly dominated by VMware, the presence of multiple, often specialized hypervisors is now part of the IT landscape.

Often, in an attempt to gain a foothold in market share, vendors of second-tier hypervisor solutions are including degrees of vSphere support in their management tools. Microsoft has attracted particular notice with its hypervisor, Hyper-V, by dint of the vendor's vast established Windows installed base. Because Hyper-V is bundled with Windows Server, industry analysts are hard-pressed to accurately measure actual numbers in use, as opposed to numbers shipped. They generally agree, however, that Microsoft's virtualization solution has gained some traction in the market.

Assuming an organization has a compelling reason to manage more than a single, standardized hypervisor solution in one data center, the ideal is a "single pane of glass" through which multiple virtualization platforms are managed. Microsoft has been claiming the ability to manage "all Hyper-V and VMware virtual machines" as a key feature of its System Center management platform. This is an alluring promise for any organization that has found it desirable to run heterogeneous hypervisors. In an ideal world, it would result in OPEX savings from ease and convenience of use. Fewer skill sets and reduced learning curves would be required for data center administrators than would be needed to manage multiple virtualized environments through separate interfaces.

However, the ideal is seldom reality, and products claiming to offer unified management of disparate platforms frequently turn out to be less than perfect in practice, completely negating any expected cost-savings. In this paper, Edison reveals that even Microsoft's latest virtualization management solution—Microsoft System Center 2012 suite—does a poor job of managing VMware vSphere. The findings show that the attempt to provide a single pane of glass for virtualization management can turn out to be simply a pain. It is also important to note that Microsoft System Center 2012 still requires that VMware vCenter Server (VMware's management layer) be installed for it to have management access to vSphere hosts. Therefore, administrators will find themselves switching to vCenter to complete vSphere management tasks that System Center cannot fully support.

Edison Group has developed the Comparative Management Cost Study (CMCS) methodology for applying hands-on research comparing administrative consoles of enterprise technology products to determine how their relative ease of use affects the ownership costs of each system. Edison's CMCS analyses have been used to evaluate administrative consoles from major vendors such as VMware and Microsoft, on IT systems from HP, IBM, NetApp, and EMC.

In the study conducted for this white paper, Edison used CMCS methodology in analyzing the management cost viability of managing VMware vSphere using Microsoft System Center in a data center deploying a heterogeneous hypervisor strategy. Specifically, Edison sought to compare the effort—thus, cost—of managing a VMware virtualized data center environment using VMware's own management interface, vCenter, as opposed to using the Microsoft System Center 2012 suite.

## Methodology for This Study

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Edison performed a series of management tasks on virtualization hypervisor solutions from VMware and Microsoft deployed in a lab within its New York City facility. It captured the steps and time required using the Edison Comparative Management Cost Study methodology. Details about the methodology, lab configuration, and testing process are described below.

### CMCS Methodology

The CMCS methodology was created by Edison to be able to objectively compare the manageability ease-of-use for enterprise technology products. Edison devised the methodology to provide an objective metric for comparing Information Technology management platforms. More subjective metrics, such as those derived from interviews with groups of testers in typical user-experience testing, are excellent for understanding the testers' preferences at the time of testing. Results vary significantly, however, for different groups of testers and test conditions.

Objective metrics based on mouse clicks cannot adequately address issues such as the difference between Wizard-based versus non-Wizard based interfaces. The Edison methodology attempts to address these concerns by establishing a set of rules that can account for complexity and different interface design philosophies. A full description of the methodology can be found in the appendix of this report.

### The Products Under Test

The hypervisors from VMware and Microsoft—vSphere Hypervisor and Hyper-V, respectively—are available for free. Microsoft, as mentioned earlier, also offers Hyper-V bundled with its Windows Server operating system. The products evaluated in the study conducted for this white paper are not the hypervisors themselves, but rather the solutions offered by their respective vendors for managing virtualized environments based on those hypervisors. They are as follows:

- VMware vSphere 4.1 Enterprise Plus Edition, with vCenter Server Standard.
- Microsoft System Center 2012, with Virtual Machine Manager 2012.

### ***vSphere Enterprise Plus***

VMware vSphere is the industry-leading virtualization platform targeting data centers planning a cloud implementation. Its design and functionality focuses on optimizing resource pool management, while enhancing cloud attributes, ranging from agility to compliance, with an arsenal of virtual infrastructure administration and automation tools.

In addition to the core vSphere ESXi hypervisor, purchasing vSphere Enterprise Plus provides licensing for an extensive toolbox of infrastructure services, application services, and management services, including vMotion, Storage vMotion, Distributed Resource Scheduler, VMware High Availability, and Fault Tolerance. Of the management tools, the VMware vCenter Agent provides connectivity to the vCenter Server.

Purchased as a separate product, VMware vCenter Server is the centralized management tool for vSphere. It allows for the management of multiple vSphere hosts and VMs from different vSphere hosts through a single console. All the modules mentioned above require vCenter Server. It is the management interface Edison used in comparing VMware's and Microsoft's management of a VMware virtualized environment.

### ***Microsoft System Center 2012***

Microsoft System Center 2012 is the latest release of the vendor's comprehensive suite for systems management. The latest enhancements are intended to appeal to organizations planning to implement private cloud installations. This loosely-integrated suite is comprised of eight component applications, each requiring its own separate management server and user interface.

The component used for managing VM environments—Virtual Machine Manager (VMM)—was used in this study to evaluate Microsoft's ability to manage VMware's hypervisor. Microsoft claims SCVMM now supports some of the more heavily used features of VMware vSphere, as well as Citrix XenServer, with the ability to combine capacity from these various virtualized platforms into a single cloud.

Microsoft System Center 2012 can be purchased as a bundled license that includes all System Center components on a per-processor basis. As implied earlier, its deployment involves installation of multiple servers and the use of multiple user interfaces. *Network World* described installing it as a "totally gruesome/forklift installation."<sup>5</sup>

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<sup>5</sup> [Review: Microsoft System Center Targets Cloud, Virtualization](#), Tom Henderson, Network World, July 16, 2012.

## Laboratory Configuration

Edison's test lab was configured with hypervisors and management solutions from VMware and Microsoft. Table 1 lists the hardware and software components of the systems installed in the lab.

**Table 1: Lab Configuration**

<b>VMware Configuration</b>	
<b>vSphere 4.1 Host Servers (2)</b>	
<b>Processor</b>	Dual 6-Core Xeon 2.533 GHz, 64-bit Processors
<b>Memory</b>	48 GB RAM
<b>Network Ports</b>	1 Gb and 10 Gb (2)
<b>Local Storage</b>	273.5 GB
<b>Storage Adapter</b>	SAS and Fibre Channel HBA
<b>Virtualization Software</b>	
vSphere 4.1 Enterprise Plus Edition	
Guest Oses for VMs (Windows Server 2008 R2 & Red Hat Enterprise Server 6.2)	
<b>Management Software</b>	
vCenter Server Standard – the vCenter Server was installed on a Windows guest VM running on one of the vSphere hosts with two processors, 4GB RAM, and Microsoft SQL Server 2008 R2 Express database (included)	
<b>Storage</b>	
Fibre Channel SAN	
500 GB VMFS-formatted volume for vSphere VM storage	
<b>Microsoft Configuration</b>	
<b>Windows Server 2008 R2 SP1 Host Servers (2)</b>	
<b>Processor</b>	Dual 6-Core Xeon 2.533 GHz, 64 bit Processors
<b>Memory</b>	48GB RAM
<b>Network Ports</b>	1Gb and 10Gb (2)
<b>Local Storage</b>	835GB for Windows 2008 R2, SCVMM 2012, SCOM, SCDPM and SCCM.
<b>Storage Adapter</b>	SAS and Fibre Channel HBA

<b>Microsoft Configuration</b>
<b>Virtualization Software</b>
Hyper-V role activated on Windows Server hosts
Guest Oses for VMs (Window Server 2008 R2 & Red Hat Enterprise Server 6.2)
<b>Management Software</b>
Microsoft System Center 2012 Virtual Machine Manager
Microsoft System Center 2012 Operations Manager
System Center 2012 Data Protection Manager
System Center 2012 Configuration Manager
<b>Storage</b>
Fibre Channel SAN
500GB volume for Hyper-V VM storage

## Test Procedures

This study focuses on regularly performed administrator scenario tasks relevant to managing a virtualized data center environment. Edison identified scenarios and associated tasks, and matched them between the platforms compared in this study. Since the vendors use either different nomenclature for the same feature or the same nomenclature for different features, this was a very important first step.

Administrators rarely perform a specific task in isolation. Often, the administrator has a goal that requires a combination of several tasks or operations. To emulate this approach, Edison defined scenarios and their associated tasks to reflect a goal-oriented approach. This also simplified comparisons where the architectural differences between the two platforms would make task-to-task comparisons difficult or even impossible. Table 2 shows the scenarios, noting the frequency with which they are typically performed.

The scenarios evaluated were developed by Edison to illustrate typical regularly performed administrative tasks performed in a virtualized environment. The tasks chosen and the frequencies listed were based upon the experience of Edison engineers in consultation with VMware. The frequencies shown are based upon years of analysis by VMware into their customers' usage and influenced the choice of scenario.

Table 2: Scenarios

Scenarios	
<b>Scenario 1: Deploy VMware vSphere on New Host</b>	Deploy vSphere on a new host to add virtual infrastructure capacity. Frequency – weekly.
<b>Scenario 2: Update VM Templates for vSphere</b>	Keep VM templates managed by System Center and also available to vSphere updated. Perform monthly patching. Frequency – monthly.
<b>Scenario 3: Create Role-Based Access Rules</b>	Create role-based access controls and permissions needed by new business units or groups of users added to the virtualized environment. Frequency – weekly.
<b>Scenario 4: Deploy Linux VM on vSphere with Guest Customization</b>	Deploy a Linux VM on vSphere with guest customization (assign static IP address, hostname, etc.) Frequency – nearly daily.
<b>Scenario 5: Gather VMware vSphere Performance Metrics for VMs and Hosts</b>	Access detailed performance and operation statistics and reports. Frequency – daily.
<b>Scenario 6: Install or Upgrade VMware Tools on vSphere VMs</b>	Install or upgrade the VMware Tools needed in VMs on vSphere hosts. Frequency – weekly.
<b>Scenario 7: Determine Storage Utilization of vSphere Thin-Provisioned Disks</b>	Obtain accurate storage information on true disk space consumed by vSphere thin-provisioned disks. Frequency – weekly
<b>Scenario 8: Introduce New VLAN in Physical Environment</b>	Make a new VLAN available to vSphere VMs. Frequency – monthly.
<b>Scenario 9: Perform Backup and Restore of VMs</b>	Backup and restore vSphere VMs. Frequency – weekly.
<b>Scenario 10: Add New ISO VM Guest OS Image</b>	Add new ISO VM guest OS image that must be available on both vSphere and Hyper-V platforms. Frequency – weekly.
<b>Scenario 11: Make vSphere Host Configuration Changes</b>	Make vSphere host configuration changes, such as storage layout changes. Frequency – weekly.

## Results Summary

The results of Edison’s testing (Table 3, below) shows the lower operational costs of a VMware vSphere environment managed using vCenter versus managing VMware using Microsoft System Center 2012’s heterogeneous hypervisor features.

Our objective findings show that, overall, managing vSphere using its own management server, vCenter, requires 36 percent less time and is 41 percent less complex than managing vSphere through Microsoft System Center 2012 and Microsoft VMM 2012.

**Table 3: Managing VMware vSphere from vCenter vs. SCVMM 2012 Summary of Results**

Scenarios	VMware		Microsoft	
	Time	Steps	Time	Steps
<b>Totals</b>				
Test Results Totals	8780	84	13790	142
VMware Advantage (Microsoft - VMware)	5010	58		
VMware Advantage % (Microsoft-VMware /ABS (Microsoft))	36%	41%		
<b>\$ savings (Average Workday Savings * Salary)</b>	\$32,552			

For most IT executives, the best way to appreciate the importance of management cost savings is by examining the findings in the context of OPEX cost savings. The following subsection explains how Edison calculated cost savings for the management time and complexity advantages shown here in the above table.

### Comparative Management Cost Savings

The Edison CMCS methodology assigns a complexity metric to tasks or scenarios, as well as measuring and comparing the time required to perform different tasks. In most real-world business environments, management costs far outweigh licensing and vendor-charged support costs throughout the life of the product. With this in mind, we estimated the annual cost a business might expect save on data center administrator time resulting from one product being easier to administer and operate than the other.



In order to compute cost savings, Edison used average fully loaded<sup>6</sup> Systems Administrator salary figures gathered from a query of salaries made at Simplyhired.com.<sup>7</sup> Edison searched for the salaries in seven metropolitan areas of various sizes and cost-of-living. Though different choices would affect the results, Edison believes the derived average salary is reasonable.

**Table 4: Average Systems Administrator Salaries**

Systems Administrator Salaries	
New York City	\$ 99,400.00
Atlanta, GA	\$ 89,600.00
Houston, TX	\$ 86,800.00
St. Louis, MO	\$ 84,000.00
Chicago, Il	\$ 93,800.00
Phoenix, AZ	\$ 81,200.00
Los Angeles, CA	\$ 85,400.00
San Francisco, CA	\$ 85,400.00
Seattle, WA	\$ 100,800.00
<b>Average</b>	<b>\$ 89,600.00</b>

The average of the results of this search (Table 4, above), when multiplied by the time savings, show cost savings for managing vSphere using its own management interface versus doing so using Microsoft System Center 2012 and Microsoft VMM 2012:

$$\text{Median Systems Administrator Salary} * (\text{Systems Administrator Time Savings}) = \\ \$89,600.00 * 36\% = \$32,552.00$$

By substituting its own costs, an organization can determine its potential savings. Edison recognizes that these savings are not going to be realized directly. Instead, they should be interpreted within the context of overall data center administrator duties and other IT budgets. Within this framework, time savings of over 36 percent can translate to reducing the need for new hires when additional data center systems are acquired, or to enabling a better allocation of resources to more strategic or mission-critical tasks.

<sup>6</sup> The fully loaded salaries calculations are based upon average salaries obtained from SimplyHired.com multiplied by a loading factor of 1.4, obtained by averaging factors found from multiple published sources. Organizations making their own comparisons should utilize their own company’s data.

<sup>7</sup> This and similar queries can be performed at <http://www.simplyhired.com/a/salary/home>

It is not practical to attach direct financial costs to complexity. However, it should be apparent that more complex management tools require more user training, can cause user error simply due to that complexity, and can otherwise affect productivity.

These objective differences do not tell the whole story. As is seen elsewhere in this white paper, in most respects performing management tasks with VMware vCenter generally provides a better user experience than doing so with Microsoft System Center 2012 and Microsoft VMM 2012. Fewer steps and a more intuitive interface reduce the odds of user error in execution.

## Results Details

The following subsections each contain a description of the tasks performed, a summary of test results for that task, a listing of the tasks performed and compared, and a subjective appraisal of the user experience.

### Scenario 1 – Deploy VMware vSphere on New Host

Deploying VMware vSphere on a new host is a frequent task with a growing VMware environment, typically performed, on average, once a week. The Summary of Results for deploying VMware vSphere on a new host in Table 5 (below) shows that performing this deployment with vSphere using vCenter requires 87 percent less time and is 60 percent less complex than performing it using Microsoft SCVMM.

In performing the adding-a-host scenario, Edison assumed that ESXi had already been installed on the server, since neither VMware vCenter nor Microsoft SCVMM can install ESXi onto a host. An ESXi installation would require the same effort regardless of management platform. What was measured was the time required for attaching a host to the management consoles. To do this in a heterogeneous hypervisor environment, where SCVMM has been integrated with an existing vCenter environment, requires the addition of the host to vCenter.

**Table 5: Deploying VMware vSphere on New Host Summary of Results**

Scenario	VMware		Microsoft	
	Time	Steps	Time	Steps
<b>Scenario 1 - Deploy VMware vSphere on new host</b>				
Test Results for Area	120	2	900	5
VMware Advantage (Microsoft - VMware)	780	3		
VMware Advantage % (Microsoft-VMware /ABS (Microsoft))	87%	60%		

## Scenario 2 – Update VM Templates Managed by System Center So They are Also Available From vSphere

VM templates provide standardized groups of hardware and software settings that can be used repeatedly to create new VMs configured with those settings. VM templates must be periodically updated (e.g., with monthly OS patching). If Microsoft System Center is the primary management tool, it would be used for managing VM templates, but those templates cannot be directly deployed to VMware vSphere, so matching VM templates would also need to be managed from VMware vCenter.

The Summary of Results for updating VM templates in Table 6 is shown below. Updating VM templates so they are available for use in both Hyper-V and vSphere, with Microsoft System Center 2012 requires 72 percent more time and is 56 percent more complex than managing templates solely for use by vSphere using vCenter

Maintaining a template requires the same essential process on both platforms:

- Deploy a template as a VM.
- Perform the updates within the VM.
- Return the VM to the template library.

In an environment managed by System Center, this set of tasks has to be performed for each platform. The additional time and complexity is the result of the need to perform the update twice.

**Table 6: Updating VM Templates Summary of Results**

Scenario	VMware		Microsoft	
	Time	Steps	Time	Steps
<b>Scenario 2 - Update VM Templates for Hyper-V and vSphere</b>				
Test Results for Area	600	8	2160	18
VMware Advantage (Microsoft - VMware)	1560	10		
VMware Advantage % (Microsoft-VMware /ABS (Microsoft))	72%	56%		

### Scenario 3 – Create Role-Based Access Rules

Enforcing security by controlling access using role-based access controls and permissions is a very common task. Edison estimates it is typically performed by systems administrators on a weekly basis.

The Summary of Results for creating role-based access rules in Table 7 (below) shows that creating role-based access rules with vSphere using vCenter requires 38 percent less time and is 57 percent less complex than by managing vSphere using Microsoft SCVMM.

Both VMware vCenter and Microsoft SCVMM enable the creation of role-based user access permissions. VMware offers much greater granularity in the security attributes available than is offered by Microsoft. Thus, configuring a user-role in vCenter requires a bit more time than would be required for creating a single platform role with SCVMM. Since roles need to be created for each platform, the overall time and complexity is much greater in the heterogeneous hypervisor environment.

**Table 7: Creating Role-Based Access Rules Summary of Results**

Scenario	VMware		Microsoft	
	Time	Steps	Time	Steps
<b>Scenario 3 - Create role-based access rules</b>				
Test Results for Area	480	3	780	7
VMware Advantage (Microsoft - VMware)	300	4		
VMware Advantage % (Microsoft-VMware /ABS (Microsoft))	38%	57%		

### Scenario 4 – Deploy Linux VM on vSphere with Guest Customization

Deploying and customizing a VM on vSphere is a fundamental task that is performed quite frequently in a typical vSphere virtualization environment. In a datacenter with a thousand VMs, the creation of multiple VMs can be a nearly daily occurrence.

The Summary of Results for deployment and customization in Table 8 (below) shows that performing deployment and guest customization of a Linux VM with vSphere using

vCenter requires 29 percent less time but is 39 percent more complex than performing it by managing vSphere through SCVMM.

The difference in complexity is due to a significant difference in capabilities. Assuming multiple instances of a customized VM are to be created, the system administrator creates a VM, converts that VM to a template, and—using the vCenter Customization Manger—performs the customizations, saves it, and then can apply the customization to a VM template for deployment of multiple VMs.

When deploying customizations using SCVMM, Edison used a template VM in the library to create a VMware VM, performing those customizations available. However, configuration of the IP address of the client was not possible within the user interface. Therefore, Edison elected to set the TCP/IP address of the client manually, using the remote desktop console to the OS user interface. This approach may not appear as easily scalable as the one taken by VMware. In almost every use case, however, once a VM is deployed an administrator must login to the OS to perform application and other functionality configurations. This makes the additional task of setting an IP address appear to be minor.

**Table 8: Linux VM Deployment and Customization Summary of Results**

Scenario	VMware		Microsoft	
	Time	Steps	Time	Steps
<b>Scenario 4 - Deploy Linux VM on vSphere with guest customization</b>				
Test Results for Area	1920	25	2720	18
VMware Advantage (Microsoft - VMware)	800	-7		
VMware Advantage % (Microsoft-VMware /ABS (Microsoft))	29%	-39%		

## Scenario 5 – Gather VMware vSphere Performance Metrics for VMs and Hosts

Performance metrics for VMs and hosts must typically be obtained on a daily basis.

The Summary of Results for gathering VMware vSphere performance metrics for VMs and hosts in Table 9 (below) shows that obtaining these metrics with vSphere using vCenter requires 13 percent less time and is 18 percent less complex than obtaining them using SCVMM.

Though accessing performance metrics does not show as great an advantage for VMware vCenter versus Microsoft SCVMM, there is a sizeable difference in the range of monitoring functionality available on the two platforms. Microsoft has greatly increased monitoring capabilities in SCVMM 2012 as compared to VMM 2008R2, but still falls short. This means that if more data is required, for troubleshooting or other analysis, administrators must resort to other tools, ranging from additional System Center plugins beyond the scope SCVMM, to native monitoring within the guests, to using vCenter to monitor the VMware environment. Edison did not compare these other approaches for this study.

**Table 9: Gathering VMware Performance Metrics for VMs and Hosts Summary of Results**

Scenario	VMware		Microsoft	
	Time	Steps	Time	Steps
<b>Scenario 5 - Gather VMware Performance Metrics for VMs and Hosts</b>				
Test Results for Area	815	9	935	11
VMware Advantage (Microsoft - VMware)	120	2		
VMware Advantage % (Microsoft-VMware /ABS (Microsoft))	13%	18%		

## Scenario 6 – Install or Upgrade VMware Tools on vSphere VMs

Although VMware releases new versions of VMware Tools approximately every three to four months, in a typical enterprise “rolling upgrade” scenario, VMware tools are typically installed or upgraded on vSphere VMs on an estimated weekly basis.

The Summary of Results for installing or upgrading VMware tools on vSphere VMs in Table 10 (below) shows vSphere using vCenter requires 20 percent less time and is 62 percent less complex than accomplishing this task using Microsoft SCVMM.

VMware tools can be installed within multiple VMs by using VMware Update Manager, accessible through vCenter. Microsoft SCVMM lacks an equivalent built-in facility. Rather than switching to vCenter in performing this operation, Edison decided to use another member of the Microsoft System Center 2012 suite—Microsoft System Center 2012 Configuration Manager (SCCM)—in order to better understand the capabilities of the Microsoft platform. We made this choice despite the fact that SCCM does not support updating Linux clients. Also, installing and configuring SCCM in a virtualized environment will add cost and complexity not considered in this analysis.

It is important to note that in our preliminary testing, the time and complexity ratings of switching from SCVMM to vCenter were similar to the results we are reporting here. Though not analyzed, performing a VMware Tools update on a Linux client from a Microsoft-centric environment would require the use of Linux updating tools, adding significant additional complexity (especially in a Windows-centric environment).

**Table 10: Installing or Upgrading VMware Tools on vSphere VMs Summary of Results**

Scenario	VMware		Microsoft	
	Time	Steps	Time	Steps
<b>Scenario 6 - Install or Upgrade VMware Tools on vSphere VMs</b>				
Test Results for Area	1200	5	1500	13
VMware Advantage (Microsoft - VMware)	300	8		
VMware Advantage % (Microsoft-VMware / ABS (Microsoft))	20%	62%		

### Scenario 7 — Determine Storage Utilization of vSphere Thin-Provisioned Disks

In a VMware environment that uses thin provisioning, it is imperative that the storage utilization of thin-provisioned disks be accurately assessed. This is typically done on a weekly basis.



The Summary of Results for determining storage utilization of vSphere thin-provisioned disks in Table 11 (below) shows that making this determination with vSphere using vCenter requires 33 percent less time and is 67 percent less complex than with SCVMM.

Microsoft SCVMM is only able to display the full allocation of a thinly provisioned storage volume, showing 100 percent utilization at all times. Therefore, to view the actual utilization, one must switch to vCenter. The extra time and steps required reflect that context switch.

**Table 11: Determining Storage Utilization of vSphere Thin Provisioned Disks Summary of Results**

Scenario	VMware		Microsoft	
	Time	Steps	Time	Steps
<b>Scenario 7 - Determine Storage Utilization of vSphere Thin Provisioned Disks</b>				
Test Results for Area	120	1	180	3
VMware Advantage (Microsoft - VMware)	60	2		
VMware Advantage % (Microsoft-VMware /ABS (Microsoft))	33%	67%		

### Scenario 8 – Introduce New VLAN in Physical Environment

VLANs are introduced to provide segmentation services that are traditionally provided by routers in LAN configurations, addressing issues such as scalability, security, and network management. In the typically volatile modern network, this scenario is generally estimated to be performed monthly.

The Summary of Results for introducing a new VLAN in a physical environment in Table 12 (below) shows that accomplishing this task managing vSphere through Microsoft System Center 2012 and Microsoft VMM 2012 requires 25 percent more time and is 13 percent more complex than with vSphere using vCenter.

In order to make the new VLAN available to VMs within the heterogeneous hypervisor environment, performing the necessary configuration steps requires changes to the external physical network (not included here), as well as to both System Center and

SCVMM logical networks and vSphere port groups (via vCenter changes to vSwitches or vSphere Distributed Switches). This means that, while changing VLAN settings are similar in complexity for both platforms, the heterogeneous hypervisor environment requires some duplication of effort not required in a pure VMware environment.

**Table 12: Introducing New VLAN in a Physical Environment Summary of Results**

Scenario	VMware		Microsoft	
	Time	Steps	Time	Steps
<b>Scenario 8 - Introduce New VLAN in Physical Environment</b>				
Test Results for Area	385	7	510	8
VMware Advantage (Microsoft - VMware)	125	1		
VMware Advantage % (Microsoft-VMware / ABS (Microsoft))	25%	13%		

### Scenario 9 – Perform Backup and Restore of VMs

VMs are essentially files, and like other files must be backed up and – as needed – restored on an estimated weekly basis.

The Summary of Results for performing backups and restores of VMs in Table 13 (below) shows that, with vSphere using vCenter, 24 percent less time is required and is 52 percent less complex, compared to performing them on vSphere using Microsoft SCVMM.

VMware VMs can be backed up directly within vCenter by making use of vSphere Data Recovery (VDR). In a Microsoft System Center 2012 environment, backup is performed using System Center 2012 Data Protection Manager (SCDPM) or a third-party backup product. Edison compared backing up of VMware VMs using vSphere Data Recovery with backing up Hyper-V VMs using SCDPM, plus backing up VMware VMs with VDR. Though we did not evaluate it, a third-party product such as Symantec Backup Exec could be used to back up both platforms.

**Table 13: Performing Backups and Restores of VMs Summary of Results**

Scenario	VMware		Microsoft	
	Time	Steps	Time	Steps
<b>Scenario 9 - Perform Backup and Restore of VMs</b>				
Test Results for Area	2075	14	2745	29
VMware Advantage (Microsoft - VMware)	670	15		
VMware Advantage % (Microsoft-VMware /ABS (Microsoft))	24%	52%		

### Scenario 10 – Add New ISO VM Guest OS Image

ISO files are CD/DVD disk images that can be used instead of requiring the insertion of physical removable disks, saving considerable time and trouble when operating systems are being installed in new VMs. Creating a shared ISO library enables all hardware servers to share the installation media. This sort of scenario task is estimated to occur, on average, weekly. This high frequency is based upon the assumption that OS patches will be streamed into the OS image for installation of new VMs.

Adding a new ISO image to vCenter is very simple and fast. Doing so with SCVMM is considerably more complex. If SCVMM is the primary management tool, adding a new ISO image that is managed from SCVMM but also available to vSphere requires a duplication of effort, taking up much more time in the heterogeneous hypervisor environment.

The Summary of Results for adding a new ISO VM guest OS image in Table 14 (below) shows that adding a new ISO VM guest OS image with vSphere using vCenter is 89 percent less complex and is accomplished in 45 percent less time than adding it by managing vSphere through Microsoft SCVMM.

**Table 14: Adding New ISO VM Guest OS Image Summary of Results**

Scenario	VMware		Microsoft	
	Time	Steps	Time	Steps
<b>Scenario 10 - Add New ISO VM Guest OS Image</b>				
Test Results for Area	480	2	880	18
VMware Advantage (Microsoft - VMware)	400	16		
VMware Advantage % (Microsoft-VMware /ABS (Microsoft))	45%	89%		

### Scenario 11 – Make vSphere Host Configuration Changes

Making changes to vSphere hosts, such as storage configuration changes, will typically be made to vSphere hosts on a weekly basis.

The Summary of Results for making vSphere host configuration changes in Table 15 (below) shows that making such changes with vSphere using vCenter requires 22 percent more time but is 33 percent less complex than doing so using Microsoft SCVMM.

This was the only scenario where the time required to perform the tasks with vCenter took longer than with SCVMM. The changes made in this scenario task could be handled in a single operation upon multiple hosts with vSphere host profiles. However, the same changes made using SCVMM need to be performed individually for each vSphere host, consuming more systems administrator time. The results shown are for a single operation. With vCenter this operation could have been performed in a single operation with the same number of steps and a similar duration over dozens or even hundreds of hosts. With SCVMM, each host would need to be updated separately.

In a real data center, since changes of this sort can have deleterious effects on the operation of a host, it is unlikely that huge blanket changes of this sort would occur in isolation. Best practices would require use of vMotion (in vSphere) or Live Migration (in Microsoft Hyper-V) to move VMs between hosts during the update process. Edison did not add the time or steps required for migration to this scenario.

**Table 15: Making vSphere Host Configuration Changes Summary of Results**

Scenario	VMware		Microsoft	
	Time	Steps	Time	Steps
<b>Scenario 11 - Make vSphere Host Configuration Changes</b>				
Test Results for Area	585	8	480	12
VMware Advantage (Microsoft - VMware)	-105	4		
VMware Advantage %(Microsoft-VMware /ABS (Microsoft))	-22%	33%		

## Conclusions and Recommendations

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General interest in heterogeneous hypervisor environments is inevitable; the advent of new technology paradigms such as cloud computing and the rapid evolution of the data center sometimes makes the use of specialized hypervisors desirable.

Edison believes, however, that as things stand today, heterogeneous hypervisor management platforms are not yet up to the task of simplifying the management of heterogeneous hypervisors. Our focus in the current study has been on comparing the management of a homogeneous, standardized VMware-based virtualized environment to management of a VMware environment using Microsoft management tools that purport to offer mixed hypervisor management capabilities. Other heterogeneous hypervisor management platforms exist in the marketplace. Edison chose to make this particular comparison because VMware is the dominant server virtualization platform, while Microsoft is a popular management platform choice for many organizations.

Edison's research shows that attempting to manage a VMware virtualized environment entirely from Microsoft System Center 2012 Virtual Machine Manager is not realistically possible. There are too many limitations in SCVMM for this to work. The 36 percent time and 41 percent complexity penalties shown in this study are based upon a lab rather than a real-world environment. Nonetheless, Edison believes the results are a realistic representation of the challenges that organizations will face they attempt this scenario in a true production environment.

Edison's findings show that, while Microsoft claims to offer heterogeneous management of multi-hypervisor environments that include VMware, in practice this more represents Microsoft's attempt to gain market share than any technology advances that result in management cost savings. As this study demonstrates, quite the reverse is true.

Management of heterogeneous hypervisors is a rapidly evolving field. VMware has recently purchased a company whose software will probably be used to enable management of other hypervisors within vCenter. But, it seems likely that the single-pane-of-glass view of mixed hypervisor management will not deliver true gains through ease of management for some time to come.

## Appendix

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### The Methodology Defined

Edison Comparative Manageability Cost Studies methodology is a product manageability cost evaluation process. The products in question are compared against a set of task-oriented objective and subjective metrics to derive an accurate set of analytical results. The outcome of this study determines the Comparative Management Cost (CMC) incurred by managing and operating the products in a production environment. The methodology employed to conduct this comparison consists of the following elements.

### The Study

The study is the baseline checklist of standard administration tasks routinely performed, quantitatively and qualitatively compared in order to determine, on a task-by-task basis, which product is superior. This is measured primarily in terms of ease of administration and secondarily (for certain tasks only) in terms of system speed of execution—the wall clock time it takes for the system in question to complete a job once it has been submitted by an administrator. This study applies a set of quantitative metrics, developed by Edison Group, to a list of essentially qualitative tasks, to reveal the real difference in management costs for the two products in question, using a meaningful set of CMCS statistics.

#### *Tasks*

Edison defines a task as a complete logical activity, composed of one or more steps, all of which effect a significant alteration on the state of the device or software program that accomplishes a specific work goal. Each task is measured for time and complexity. Time and complexity, as used in the study, are defined as follows:

#### *Time*

Defined as the amount of time it takes to perform a given task. For certain (asynchronous) tasks, when a job can be run in the background so that the administrator can use the time for accomplishing other tasks, time is measured strictly in terms of the time it takes the administrator to perform the steps to configure, initiate, and submit a given task. For other (synchronous) tasks in the study that demand the administrator's full attention and prevent the accomplishment of other tasks (as in performing a hot

recovery operation on a live database), time is measured to include both the time it takes for an administrator to configure/execute the task in question as well as the time it takes the system to complete the task. All time metrics are measured in wall-clock time.

### *Complexity*

Complexity is measured using a proprietary metric devised by Edison Group: the number of system-affecting steps it takes to complete a given task, where a step is defined as a task component that effects a change of state to the system under test.

Because not all steps have the same inherent complexity, each step is further broken down into increments to account for the difference. An increment is a decision point that the user must make to complete a step. Increments are defined as the parts of a step that will have a measurable effect on the state or execution path of that step, but which does not itself change underlying system state until the step is complete. For example, selecting Basic vs. Advanced Install with the installation wizard is an increment and not a step.

- Complexity is then measured in terms of number of steps, but taking into account the following factors:
- The number of increments it takes to complete each step.
- Whether or not instrumentation for a given step is GUI-based or requires the use of a command line/scripting interface.
- Whether or not the task requires a context switch between multiple interfaces in order to be completed. If a context switch exists, then additional steps will be added to the total step count for a given task.

The above factors affect the complexity calculation as follows:

The primary measure is steps. If a step has many increments, it is considered several steps. The metric allows each step five increments, and thereafter we add steps for each additional five increments, rounded up. So if a step has between 0–5 increments, it remains unchanged; if it has between 6–10 increments, it is increased by one; between 11–15 increments, it is increased by two; and so on. We decided to do this because, while increments are secondary to steps in determining complexity, they do modify the relative complexity of a given step in the course of completing a task. In other words, steps with a low number of increments are simple, and steps with a high number of increments are complex.

The other modifiers (instrumentation and context switching) may occur very infrequently in the products under review. Still they are a significant enough factor that



we needed to account for them in some meaningful way to generate a measure of complexity that accurately reflects our experience of using the products.

Regarding instrumentation, if an operation could be executed entirely within a GUI interface, then the complexity/step value for that task would remain unmodified. If, on the other hand, a step required the use of a command line interface, this would increase the step count. For a simple single-line command operation, the step count was increased by one, whereas if the operation required the user to write a script, the step value was increased by two or more, depending on how much work was required to write the script in question.

Lastly, we come to the matter of context switching. If a context switch was encountered during the course of completing a given task, then two or more steps were added to the step count for that task. The possible addition of more than two steps was allowed for as a judgment call on the part of the subject matter expert performing the task under consideration. The reasoning is that we regard understanding the dependencies of relating and performing a single operation in two different environments as inherently more complex than performing a similarly complex task in a well-integrated environment, where all the operations can be accomplished in one place.

The following is the complexity formula utilized throughout these studies.

### Complexity Calculation Formula

Complexity is defined as the number of computed steps it takes to complete a given task. The formula Edison typically uses to compute complexity for each of the tasks in this study is as follows:

For every five increments contained in a step, we increase the step value by one. For example:

If a step has 0–5 increments, step value = step + 0,

If a step has 6–10 increments, step value = step + 1

If a steps has 11–15 increments, step value = step + 2

... and so on.

The type of instrumentation offered to perform a given task modifies the task's complexity.

If a task can be performed completely with a GUI, then step count = step count + 0.

If a task requires the use of a command line interface, then step count is modified as follows:

If the command line operation consists of a single-line command, then step count = step count + 1.

If the command line operation requires writing a script, then step count = step count + 2 or more steps, depending on a subjective assessment of the complexity of the script.

If a task requires a context switch between different environments, then step count = step count + 2 or more steps, depending on a subjective assessment of the complexity of the context switch.