

# VMware vSphere<sup>®</sup> 5.0 Evaluation Guide

Volume Two - Advanced Storage Features

TECHNICAL WHITE PAPER



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# **About This Guide**

The purpose of the VMware vSphere 5.0 Evaluation Guide, Volume Two – Advanced Storage Features is to support a self-guided, hands-on evaluation of VMware vSphere® 5.0 ("vSphere") advanced storage features such as vSphere Storage I/O Control (SIOC) and vSphere Storage DRS.

This guide covers evaluation cases that are suitable for IT professionals who have an existing VMware virtualization environment and want to evaluate features in vSphere that enable greater storage automation and consolidation while maintaining service levels.

# System Requirements

To ensure the best experience when using this guide, the user must configure hardware and software as detailed in the following section.

# **Hardware Requirements**

This guide makes the following assumptions about your existing physical infrastructure:

## Servers

You must have at least three dedicated servers capable of running VMware ESXi<sup>™</sup> 5.0 to provide resources for this evaluation.<sup>1</sup>

## Storage

You have shared storage with enough space available to allow creating three 100GB dedicated datastores. Shared storage can be SAN or NAS. This document assumes SAN-based storage.

## Networking

You will need at least three virtual networks configured to separate virtual machine, VMware vSphere® vMotion® and vSphere management. These networks can be set up on a single virtual switch with multiple port groups or across multiple virtual switches. For the purposes of this evaluation guide, the configuration includes a single vSphere standard switch with three port groups.

For more detailed requirements, see the following table.

HARDWARE	MINIMUM	WHAT'S USED IN THIS GUIDE
ESXi	Three ESXi hosts CPU – Two processors of 2GHz Memory – 6GB Network – 2x 1Gb network adaptor	Three ESXi hosts (Cisco CS 1.3.1) CPU – Two quad-core Intel Xeon "Nehalem" processors of 2.6GHz Memory – 48GB Network – 4x 10GB network adaptor
Storage	Two datastores (100GB each)	Three datastores (Fibre Channel – 100GB each)
Network	One VLAN for carrying virtual machine traffic; one VLAN for carrying management traffic	Separate VLANs for ESXi management, vMotion, and virtual machine traffic

<sup>1.</sup> These servers must be on the VMware vSphere 5.0 Hardware Compatibility List (HCL).

# Software and Licensing Requirements

This guide makes the following assumptions about your existing software infrastructure:

#### VMware vSphere

This volume of the *VMware vSphere 5.0 Evaluation Guide* requires vSphere 5.0 and licensing for vSphere Enterprise Plus. The vSphere 5.0 evaluation license available from the VMware evaluation portal provides Enterprise Plus functionality for 60 days and is the best choice for performing the vSphere 5.0 evaluations.

#### Guest operating systems

This volume of the *VMware vSphere 5.0 Evaluation Guide* will require five or six virtual machines running Windows 2003 or Windows 2008.

# **Evaluation Guide Environment Setup**

The VMware Technical Marketing lab was built using a combination of Cisco UCS server hardware and EMC CLARiiON CX-4 Fibre Channel (FC) storage. The environment consisted of eight identical four-node "pods," with most pods configured as a three-node ESXi cluster and a fourth node for management. In many cases, additional resources have been configured in the Technical Marketing test-bed configuration to support other evaluation projects and are present in the diagrams. The user can configure only what is called for in the following and can safely ignore additional resources in screenshots and topology diagrams. The following picture shows the Technical Marketing test rack.



# **Server Configuration**

The VMware vSphere Evaluation Guide is based on three modern "server class" systems with adequate processor and memory to host six to eight minimally configured virtual machines used for testing. The servers used for this evaluation do not need to be extremely powerful, just reliable and on the vSphere 5.0 HCL.

Each server must have at least 2x 1GB or 2x 10GB network adaptor and proper connection to shared storage. The following diagram summarizes the evaluation guide test-bed configuration.



## Logical Network Setup

*VMware vSphere 5.0 Evaluation Guide, Volume Two*, uses a simple network configuration consisting of three logical networks. The first is for vSphere management traffic, including vSphere High Availability. The second is for vMotion and the third is for virtual machine traffic. Each logical network is configured as a port group on a standard switch, with a corresponding VLAN configured to provide physical isolation of the network traffic.



On the vSphere side, the network configuration looks like the following:



# Storage Setup

*VMware vSphere 5.0 Evaluation Guide, Volume Two,* uses a storage configuration consisting of three 100GB FC LUNs presented to each host, enabling creation of three datastores.

tm-pod01-esx01.tmsb.local VMware ESXi, 5.0.0, 413596							
Hardware	View: Datastores Devices	Tasks & Eveni	s (Marins (Perinissions (Maps ) Scorai	je views 🔪 Hari	uware status		
Processors -	Datastores			Refresh	Delete	Add Storage	Rescan All
Memory	Identification	Status	Device	Drive Ty	Capacity	Free Type	Last Upd
<ul> <li>Storage</li> </ul>	7						
Networking	TM-POD01-ESX01-Local	🔿 Normal	FUJITSU Serial Attached SCSI Disk (naa	Non-SSD	132.00 GB	131.04 GB VMF55	6/14/201
Storage Adapters	tm-pod01-sas300-sp	Normal	DGC Fibre Channel Disk (naa.60060160	Non-SSD	99.75 GB	26.69 GB VMFS5	6/14/201
Network Adapters	im-pod01-sas600-sp-01	Normal	DGC Fibre Channel Disk (naa.60060160	Non-SSD	99.75 GB	45.63 GB VMFS5	6/14/201
Advanced Settings	🗑 tm-pod01-sas600-sp-02	📀 Normal	DGC Fibre Channel Disk (naa.60060160	Non-SSD	99.75 GB	58.65 GB VMF55	6/14/201
Power Management							
Software							
Licensed Features							
Time Configuration	•						Þ
DNS and Routing	,,			_			
Authentication Services	Datastore Details						Properties
Power Management							
Virtual Machine Startup/Shutdown							
Virtual Machine Swapfile Location							
Security Profile							
Host Cache Configuration							
System Resource Allocation							
Agent VM Settings							
Advanced Settings							

# **Virtual Machine Setup**

*VMware vSphere 5.0 Evaluation Guide, Volume Two,* uses a total of seven virtual machines for testing. This volume will require Windows 2003 or Windows 2008 guest operating systems. It is up to the user to configure virtual machines that can be brought up to a running state for testing. The following diagram shows VM\_01 through VM\_07 configured in the Technical Marketing test lab:



# VMware vSphere 5.0 Evaluation Guide, Volume Two – Worksheet

You can use the following worksheet to organize your evaluation process.

HARDWARE CHECKLIST:	
All hardware has been validated against the <i>VMware Hardware Compatibility List</i> (HCL).	
Each host has 2x 1GB or 2x 10GB network cards connected to a common switch (will be configured as a network adaptor team).	
Each host has required HBA/network adaptor to access shared storage.	

SOFTWARE CHECKLIST:	
VMware vSphere/VMware ESXi installation media is available.	
VMware vCenter™ Server appliance is downloaded.	
VMware vSphere® Client™ is installed.	
ESXi host 1 host name.	
ESXi host 2 host name.	
ESXi host 3 host name.	
Subnet, netmask and default gateway for management network.	
Subnet, netmask and default gateway for virtual machine network.	
Subnet, netmask and default gateway for vMotion network.	

STORAGE CHECKLIST:	
All servers can see at least three common 100GB LUNs (or NFS exports).	
Datastore 1 name.	
Datastore 2 name.	
Datastore 3 name.	

# Help and Support During the Evaluation

This guide provides an overview of the steps required to ensure a successful evaluation of VMware vSphere. It is not meant to substitute product documentation. Refer to online vSphere product documentation for more detailed information (see the following links). You can also consult the online VMware knowledge base if you have any additional questions. If you require further assistance, contact a VMware sales representative or channel partner.

VMware vSphere and vCenter resources:

- Product documentation: http://www.vmware.com/support/pubs/
- Online support: http://www.vmware.com/support/
- Support offerings: http://www.vmware.com/support/services
- Education services: http://mylearn1.vmware.com/mgrreg/index.cfm
- Support knowledge base: http://kb.vmware.com
- VMware vSphere® PowerCLI Toolkit Community: http://communities.vmware.com/community/developer/windows\_toolkit (or type Get-VIToolkitCommunity within PowerCLI)
- PowerCLI Blogs: http://blogs.vmware.com/vipowershell

## **VMware Contact Information**

For additional information or to purchase VMware vSphere, the VMware global network of solutions providers is ready to assist. If you would like to contact VMware directly, you can reach a sales representative at 1-877-4VMWARE (650-475-5000 outside North America) or email sales@vmware.com. When emailing, include the state, country and company name from which you are inquiring. You can also visit http://www.vmware.com/vmwarestore/.

#### **Providing Feedback**

We appreciate your feedback on the material included in this guide. In particular, we would be grateful for any guidance on the following topics:

- How useful was the information in this guide?
- What other specific topics would you like to see covered?
- Overall, how would you rate this guide?

Send your feedback to the following address: tmdocfeedback@vmware.com, with "VMware vSphere 5.0 Evaluation Guide" in the subject line. Thank you for your help in making this guide a valuable resource.

# vSphere Advanced Storage Features

# Enabling Storage I/O Control

vSphere Storage I/O Control (SIOC) was initially introduced in vSphere 4.1 to provide I/O prioritization of virtual machines running on a cluster of VMware ESX® servers that had access to a shared, iSCSI or FC, storage pool. It extended the familiar constructs of shares and limits, which existed for CPU and memory, to address storage utilization through a dynamic allocation of I/O queue slots across a cluster of ESX servers.

#### Enabling Storage I/O Control to Avoid Denial of Service on Shared Storage

This next section will display how easy it is to enable SIOC:

#### Step 1:

1. Go to the Datastores and Datastore Clusters view.



2. Select a datastore.

🛃 tm-pod01-vc01 - vSphere Client		
File Edit View Inventory Administra	ation Plug-ins Help	
🖸 🖸 🏠 Home 🕨 🛃 Inv	entory 🕨 😝 Datastores and Datastore Clusters	
tm-pod01-vc01     DemoDatacenter-01     TM-Gobal-Interchange01	tm-pod01-sas300-sp Summary Virtual Machines Hosts Performance Configu	ration Tasks & Events Alarms Permissions Storage Views
TM-POD01-ESX01-Local TM-POD01-ESX02-Local	General	Capacity
TM-POD01-E5X03-Local tm-pod01-sas300-sp tm-pod01-sas600-sp-01 tm-pod01-sas600-sp-02	Location: ds:///vmfs/volumes/4de87ff2-e1c750 Type: VMF5 Number of Hosts Connected: 3 Virtual Machines and Templates: 2	Refresh           Capacity:         99.75 GB           Provisioned Space:         73.06 GB           Free Space:         26.69 GB           Last updated on:         6/3/2011 2:57:38 PM
	Commands	Storage Capabilities
	Refresh     Enter SDRS Maintenance Mode     Browse Datastore     So Assign User-Defined Storage Capability	System Storage Capability: N/A User-defined Storage Capability: N/A

3. Click the **Configuration** tab and click **Properties**.

🛃 tm-pod01-vc01 - vSphere Client		_ 8
File Edit View Inventory Administ	ration Plug-ins Help	
🖸 🔯 🔥 Home 🕽 🔊 In	wentory 🕨 😭 Datastores and Datastore Clusters 🛛 👩 🗸 Search Inventory	C
tm-pod01-vc01     DemoDatacenter-01	tm-pod01-1as600-19-01	
TM-Gobal-Interchange0	Sunnary Wrtuel Machines Hoots Performance. Configuration Tasks 8 Events Alarma Permissions, Storage Views	
TM-POD01-E5X01-Local	The following hosts are connected to this datastore (select a host from the list to view the details):	
TM-POD01-ESX03-Local	Name Datastore State Status % CPU % Memory Last Time Exited Standby Alarm Actions AutoDeploy, Machinel dentity	
tm-pod01-sas500-sp tm-pod01-sas600-sp-01	tm-podD1-exc22 Mounted Connected Nor 0 11 Never Enabled	
tm-pod01-sas600-sp-02	b throad 1-solut. A monted Connected or Nor 0 0 0 New Ended	
	Datastore Details	Properties
	tm-pod01-sas600-sp-01 99,75 @ Casady	-
	Location: //mfs/values/488401-73284/78-2e69-0025550002bd 40.05.09 Ellevel	
	Andrew Constraint Supported 1997 00 1997	
	System Scoop Capability NA	
	User-defined Storage Capability: N/A	
	Path Selection	
	Fixed (Mware) Properties Extents Extents Storage //0 Control Volume Label: tim-podUl-s DVC/Fire Channel Disk (ns 100.00 G8 Disabled	
	Datastore Name: tm-pod01-s Total Formatted Capacity 99,75 GB	
	Paths Total: 4 Formatting	
	Broken: 0 File System: WHS 5.54 Broken: 0 High State: 1 MR	
	Disables: 0	
	Pie System: VMES 5.54 Broken: 0 Block Star: 1 MB	

4. Click **Enabled** in the **Storage I/O Control** section.

🛿 tm-pod01-sas600-sp-01 Properties		×
Volume Properties	Format	
Datastore Name: tm-pod01-sas600-sp-01 Rename	File System: VMFS 5.54	
	Maximum File Size; 2.00 TB	
Total Capacity: 99,75 GB	Block Size: 1 MB	
Storage I/O Control		l
Enabled Advanced		
Extents	Extent Device	
A VMFS file system can span multiple hard disk partitions, or extents, to create a single logical volume.	The extent selected on the left resides on t disk described below.	he LUN or physical
Extent Capacity	Device	Capacity
DGC Fibre Channel Disk (naa.60060160916 100.00 GB	DGC Fibre Channel Disk (naa.60	100.00 GB
	Dia an Datilia	Constant Inc.
	1 UMES	
	1. WHES	100.00 GB
	Refresh	Manage Paths
		ilose Help

une riopercies			
eneral		Format	
atastore Name: tm-pod01-sas300-sp	Rename	File System: VMFS 5.54	
ital Capacity: 99.75 GB	Increase	Maximum File Size: 2.00 TB	
		Block Size: 1 MB	
orage I/O Control			
Enabled	Advanced		
ents		Extent Device	
MFS file system can span multiple hard disk pa ents, to create a single logical volume.	rtitions, or	The extent selected on the left resides or disk described below.	the LUN or physical
tent	Capacity	Device	Capacity
iC Fibre Channel Disk (naa.60060160916	100.00 GB	DGC Fibre Channel Disk (naa.60	100.00 GB
		Primary Partitions	Capacity
		1. VMFS	100.00 GB

5. The latency threshold can be configured separately when you click **Advanced.** We will leave it set to the default.

## Performing a VMware vSphere® VMFS Live Upgrade

#### Create a VMFS-3 Datastore

This first step is necessary only if you do not already have a VMFS-3 datastore. If you already have a VMFS-3 datastore, proceed to step 2. If you do not have a VMFS-3 datastore, first select an ESXi host from the vCenter inventory, click the **Configuration** tab, and in the **Hardware** window, choose **Storage**. This will display the current list of datastores. Click on the link **Add Storage**...:

View:	Datastores	Devices			Г	
Datast	ores		Refresh	Delete	Add Storage	Rescan All

🚱 Add Storage	
Select Storage Type Specify if you want to for	mat a new volume or use a shared folder over the network.
Disk/LUN     Select Disk/LUN     File System Version     Current Disk Layout     Properties     Formatting     Ready to Complete	Storage Type  Cosk/LUN Create a datastore on a Fibre Channel, ISCSI, or local SCSI disk, or mount an existing VMFS volume.  CNetwork File System Choose this option if you want to create a Network File System.  Adding a datastore on Fibre Channel or ISCSI will add this datastore to all hosts that have access to the storage media.
Help	< Back Next > Cancel

This will launch the Add Storage wizard. From the first screen, select Disk/LUN:

Choose a spare LUN for the VMFS-3 datastore. In this example, a spare 100GB LUN is selected.

🕜 Add Storage					
Select Disk/LUN Select a LUN to create a da	tastore or expand the current one				
Disk/LUN     Select Disk/LUN	Name, Identifier, Path ID, LUN, Capaci	ty, Expandable or VM	FS Label c		Clear
File System Version	Name	Path ID	LUN A	Drive Type	Capacity
Current Disk Layout	DGC Fibre Channel Disk (naa.60060	vmhba1:C0:T0:L13	13	Non-SSD	100.00 GB
Formatting					
Ready to Complete					
		п		_	•
Help			Back	Next >	Cancel

🕜 Add Storage		
File System Version Specify the version of the V	MFS for the datastore	
DiskLUN Select DiskAUN File System Version Current Disk Layout Properties Formatting Ready to Complete	File System Version            • VMFS-5         Select this option to enable additional capabilities, such as 2TB+ support.         VMFS-5 is not supported by hosts with an ESX version older than 5.0.             • VMFS-5          Select this option if the datastore will be accessed by legacy hosts.	
Help	< Back Next >	Cancel

Select the filesystem version. For the purposes of this exercise, you should choose VMFS-3.

This displays the disk layout. The partition format used for VMFS in vSphere 5.0 has changed from master boot record (MBR) to GUID partition table (GPT).

🕜 Add Storage							
Current Disk Layout You can partition and format	the entire device, all free space, or a sin	gle block of free	space.				
E DiskAUN	Review the current disk layout:						
Electrosectory EleSystem Version Current Disk Layout Properties Formatting Ready to Complete	Device DGC Fibre Channel Disk (naa.6 Location /vmfs/devices/disks/naa.6006010 Partition Format GPT	Drive Type Non-SSD 5091612800f8a8f	Capacity 100.00 GB f0144654e011	Available 100.00 GB	LUN 13		
	The hard disk is blank.						
	, There is only one layout configuration available. Use the Next button to proceed with the other wizard pages.						
	A partition will be created an	d used					
Help			< Badk	Next >	Cancel		

Give the datastore a name.

🕜 Add Storage		
Properties Specify the properties for the	he datatore	
DiskAUN     Select DiskAUN     Ele System Version     Qurrent Disk Lavout     Properties     Formatting     Ready to Complete	Enter a datastore name [tm-pod01-sas600-sp-02	
Help	< Back Next >	Cancel

Select a block size. This impacts the largest file size in VMFS-3. You can also choose to use only part of the disk for VMFS-3. In this example, we will leave the block size at 1MB, giving us a maximum file size of 256GB. We will also use all available space on the disk for this datastore.

🕜 Add Storage										
Disk/LUN - Formatting Specify the maximum file size and capacity of the datastore										
DiskAUN Select DiskAUN He System Version Current Disk Layout Properties Formatting Ready to Complete	Maximum file size         Large files require large block size. The minimum disk space used by any file is equal to the file system block size.         [256 GB , Block size: 1 MB         Capacity         (* Maximum available space         (* Custom space setting         [100.00 =]       GB of 100.00 GB available space									
Help	< Back Next > Cancel									

Ready to Complete         PoixALLN       Disk layout:         Complete         Device       Drive Type       Capacity         DGC Fibre Channel Disk (naa.6006 Non-SSD       100.00 GB       13         Location       /vmfs/devices/disks/naa.6006015091612800f8a8f0144654e011       13         Pariation Format       MBR       Primary Partitions       Capacity         VMFS (DGC Fibre Channel Disk (naa       100.00 GB       13         File system:         Properties       Datastore name:       tm-pod01-sas600-sp-02         Formatting         File system:       vmfs-3         Block size:       1 MB         Maximum file size:       256.00 GB	🔗 Add Storage		
DiskALUN       Disk layout:         Device       Drive Type       Capacity       LUN         DGC Fibre Channel Disk (naa.6006       Non-SSD       100.00 GB       13         Location       /vmfs/devices/disks/naa.6006016091612800f8a8f0144654e011       13         Partition Format       MBR         Primary Partitions       Capacity         VMFS (DGC Fibre Channel Disk (naa       100.00 GB         File system:       Properties         Datastore name:       tm-pod01-sas600-sp-02         Formatting       File system:         File system:       vmfs-3         Block size:       1 MB         Maximum file size:       256.00 GB	Ready to Complete Review the disk layout a	nd click Finish to add storage	
Formatting File system: vmfs-3 Block size: 1 MB Maximum file size: 256.00 GB	DiskAUN     Ready to Complete	Disk layout:         Device       Drive Type       Capadty         DGC Fibre Channel Disk (naa.6006       Non-SSD       100.00 GB         Location       /vmfs/devices/disks/naa.6006016091612800f8a8f0144654e011         Partition Format       MBR         Primary Partitions       Capadty         VMFS (DGC Fibre Channel Disk (naa       100.00 GB         File system:       Properties         Datastore name:       tm-pod01-sas600-sp-02	LUN 13
	une 1	Formatting File system: vmfs-3 Block size: 1 MB Maximum file size: 256.00 GB	

Click **Finish** to initiate the creation of the VMFS-3 datastore.

When the datastore is created, select it from the **Storage** view. In the **Datastore Details**, notice that it is VMFS-3. There is also an option in the **Datastore Details** to perform an **Upgrade to VMFS-5**. We will return to this in a while.

View: Datastores Dev	ices						
Datastores			Refresh	Delete A	dd Storage	Rescan	AI
Identification	<ul> <li>Status</li> </ul>	Device	Drive Type	Capacity	Free	Туре	La
TM-Gobal-Intercha	nge 🥑 Normal	DGC Fibre C	hannel Non-SSD	749.75 GB	536.69 GB	VMFS3	6/3
TM-POD01-ESX01-L	ocal 🦁 Normal	FUJITSU Se	rial At Non-SSD	132.00 GB	131.04 GB	VMFS5	6/3
tm-pod01-sas300-s	o 🥑 Normal	DGC Fibre C	hannel Non-SSD	99.75 GB	26.69 GB	VMFS5	6/3
tm-pod01-sas600-s	p-01 🥏 Normal	DGC Fibre C	hannel Non-SSD	99.75 GB	53.63 GB	VMFS5	6/3
👔 tm-pod01-sas600-s	p-02 🦁 Normal	DGC Fibre C	hannel Non-SSD	99.75 GB	99.19 GB	VMF53	6/3
•	III						•
Datastore Details				Upgrade to V	MFS-5	Propert	ties
tm-pod01-sas600-sp-	02		99.75 GB	Capacity			
Hardware Acceleration: Refresh Storage Capabili System Storage Capabili User-defined Storage Ca	Supported ties ty: N/A pability: N/A		574.00 MB 99.19 GB	Used Free			
Path Selection Fixed (VMware)	Properties Volume Label:	tm-pod01-s	Extents DGC Fibre Channel Dis	k (na 100.0	0 GB	Storage I, Disabled	/0 Coi
Paths	Datastore Name:	tm-pod01-s	Total Formatted Capaci	ty 99.75	5 GB		
Total: 4 Broken: 0 Disabled: 0	Formatting File System: Block Size:	VMFS 3.54 1 MB					
					_		

This completes step 1 of the VMFS Live Upgrade evaluation.

#### Move Virtual Machines to the VMFS-3 Datastore

If you have virtual machines on other datastores, and your environment contains a license for vSphere Storage vMotion, you can hot-migrate a number of virtual machines to this VMFS-3 datastore. If you do not have running virtual machines, create a new one, or deploy one from a template, to the VMFS-3 filesystem. At the end of this step, you should have at least one virtual machine running on this datastore.

To verify that the virtual machines are running on your VMFS-3 datastore, navigate to **Datastore** and **Datastore Clusters,** choose your VMFS-3 datastore and then select the **Virtual Machines** tab. In this example, there are two virtual machines running on the VMFS-3 datastore.

💋 tm-pod01-vc01 - vSphere Client								
File Edit View Inventory Administration Plug-ins Help								
🖸 🔯 🔥 Home 🕨 💦 Inventor	y 👂 📔 Datastores and Datas	store Clusters			Search Inventory	Q		
tm-pod01-vc01  multiple DemoDatacenter-01  multiple TM-Gobal-Interchange01	tm-pod01-sas600-sp-02 Summary Virtual Machines	Hosts Performance Co	onfiguration Tasks & E	Events Alarms Permissions St	orage Views			
TM-POD01-ESX01-Local TM-POD01-ESX02-Local	TM-POD01-ESX01-Local Name, State, Host or Guest TM-POD01-ESX02-Local Name, State, Host or Guest					Clear		
TM-POD01-ESX03-Local	Name	State	Status	Host	Provisioned Space Used Space	Host CPU -		
tm-pod01-sas300-sp	VM_05	Powered On	Normal	tm-pod01-esx03.tmsblocal	17.05 GB of 17 0.00 B of 3.03	0		
tm-pod01-sas600-sp-01 tm-pod01-sas600-sp-02	M_06	Powered On	Normal	tm-pod01-esx03.tmsbJocal	17.05 GB of 17 0.00 B of 3.03	0		

We have running virtual machines to demonstrate that the VMFS can be upgraded without impacting the running virtual machines using that datastore.

This completes step 2 of the VMFS Live Upgrade evaluation.

#### Initiate the Live Upgrade from VMFS-3 to VMFS-5

Return to the Storage view that we saw previously, where there was a link to Upgrade to VMFS-5.

View:	Datastores D	evices							
Datas	stores				Refres	ih Delete	Add Storage	Rescan	Al
Iden	tification	~	Status	Device	Drive Type	Capa	city Free	Туре	La
8	TM-Gobal-Interd	hange	Normal	DGC Fibre C	hannel Non-SSD	749.75	GB 536.69 GB	VMFS3	6/3
	TM-POD01-ESX01	-Local	Normal	FUJITSU Se	rial At Non-SSD	132.00	GB 131.04 GB	VMFS5	6/3
8	tm-pod01-sas300	⊢sp	Normal	DGC Fibre C	hannel Non-SSD	99.75	GB 26.69 GB	VMFS5	6/3
0	tm-pod01-sas60	0-sp-01	Normal	DGC Fibre C	hannel Non-SSD	99.75	GB 53.63 GB	VMFS5	6/3
	tm-pod01-sas60	0-sp-02	Normal	DGC Fibre C	hannel Non-SSD	99.75	GB 99.19 GB	VMF53	6/3
•			111						÷
Datas	store Details					Upgrade	to VMFS-5	Propert	ties
tm-p	od01-sas600-sp	-02		FLL - 0000 000Fl	99.75 G	B Capacity			
Ref Sys Use	oware Acceleration resh Storage Capa tem Storage Capab r-defined Storage (	:: Sup) bilites bility: Capability:	N/A N/A		99.19 G	B Free			
Path Fixe	Selection d (VMware)	Prope Volum Datas	rties ne Label: store Name:	tm-pod01-s tm-pod01-s	Extents DGC Fibre Channel D	isk (na 1	00.00 GB	Storage I, Disabled	/0 Coi
Path: Tota Brok Disa	s al: 4 xen: 0 bled: 0	Forma File S Block	<b>atting</b> ystem: Size:	VMFS 3.54 1 MB					
1									,

Click the **Upgrade to VMFS-5** link. The first thing that vCenter does is verify that all hosts accessing the datastore are running ESXi 5.0. If any hosts accessing this datastore are not running ESXi 5.0, the upgrade is not allowed. In this example, all hosts are ESXi 5.0:

Upgrade to	VMFS-5	×
	All hosts accessing this datastore must support VMFS-5 (version 5.0 or newer).	
-	All hosts accessing this datastore support VMFS-5.	
	Click OK to start the upgrade	
	OK Cance	

Click **OK** to proceed with the upgrade. You should see an **Upgrade VMFS** task commence in the task bar. After a moment, the task completes and your VMFS-3 filesystem is now a VMFS-5 filesystem:

View:	Datastores	Devices									
Datas	Datastores Refresh Delete Add Storage Rescan All										
Ident	ification	~	Status	Device	Driv	е Туре	Capacity	Free	T)		
8	TM-Gobal-Int	terchange	Norma	DGC Fibre	Channel Non-	-SSD	749.75 GB	536.69 GB	VI		
	TM-POD01-ES	X01-Local	Norma	FUJITSU Se	rial At Non	-550	132.00 GB	131.04 GB	VI		
8	tm-pod01-sa	s300-sp	Norma	DGC Fibre (	Channel Non-	SSD	99.75 GB	26.69 GB	VI		
0	tm-pod01-sa	s600-sp-01	Norma	DGC Fibre (	Channel., Non	-SSD	99.75 GB	59.70 GB	VI		
	tm-pod01-sa	s600-sp-02	📀 Norma	DGC Fibre (	Channel Non	-SSD	99.75 GB	93.11 GB	VI		
					_						
( * L			m		1				,		
Datas	tore Details							Properties	s		
tm-p Loca Hard Refr Syst User	od01-sas60 ation: /vmfs dware Accelera esh Storage C tem Storage C r-defined Stora	0-sp-02 s/volumes/4 ation: Sup apabilities apability: age Capability	de8d49f-1c5 pported N/A y: N/A	85bbe-8329-0025	b500020d	99.75 GB 6.64 GB 93.11 GB	Capacity Used Free	6			
Path Fixed	Selection d (VMware)	Prop Volu Data	erties me Label: astore Name:	tm-pod01-s tm-pod01-s	Extents DGC Fibre	Channel Dis	ik (na 100.00	GB GB	Stor Disa		
Paths Tota Brok Disat	4 l: 4 en: 0 bled: 0	Form File 3 Blod	atting System: k Size:	VMFS 5.54 1 MB			, 2300				

While this upgrade of VMFS-3 to VMFS-5 was taking place, the virtual machines continued to run on the datastore. There was no need to move them to other datastores during the upgrade, which is something that was necessary in previous upgrades on VMFS.

This concludes the **VMFS Live Upgrade** evaluation.

# Testing vSphere Storage DRS

#### Introduction

Virtual machine provisioning has always imposed operational challenges. Monitoring datastore capacity and I/O load has proven to be very difficult and as a result is often neglected. This can lead to hot spots and over- or under-utilized datastores over time. vSphere Storage DRS is a new feature introduced in vSphere 5.0 that helps prevent these problems. It provides smart virtual machine placement and load balancing mechanisms based on I/O and space capacity. Storage DRS will help decrease operational effort associated with the provisioning of virtual machines and the monitoring of the storage environment.

#### Creating a Datastore Cluster

1. From the vCenter Home view, select Datastores and Datastore Clusters.



2. Select your Datacenter object. Right-click it and select New Datastore Cluster.



Prew Datastore Cluster General How do you want this Datastore	Cluster configured?
General SDRS Automation SDRS Runtime Rules Select Hotas and Clusters Select Totastores Ready to Complete	Datastore Cluster Name         Datastore Cluster Features         ✓         ✓         ✓         Turn on Storage DRS         vSphere Storage DRS enables vCenter Server to manage datastores as an aggregate pool of storage resources.         vSphere Storage DRS also enables vCenter Server to manage the assignment of virtual machines to datastores, suggesting placement when virtual machines are created, migrated or cloned, and migrating running virtual machines to balance load and enforce placement rules.
Help	< Back Next > Cancel

3. Give the New Datastore Cluster a name and click Next.

4. Select **No Automation (Manual Mode)** and click **Next**. (**Manual Mode** means that Storage DRS will only make recommendations and that the user must apply these. **Fully Automated** means that Storage DRS will make recommendations and apply these directly by migration virtual machines or virtual disks to the proposed destination datastore.)

🚱 New Datastore Cluster	
SDRS Automation How do you want this Datastore C	uster configured?
General SDRS Automation SDRS Ruthme Rules Select Hosts and Clusters Select Datastores Ready to Complete	Automation level     No Automation (Manual Mode)     vCenter will make migration recommendations for virtual machine storage, but will not perform automatic migrations.     Fully Automated     Elies will be migrated automatically to optimize resource usage
Help	< Back Next > Cancel

5. Click Show Advanced Options. In the top part of the screen, the threshold for both Utilized Space and I/O Latency are shown. Storage DRS will make recommendations only when either of the two is exceeded. At the bottom of the screen, you will see the utilization difference, invocation period and the imbalance threshold. The utilization difference is the minimal difference between the source and the destination. Based on this value, Storage DRS will filter out those datastores whose utilization difference is below the given threshold during the selection of a destination. The default is set to 5%. The aggressiveness factor determines the amount of I/O imbalance Storage DRS should tolerate. The invocation period, 8 hours by default, determines how often Storage DRS will evaluate the environment and possibly generate recommendations.

🛃 New Datastore Cluster	
SDRS Runtime Rules	
How do you want this Datastore Cl	uster configured?
General	-I/O Metric Inclusion
SDRS Automation SDRS Runktime Rules Select Hosts and Clusters Select Datastores Ready to Complete	Select this option if you want 1/0 metrics considered as a part of any SDRS recommendations or automated impactions in this datastore cluster. This will also enable Storage 1/0 Control on all datastores in this cluster.  If Enable 1/0 metric for SDRS recommendations I/0 Load balancing functionality is available only when all hosts connected to the datastores in this datastore cluster are of version 5.0. Storage DRS Thresholds Runtime thresholds govern when storage DRS performs or recommends migrations (based on your selected automation level). Utilized space dictates the minimum level of consumed space that is the threshold for action, and 1/0 latency dictates the minimum 1/0 latency below which 1/0 load balancing moves with not be considered.
	Utilized Space:         50%         100%         90         30         %           I/O Latency:         Sms         100ms         15         ms
	Hide Advanced Options
	Advanced Options No recommendations until UN
	I/O imbalance threshold: Aggressive Conservative The I/O imbalance threshold determines the amount of imbalance that Storage DRS should tolerate. Aggressive setting would make Storage DRS correct small imbalances, if possible and moving it toward conservative would make Storage DRS produce recommendations only in cases when the imbalance across datastores is very high.
Help	<back next=""> Cancel</back>

6. Leave all the settings to default and click **Next**. Storage DRS enables Storage I/O Control automatically when I/O metric is enabled.

🛃 New Datastore Cluster	
Select Hosts and Clusters	uu wish ka add bhir Dahadaya Chukay ka
Select the host(s) and cluster(s) ye	u wish to add this Datastore Liuster to.
General	
SDRS Automation	Select Hosts and Clusters:
SDRS Runtime Rules Select Hosts and Clusters	DemoCluster-01
Select Datastores	
Ready to Complete	
1	
Help	< Back Next > Cancel

7. Select the cluster to which you want to add this datastore cluster.

8. Select the datastores that should be part of this datastore cluster. We are using datastores that already contain virtual machines. Creating a datastore cluster is a nondisruptive task and can be done if needed during production hours.

🛃 New Datastore Cluster		ĸ
Select Datastores Select the datastores you want to u every host in all of your associated	use for this datastore cluster. For best results the datastores you select should be connected to dusters.	
General SDRS Automation SDRS Runtime Rules Select Hosts and Clusters	Available Datastores: Show Datastores: Connected to all hosts	I
Select Datastores	System Capability or User-defined Capability contains:	
Ready to Complete	🛛 🖓 Name 🛛 Host Connection Status 🕗 Capacity   Free Space   System Capabili User-defined Capability   Typ	
	TM-Gobal-Interchange 🥏 All Hosts Connected 749.8 GB 536.7 GB N/A N/A VM	4
	Tri-pod01-sas600-sp-01 All Hosts Connected 99.8 GB 55.3 GB N/A N/A VM	1
	tm-pod01-sas300-sp 🕐 All Hosts Connected 99.8 GB 26.7 GB N/A N/A VM	
		1
		1
	3 datachires selected	1
Help	< Back Next > Cancel	

neral	The Datastore Cluster will be created	with the following options:			
RS Runtime Rules	General				_
ect Hosts and Clusters	Datastore Cluster Name:	Datastore Cluster 01			
ect Datastores	Storage DRS:	Enabled			
ady to Complete					
	SDRS Automation				
	Storage DRS Automation Level:	Manual			
	SDRS Runtime Rules				
	Storage I/O Load Balancing:	Enabled			
	Utilized Space:	80 %			
	I/O Latency:	15 ms			
	SDRS Advanced Options				
	Utilization difference:	5%			
	Check imbalances every:	8 Hours			
	I/O Imbalance Threshold:	5			
	Datastores:				
	Name	Capacity	Free Space	Type	
	tm-pod01-sas600-sp-01	99.8 GB	55.3 GB	VMFS	
	tm-pod01-sas300-sp	99.8 GB	26.7 GB	VMFS	
	tm-pod01-sas600-sp-02	99.8 GB	93.1 GB	VMFS	
	Clusters and Hosts:				
	Name	Host/Datastore Connection	Selected	I/O Load Balance Capable	

9. Review your selections. Ensure that all hosts are connected to the datastores in the datastore cluster. Click **Finish**.

10. The datastore cluster will now be created and a new object should appear on the **Datastores and Datastore Clusters** view. This object should contain the selected datastores.

This completes step 1 of **Testing vSphere Storage DRS.** 

#### **Exploring Your Datastore Cluster**

In this section, we will show some of the important tabs of the **Datastore Cluster** object. These can be used for monitoring and managing your datastore cluster.

1. From the vCenter Home view, select Datastores and Datastore Clusters.

🛃 tm-pod01-vc0	1 - vSphere Client							
File Edit View I	Inventory Administratio	in Plug-ins He	lp .					
🖸 🗈 [	Home							
Inventory				1				
Q	<b>F</b>	Ð						
Search	Hosts and Clusters	VMs and Templates	Datastores and Datastore Clusters	Networking				
Administration								
6		2		₽			<b></b>	Q2
Roles	Sessions	Licensing	System Logs	vCenter Server Settings	vCenter Solutions Manager	Storage Providers	Auto Deploy	vCenter Service Status
Management								
20		5		R	-			
Scheduled Tasks	Events	Maps	Host Profiles	VM Storage Profiles	Customization Specifications Manager			

2. Select your newly created **Datastore Cluster.** The **Summary** tab will show the number of datastores that are part of the datastore cluster and details regarding capacity and how Storage DRS was configured.

🛃 tm-pod01-vc01 - vSphere Client					
File Edit View Inventory Administration Plug	rins Help				
💽 💽 🏡 Home 🕨 🟭 Inventory 👂	Datastores and Datastore Cluster	5			
🖃 🛃 tm-pod01-vc01	Datastore Cluster 01				
DemoDatacenter-01     Datastore Cluster 01	Summary Virtual Machines Host	and Clusters Datastores Stor	ge DRS Performance Tasks & Ev	ents Alarms Permissions Sto	orage Views
tm-pod01-sas300-sp tm-pod01-sas600-sp-01	General		vSphere Storage DRS		]
thr pod01-sa500-sp-01     thr pod01-sa500-sp-02     TH-sob01-first00-sp-02     TH-sob01-first01-coal     TH+PO01-ESX03-Local     TH+PO01-ESX03-Local	Datastores: Capacity: Used space: Free space: Datastore Largest Free Space: Type: Virtual Machines: VMDKs: Snapshots:	3 299,25 GB 124,18 GB 175,07 GB 93,11 GB VM#5 0 9 1	I/O metrics: Storage DRS: Automation level: Utilized Space threshold: I/O lettercy threshold: I/O lettercy threshold: View troubleshooting guide Storage Capabilities	Enabled Enabled Manual 80 % 15 ms	
	Commands @ Refresh @ Edit Datastore Cluster @ Add Storage		System Storage Capability: N User-defined Storage Capability: N	IA IA	

3. The **Hosts and Clusters** tab shows the datastore cluster and the health of the datastore cluster. It also shows, when the datastore cluster is selected, which hosts are connected and how many datastores are connected from this datastore cluster to the host.

DemoCluster-01	All Datastores Connected		
		897.8 GB	593.4 GB
emol lucrer_ll1 heraile			
ame	Datastore Connected	Details	
ame tm-pod01-esx02.tmsb.local	Datastore Connected	Details All Datastores connected	
ame tm-pod01-esx02.tmsb.local tm-pod01-esx03.tmsb.local	Datastore Connected 3 3	Details All Datastores connected All Datastores connected	
me tm-pod01-esx02.tmsb.local tm-pod01-esx03.tmsb.local tm-pod01-esx01.tmsb.local	Datastore Connected 3 3 3	Details All Datastores connected All Datastores connected All Datastores connected	

4. The **Datastores** tab shows all connected datastores and their characteristics. Storage I/O Control is enabled on these datastores.

Datastore Cluster 01							
Summary Virtual Machines Host and Clusters Datastores Storage DRS Performance Tasks & Events Alarms Permissions Storage Views							
Datastores Refresh Move out of Datastore Cluster A							
Identification 🔨 Status	Host Connection Status	Device	Drive Type	Capacity	Free Type	Last Update	
🗊 tm-pod01-sas300 🥏 Normal	All Hosts Connected	naa.6006016091	Non-SSD	99.75 GB	26.69 GB N/A	6/9/2011 1:16:56 PM	
🗊 tm-pod01-sas600 🧒 Normal	🤣 All Hosts Connected	naa.6006016091	Non-SSD	99.75 GB	55.27 GB N/A	6/9/2011 12:36:42 PM	
🗊 tm-pod01-sas600 🥏 Normal	All Hosts Connected	naa.6006016091	Non-SSD	99.75 GB	93.11 GB N/A	6/9/2011 12:36:42 PM	

5. The **Storage DRS** tab is one of the main tabs in this view. If there are any recommendations, they will be displayed in this tab. It is also possible to manually run Storage DRS by clicking **Run Storage DRS**.

Datastore Cluster 01		
Summary Virtual Machines Host and Clusters Datastores Storage D	RS Performance Tasks & Events Alarms Permissions Storage Views	
View: Recommendations Faults History		Last updated: 6/9/2011 1:38:44 PM Run Storage DRS
Datastore Cluster Properties Ec	t	
Migration Automation Level: Manual		
Utilized Space Threshold: 80%		
I/O Latency Threshold: 15 ms		
Storage DR5 Recommendations		
Apply Recommendation	Reason	Space Util., Space Util., Space Util., Space Util., I/O Late, I/O Late
Override Storage DRS recommendations		Apply Recommendations

6. The **Performance tab** shows the current and trending space utilization or performance statistics when selected from the pull-down list.



7. The Tasks & Events tab shows all recent tasks and events. This tab is very useful for troubleshooting purposes and to validate the successful completion of tasks.

This completes step 2 of Testing Storage DRS.

#### **Provisioning a New Virtual Machine**

In this section, we will create a new virtual machine and provision it to the newly created datastore cluster. Storage DRS will place the virtual machine, based on the current disk space utilization and I/O latency.

1. From the **vCenter Home** view, select **Hosts and Clusters**.



2. Right-click your Cluster object and click New Virtual Machine.

🛿 tm-pod01-vc01 - vSphere Client									
File Edit View Invento	File Edit View Inventory Administration Plug-ins Help								
🖸 🗈 🏠 Home	e 🕨 🚮 Inventory 🕨 🛚	Hosts and Cluste	ers						
ा ह द <del>स</del>									
🖃 🛃 tm-pod01-vc01	01	DemoCluster-0	1						
DemoDatacent	er-Ul	Summary Virt	ual Machines Hosts	DRS Reso					
	Add Host	Ctrl+H							
🗌 🗌 ti 📑	New Virtual Machine.	Ctrl+N							
🛛 🖳 🖞 🥑	New Resource Pool	Ctrl+0		On					
8	New vApp	Ctrl+A		Off					
l 👸 🖞	Rescan for Datastores		)de:	Disabled					
l 🖁 🖓	Host Profile	•	urces:	57 GHz 143.80 GB					
<b>™</b> 1	Add Permission	Ctrl+P	-	1.41 TB					
	Alarm	•		_					
Ra	Edit Sattinas		s:	3					
543	Edic Settings		p.	24					
	Open in New Window	Ctrl+Alt+N	store Clusters:	1					
	Remove		s:	7					
	Rename			<i>c</i>					
		Total Migration	s and remplates; s using vMotion;	13					
			s using vmotion.	15					

3. Select **Typical** and click **Next**.

🗿 Create New Virtual Machin	e _ 🗆 🗙
<b>Configuration</b> Select the configuration fo	or the virtual Machine Version: 8
Configuration Name and Location Storage Guest Operating System Network Create Disk Ready to Complete	Configuration Typical Create a new virtual machine with the most common devices and configuration options. C Custom Create a virtual machine with additional devices or specific configuration options.
Help	<back next=""> Cancel</back>

4. Give the virtual machine a unique name and click **Next**.

🛃 Create New Virtual Machin	
Name and Location	Virtual Machine Version: 8
Specify a name and locati	n for this virtual machine
Configuration Name and Location Storage Guest Operating System Network Create a Disk Ready to Complete	Name:         WM_07         Wituka machine (MM) names may contain up to 80 characters and they must be unique within each vCenter Server VM folder.         Inventory Location:         Inventory Location:         Image: DemoDatacenter-01         Image: DemoDatacenter
Help	< Back Next >  Cancel Cancel

ation Sel	lect a destination stor	age for the virtua	l machine file	es:			
VM	l Storage Profile:			<u> </u>			
N	lame	Drive Type	Capacit	ty Provisioned	Free	Туре	Storage [
ų	🕡 🛛 Datastore Clus		299.25 0	GB 124.19 GB	175.06 GB		Enabled
	TM-Gobal-Inte	Non-SSD	749.75 0	5B 213.06 GB	536.69 GB	VMFS3	
1	TM-POD01-ES	Non-SSD	132.00 0	5B 979.00 MB	131.04 GB	VMFS5	
1	TM-POD01-ES	Non-SSD	132.00 0	5B 979.00 MB	131.04 GB	VMFS5	
	TM-POD01-ES	Non-SSD	131.75 0	5B 979.00 MB	130.79 GB	VMFS5	
ſ	Disable Storage DR	S for this virtual r	nachine				Þ
I∎ Si	Disable Storage DR	S for this virtual r	nachine				Þ
	Disable Storage DR elect a datastore: Jame	S for this virtual r	nachine Capacity	Provisioned	Free T	Гуре	Thin Provis
	Disable Storage DR elect a datastore: Jame itm-pod01-sas	S for this virtual r	Capacity   99.75 GB	Provisioned 90.07 GB	Free T 55.27 GB V	Гуре /MFS5	Thin Provis
	Disable Storage DR elect a datastore: lame tm-pod01-sas tm-pod01-sas	S for this virtual r	Capacity   99.75 GB 99.75 GB	Provisioned 90.07 GB 73.06 GB	Free T 55.27 GB V 26.69 GB V	Гуре /MFS5 /MFS5	Thin Provis Supported Supported
	Disable Storage DR elect a datastore: lame tm-pod01-sas tm-pod01-sas	S for this virtual r Drive Type Non-55D Non-55D Non-55D	Capacity 99.75 GB 99.75 GB 99.75 GB	Provisioned 90.07 GB 73.06 GB 34.67 GB	Free T 55.27 GB V 26.69 GB V 93.11 GB V	Type //MFS5 //MFS5 //MFS5	Thin Provis Supported Supported Supported
	Disable Storage DR elect a datastore: lame Im-pod01-sas Im-pod01-sas	S for this virtual n Drive Type Non-SSD Non-SSD Non-SSD	Capacity 99.75 GB 99.75 GB	Provisioned 90.07 G8 73.06 G8 34.67 G8	Free T 55.27 GB V 26.69 GB V 93.11 GB V	Type IMFSS IMFSS IMFSS	Thin Provis Supported Supported
Si N	Disable Storage DR elect a datastore: Jame Tm-pod01-sas Tm-pod01-sas tm-pod01-sas	S for this virtual r Drive Type Non-SSD Non-SSD	Capacity 99.75 GB 99.75 GB 99.75 GB	Provisioned 90.07 GB 73.06 GB 34.67 GB	Free T 55.27 GB V 26.69 GB V 93.11 GB V	Type /MFS5 /MFS5 /MFS5	Thin Provis Supported Supported

5. Select the datastore cluster where this virtual machine must be stored and click **Next**.

6. Select an operating system. In our example, we use Windows 2008, 64-bit. Click Next.

🚱 Create New Virtual Machine	
Guest Operating System Specify the guest operatin	g system to use with this virtual machine
Configuration Name and Location Storate Guest Operating System Network Create a Disk Ready to Complete	Guest Operating System:
Help	< Back Next > Cancel

7. Select the correct port group and click **Next**.

🛃 Create New Virtual Machine	
Network Which network connection	s will be used by the virtual Machine Version: 8
Configuration Name and Location Storage Guest Operating System Network Create a Disk Ready to Complete	Create Network       I         Network       Adapter         Power On         NIC 1:       Production02         If supported by this virtual machine version, more than 4 NICs can be added after the virtual machine is created, via its Edit Settings dialog.         If supported by this virtual machine version, more than 4 NICs can be added after the virtual machine is created, via its Edit Settings dialog.         Adapter choice can affect both networking performance and migration compatibility. Consult the 'HMMer RowWadgeBace's for more information on choosing among the network adapters supported for various guest operating systems and hosts.
Help	< Back Next > 1/2 Cancel

8. Depending on the available disk space, it might be necessary to decrease the size. In most cases, the default setting should be fine. Click **Next**.

🔗 Create New Virtual Machine		
Create a Disk		Virtual Machine Version: 8
Specify the virtual disk size	and provisioning policy	
Configuration Name and Location Storage Guest Operating System Network Create a Disk Ready to Complete	Datastore Cluster 01         Available space (GB):       175.1         Virtual disk size:       40 🚔 GB 💌 <sup>©</sup> Thick Provision Lazy Zeroed       Image: Comparison Comparison Comparison <sup>©</sup> Thick Provision Eager Zeroed       Image: Comparison Comparison Comparison	
Help		< Back Next > Cancel

🚱 Create New Virtual Machin	e	_ <b>_</b> X
Ready to Complete Click Finish to start a task	that will create the new virtual machine	Virtual Machine Version: 8
Configuration Name and Location Storage Guest Operating System Network Create a Disk Ready to Complete	Settings for the new virtual machine Name: Folder: Host/Cluster: Datastore Cluster: Guest OS: NICS: NICS: NICS: NICS: NICS: NICS: NICS: Virtual Disk Size:	VM_07 DemoDatacenter-01 DemoCluster-01 Datastore Cluster 01[tm-pod01-sas600-sp-02] (Recomme Microsoft Windows Server 2008 R2 (64-bit) 1 Production02 E1000 Thick Provision Lazy Zeroed 40 GB
	Edit the virtual machine settings     Show all storage recommendatio     Creation of the virtual machine     system. Install a guest OS on t	before completion ns (VM) does not include automatic installation of the guest operating he VM after creating the VM.
Help		< Back Continue Cancel

9. Select **Show all storage recommendations** to see which datastore is recommended by Storage DRS as the destination for this virtual machine. Click **Continue**.

10. Storage DRS, when possible, makes several recommendations, enabling you to manually select a different datastore. We will use the recommended datastore by clicking **Apply Recommendations**.

ests
ests
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ests

11. The virtual machine will now be created.

Recent Tasks								
Name	Target	Status	Details	Initiated by	vCenter Server	Requested Start Time 🛛 🖯	Start Time	Completed Time
Apply Storage DRS recommend	-	Completed		root	🛃 tm-pod01-vc01	6/9/2011 2:30:25 PM	6/9/2011 2:30:25 PM	6/9/2011 2:30:32 PM

This completes step 3 of **Testing Storage DRS.** If the used datastores were newly created, we recommend going through step 3 multiple times to create multiple virtual machines. In addition, we recommended installing an operating system to enable the possibility of creating load and also to ensure that disk space is allocated to the VMDK.

#### **Space Balancing**

In this section, we will create an imbalance from a disk space perspective, to see what recommendations Storage DRS will make. To complete this step, it is required to have multiple virtual machines stored on your datastore cluster.

1. From the vCenter Home view, select Datastores and Datastore Clusters.



2. Select one of the datastores in your datastore cluster. Click the virtual machine tab and find the virtual machine with the most **Used Space**.



3. Migrate a virtual machine to the datastore that has the least amount of free space. Find a combination that will exceed the configured 80% space utilization.

tm-pod01-sa	is600-sp-01				
Summary	Virtual Machine	s Hosts P	erformance	Configuratio	n Ta:
Name	State	Status	Host		
🚯 VM_04	Powered C	)n 🦁 No	rmal tm-p	od01-esx02.tm	sb.loca
		Power Guest Snapshot Open Console Edit Settings			) ) )
	<b>*</b> **	Clone Template Fault Tolerand VM Storage Pr	e		> >
		Add Permission Alarm	٦	Ctrl+P	•
		Report Perfor	mance		
		Rename Edit Notes			
		Open in New V Remove from Delete from D	<b>Vindow</b> Inventory sk	Ctrl+Alt+N	
		Copy to Clipbo	ard	Ctrl+C	

a. Right-click the virtual machine and click Migrate.

b. Select Change Datastore and click Next.

Migrate Virtual Machine	
Select Migration Type	
Change the virtual mathin	e's nost, datastore or both.
Select Migration Type Storage	C Change host
Ready to Complete	move the virtual machine to another host.
	Change datastore
	Move the virtual machine's storage to another datastore.
	C Change both host and datastore
	Move the virtual machine to another host and move its storage to another datastore. <u>A</u> The virtual machine must be powered off to change the VM's host and datastore.
1146	Canal
Help	< Back Next > Cancel

Storage	terre and the state of the state of the state of the				
Select the destination	torage for this virtual machine migration.				
Select Migration Type	Select a virtual disk format:				
Storage	Same format as source	•			
Ready to Complete	Select a destination storage for the virtu-	al machine files:			
	VM Storage Profile: Do not change the	profiles 🔻 🔬			
	Name Drive Type	Canacity Provisioned	Free Type	Storage DRS	Thin Pr
	Call Datastore Clus	299.25 GB 164.19 GB	135.06 GB	Enabled	Suppor
	TM-Gobal-Inte Non-SSD	749.75 GB 213.06 GB	536.69 GB VMF53		Suppor
	TM-POD01-ES Non-SSD	132.00 GB 979.00 MB	131.04 GB VMFS5		Suppor
	-				
	Disable Storage DRS for this virtual	machine			
	<ul> <li>Disable Storage DRS for this virtual</li> <li>Select a datastore:</li> </ul>	machine			
	Disable Storage DRS for this virtual     Select a datastore:     Name Drive Type	Capacity Provisioned	Free Type	Thin Provisioning	
	Image: Figure 1         Image: Figure 2         Image: Fi	Capacity Provisioned 99.75 GB 90.07 GB	Free Type 55.27 GB VMF55	Thin Provisioning Supported	
	Disable Storage DRS for this virtual     Select a datastore:     Name Drive Type     tri-podD1-sas Non-SSD     tri-podD1-sas Non-SSD	Capacity Provisioned 99.75 GB 90.07 GB 99.75 GB 90.07 GB	Free Type 55.27 GB VMF55 20.69 GB VMF35	Thin Provisioning Supported Supported	
	Disable Storage DRS for this virtual     Select a datastore:     Name Drive Type     thr.pod01-sas Non-S5D     thr.pod01-sas Non-S5D     thr.pod01-sas Non-S5D	Capacity Provisioned 99.75 GB 90.07 GB 99.75 GB 73.00 GB 99.75 GB 73.00 GB	Free Type 55.27 GB VMF55 26.69 GB VMF55 53.11 GB VMF55	Thin Provisioning Supported Supported Supported	
	Image: Storage DRS for this vertual           Select a datastore:           Name         Drive Type           Image: trippedD1-sas         Non-SD           Image: trippedD1-sas         Non-SD           Image: trippedD1-sas         Non-SD	Capacity Provisioned 99,75 GB 90,07 GB 99,75 GB 90,07 GB 99,75 GB 99,75 GB 78,79 GB	Free Type 55.27 GB VMF55 26.69 GB VMF55 53.11 GB VMF55	Thin Provisioning Supported Supported Supported	
	Disable Storage DRS for this vertual     Select a datastore:     Name Drive Type     tim-pod01-sas Non-SSD     tim-pod01-sas Non-SSD     tim-pod01-sas Non-SSD	Capacity Provisioned 99.75 GB 90.07 GB 99.75 GB 99.07 GB 99.75 GB 99.75 GB 78.79 GB	Free Type 55.27 GB VMF55 20.69 GB VMF55 53.11 GB VMF55	Thin Provisioning Supported Supported Supported	
	Disable Storage DRS for this virtual     Select a datastore:     Name Drive Type     thr-pod01-sas Non-SSD     thr-pod01-sas Non-SSD     thr-pod01-sas Non-SSD	Capacity Provisioned 99.75 GB 90.07 GB 99.75 GB 73.00 GB 99.75 GB 73.00 GB 99.75 GB 78.79 GB	Free         Type           55,27 GB         VMF55           20:69 GB         VMF35           53,11 GB         VMF55	Thin Provisioning Supported Supported Supported	
	Image: Storage DRS for this vertual       Select a datastore:       Name     Drive Type       Image: Third the transmission of transmission of the transmission of the transmission of the transmission of transmission o	machine Capacity Provisioned 99.75 GB 90.07 GB 99.75 GB 78.79 GB 99.75 GB 78.79 GB	Free         Type           55,27 GB         VMF55           20,69 GB         VMF33           53,11 GB         VMF55	Thin Provisioning Supported Supported Supported	anced >
	Disable Storage DRS for this vertual     Select a datastore:     Name Drive Type     Urive Type     uripod01-sas Non-SSD     UriveD01-sas Non-SSD	machine Capacity Provisioned ( 99,75 GB 90,07 GB 99,75 GB 78,79 GB 99,75 GB 78,79 GB	Free Type 55.27 GB VMP55 20.69 GB VMP55 53.11 GB VMP55	Thin Provisioning Supported Supported Supported Adve	anced >
	Compatbility:	Capacity Provisioned 99,75 GB 90.07 GB 99,75 GB 73.00 GB 99,75 GB 78,79 GB	Free         Type           55.27 GB         VMF55           26.39 GB         VMF35           53.11 GB         VMF55	Thin Provisioning Supported Supported Supported	anced >
	Compatbility: Valdation succeeded	mechine Capacity Provisioned   99,75 GB 90,07 GB <del>99,75 GB 73,00 GB</del> 99,75 GB 78,79 GB	Free Type 55,27 GB VMF55 28,09 GB VMF55 53,11 GB VMF55	Thin Provisioning Supported Supported Supported	anced >
	Compatbility: Validation succeeded	machine Capacity Provisioned   99,75 GB 90.07 GB 99,75 GB 78,79 GB 99,75 GB 78,79 GB	Free Type 55,27 GB VMF55 20:05 GS VMF55 53,11 GB VMF55	Thin Provisioning Supported Supported Supported	anced >>
	Compability: Validation succeeded	Capacity Provisioned [ 99,75 GB 90.07 GB 99,75 GB 70.00 GB 99,75 GB 78,79 GB	Free Type 55,27 G0 VMP55 26,697 85 VMP55 53,11 G8 VMP55	Thin Provisioning Supported Supported Supported Adve	anced >>
	Compatbility: Validation succeeded	mechine Capacity Provisioned   99,75 GB 90,07 GB <del>99,75 GB 73,00 GB</del> 99,75 GB 78,79 GB	Free Type 55,27 GB VMP55 20:09 90 VMP55 53,11 GB VMP55	Thin Provisioning Supported Supported Supported	anced >
	Compatbility:	mechine Capacity Provisioned   99,75 GB 90.07 GB 99,75 GB 78,09 GB 99,75 GB 78,79 GB	Free         Type           55,27 GB         VMP55           20:09 GB         VMP55           53,11 GB         VMP55	Thin Provisioning Supported Supported Supported Adva	anced >>
	Compatibility: Validation succeeded	Capacity Provisioned [ 99,75 GB 90.07 GB 99,75 GB 78,79 GB 99,75 GB 78,79 GB	Free         Type           55,27 GB         VMP35           26,05 SB         VMP35           53,11 GB         VMP55	Thin Provisioning Supported Supported Supported	anced >:
Help	Compabbility: Validation succeeded	mechine Capacity Provisioned   99.75 GB 90.07 GB <del>39.75 GB 73.00 GB</del> 99.75 GB 78.79 GB	Free Type 55.27 GB VMP55 20.09 S9 VMP55 53.11 GB VMP55 53.11 GB VMP55	Thin Provisioning Supported Supported Supported	anced >:

c. In the bottom section of the window, find the datastore that will exceed the utilization threshold after the migration. Select it and click **Next**.

d. Review the selections and click **Finish**.

Migrate ¥irtual Machine					
Ready to Complete					
Click Finish to start migratio	n				
Select Migration Type	Host:	Current Location			
Ready to Complete	Datastore:	tm-pod01-sas600-sp-02			
,,	vMotion Priority:	Default Priority			
	Disk Storage:	Same format as source			
	]				
	Show all storage recomme	endations			
1			1	1	r
Help			< Back	Einish	Cancel

e. The virtual machine is now migrated live to the selected datastore. Validate that the migration has been successfully completed.

Recent Tasks								
Name	Target	Status	Details	Initiated by	vCenter Server	Requested Start Time 🛛 🗢	Start Time	Completed Time
Apply Storage DRS recommend		Completed		root	🚱 tm-pod01-vc01	6/9/2011 5:03:25 PM	6/9/2011 5:03:25 PM	6/9/2011 5:09:50 PM

4. If the migration has been successfully completed, select your datastore cluster and click the Storage DRS tab.

Datastore Cluster 01		· · · · · · · · · · · · · · · · · · ·
Summary Virtual Machines Host and Clusters Datastores Storage DRS Performance	Tasks & Events Alarms Permissions Storage Views	
View: Recommendations Faults History		Last updated: 6/9/2011 5:05:16 PM Run Storage DRS
Datastore Cluster Properties Edit		V
Monation Automation Level: Manual		
Utilized Space Threshold: 80%		
I/O Latency Threshold: 15 ms		
Storage DR5 Recommendations		
Apply Recommendation	Reason Space Util. Space Util. Space Util. Space Util.	Util. I/O Late I/O Late

5. Click Run Storage DRS to manually start the process. Storage DRS will now check whether any of the thresholds have been exceeded (space and I/O) and will make a recommendation when it is possible to solve the imbalance. When Storage DRS is set to Fully Automated, it will automatically solve the imbalance.

Datastore Cluster 01									
Summary Virtual Machines Host and Clusters Datastores Storage DRS Performance	Tasks & Events Alarms Permissions Storage Views								
View: Recommendations Faults History							Last update	ed: 6/9/2011 5:15:43 PM	Run Storage DRS
Datastore Cluster Properties Edt									
Migration Automation Level: Manual									
Utilized Space Infreshold: 80%									
DO Latency Inteshold: 15 his									
Storage DRS Recommendations									
Apply Recommendation	Reason	Space Util.	Space Util.	Space Util.	Space Util.	I/O Late	I/O Late		
Migrate hard disk Hard disk 1 for VM_05 from tm-pod01-sas600-sp-02	Balance datastore space usage	91.40527	88.36153	4.002193	7.045935	0.001055	0.001983		
Migrate hard disk Hard disk 1 for VM_06 from tm-pod01-sas600-sp-02	Balance datastore space usage	88.36153	85.3266	7.045935	10.08087	0.001055	0.001983		
Migrate hard disk Hard disk 1 for VM_07 from tm-pod01-sas600-sp-02	Balance datastore space usage	85.3266	41.16737	10.08087	54.24009	0.001055	0.001983		
							,		
Councilla Stances DDS accommendations								Apply Rev	commendations
C overnue plurage pro recommendatoris									
								15	

6. Click **Apply Recommendations** to solve the imbalance. Using Storage vMotion, Storage DRS will now migrate the virtual machines that were recommended to be migrated. As can be seen in the following screenshot, Storage DRS will make multiple recommendations to solve the imbalance, if required.

Recent Tasks	tecent Tasks									
Name	Target	Status	Details	Initiated by	vCenter Server	Requested Start Time	√ Start Time	Completed Time		
Execute Storage vMotion for St	M_07	In Progress		System	🛃 tm-pod01-vc01	6/9/2011 5:24:13 PM	6/9/2011 5:24:13 PM			
Execute Storage vMotion for St	M_06	40% 💶 🗌	Migrati	System	🛃 tm-pod01-vc01	6/9/2011 5:24:13 PM	6/9/2011 5:24:13 PM			
Apply a Storage DRS recomme		🥝 Completed		root	🛃 tm-pod01-vc01	6/9/2011 5:24:13 PM	6/9/2011 5:24:13 PM	6/9/2011 5:24:13 PM		
Apply a Storage DRS recomme		Completed		root	🛃 tm-pod01-vc01	6/9/2011 5:24:13 PM	6/9/2011 5:24:13 PM	6/9/2011 5:24:13 PM		
Execute Storage vMotion for St	M_05	29% 💻 🗌	Migrati	System	🛃 tm-pod01-vc01	6/9/2011 5:24:13 PM	6/9/2011 5:24:13 PM			
Apply a Storage DRS recomme		🥝 Completed		root	🛃 tm-pod01-vc01	6/9/2011 5:24:13 PM	6/9/2011 5:24:13 PM	6/9/2011 5:24:13 PM		

7. Validate that the migration has been successfully completed.

Recent Tasks										
Name	Target	Status	Details	Initiated by	vCenter Server	Requested Start Time 🛛 🗢	Start Time	Completed Time		
Execute Storage vMotion for St	M_07	Completed		System	🛃 tm-pod01-vc01	6/9/2011 5:24:13 PM	6/9/2011 5:24:13 PM	6/9/2011 5:25:33 PM		
Execute Storage vMotion for St	M_06	Completed		System	🛃 tm-pod01-vc01	6/9/2011 5:24:13 PM	6/9/2011 5:24:13 PM	6/9/2011 5:25:28 PM		
Apply a Storage DRS recomme		Completed		root	🛃 tm-pod01-vc01	6/9/2011 5:24:13 PM	6/9/2011 5:24:13 PM	6/9/2011 5:24:13 PM		
Apply a Storage DRS recomme		Completed		root	🛃 tm-pod01-vc01	6/9/2011 5:24:13 PM	6/9/2011 5:24:13 PM	6/9/2011 5:24:13 PM		
Execute Storage vMotion for St	PM_05	Completed		System	🛃 tm-pod01-vc01	6/9/2011 5:24:13 PM	6/9/2011 5:24:13 PM	6/9/2011 5:25:25 PM		
Apply a Storage DRS recomme		Completed		root	😥 tm-pod01-vc01	6/9/2011 5:24:13 PM	6/9/2011 5:24:13 PM	6/9/2011 5:24:13 PM		

You have now successfully completed step 4 and the exercise Testing Storage DRS.

## Using Profile-Driven Storage

#### Introduction

Large-scale storage configurations are difficult to manage. It is difficult for administrators to correctly identify storage characteristics in vSphere, so it is difficult for them to know whether virtual machines are being deployed or migrated to the correct datastore. Virtual machine storage profiles predefine classes of virtual machine storage. This reduces placement errors during provisioning, migration and cloning by monitoring virtual machine storage placement against predefined virtual machine storage profiles.

**Create a Virtual Machine Storage Profile with a User-Defined Storage Capability** From the **vCenter Home** view, select **VM Storage Profiles**.



You must now click the **Enable VM Storage Profiles** button, located in the toolbar underneath the navigation bar at the top right of the window:

File	File Edit View Inventory Administration Plug-ins Help								
	💽 🔝 🏡 Home 👂 📹 Management 👂 🅪 VM Storage Profiles 👂 🧬 pml-pod13-vc.pml.local								
<b>2</b>	🛃 Create VM Storage Profile 🛞 Edit VM Storage Profile 👔 Delete VM Storage Profile 🧔 Manage Storage Capabilities 🔅 Enable VM Storage Profiles								
	VM Storage Profiles								
		Getting Started St	mmary VM Storage Profiles						

If your hosts are in a cluster, you can enable the **VM Storage Profiles** cluster-wide. If your hosts are not in a cluster, you must enable them individually. In this example, the hosts are in a cluster, so they can be enabled cluster-wide. Single-click the **Enable** link.

🛿 Enable VM Storage Profiles									
Enable or disable VM storage profiles for a host or a cluster. To enable the feature for a host, the host must have a license that includes VM storage profiles. To enable the feature for a cluster, all hosts in the cluster must have a license that includes VM storage profiles. Hosts and Clusters: Enable Disable									
Name	Name Datacenter Licensing Status VM Storage Profile Status Notes								
👔 VSA HA Cluster 🔛 VSA 🛛 All hosts Licensed Unknown									

After VM Storage Profiles has been enabled, the VM Storage Profile will change to Enabled:

🛃 Enable YM Storage Profiles 📃 🗖									
Enable or disable VM storage profiles for a host or a cluster. To enable the feature for a host, the host must have a license that includes VM storage profiles. To enable the feature for a cluster, all hosts in the cluster must have a license that includes VM storage profiles.									
	Hosts and Clusters:					Enable	Disable		
	Hosts and Clusters:	Datacenter	Licensing Status	VM Storag	e Profile Status	Enable	Disable		

Close the **Enable VM Storage Profiles** window by clicking the **Close** button, located in the lower right-hand corner. You must now click the **Manage Storage Capabilities** button, located in the toolbar underneath the navigation bar at the top of the window:

File Edit View Inventory Administration Plug-ins Help								
💽 🔯 Home 👂 🖷 Management 👂 🚱 VM Storage Profiles 👂 💋 pmi-pod13-vc.pmi.local								
🛃 Create VM Storage Profile 🛛 😵 Edit VM Storage Profile 🛛 🖉 Delete VM Storage Profile	🐮 Create VM Storage Profile 🔗 Edit VM Storage Profile 🥂 Delete VM Storage Profile 🧞 Manage Storage Capabilities 🖏 Enable VM Storage Profiles							
VM Storage Profiles  Getting Started Summary VM Storage Profiles	With Storage Profiles     Getting Started     Summary     VM Storage Profiles							

The **Manage Storage Capabilities** window will appear. Click the **Add** button. Give your storage capability a name; in this example, **Gold.** You can provide an optional description.

ame	Description	Туре	Add
	Add Storage Capability          Name         [Gold         Description         Gold Storage Capability	Ok Cancel	Remove Edit

Click OK and then Close. This completes the first step of the Storage-Driven Profiles Evaluation.

#### Assign a Storage Capability to a Datastore

This datastore should not contain any virtual machines. This is not a requirement. From the **vCenter Home** view, select **Datastores and Datastore Clusters**.

<u>Eile E</u> dit Vie <u>w</u> 1	Inventory Administratio	on Plug-ins He	þ				
🖸 🖬 🔮	Home						
Inventory		1		1			
Q	70	Ð					
Search	Hosts and Clusters	YMs and Templates	Datastores and Datastore Clusters	Networking			
Administration		/					
6		2		₽			V3
Roles	Sessions	Licensing	System Logs	vCenter Server Settings	vCenter Solutions Manager	Storage Providers	vCenter Service Status
Management							
20		14	3		B		
Scheduled Tasks	Events	Maps	Host Profiles	VM Storage Profiles	Customization Specifications Manager		

From the vCenter **Inventory** on the left-hand side, right-click the datastore to which you want to assign the storage capability. Select **Assign User-Defined Storage Capability...** :

∃ 🚰 pml-pod1 ⇒ 🛄 VSA i ka i ka	3-vc.pml.local cal-380-14 cal-380-15 cal-380-16 Enouse Datastore Alarm	VSADs-0 Getting Started Summe What is a datasto
	Rename Unmount Open in New Window Refresh	Ctrl+Alt+N

From the drop-down menu, choose the **User-Defined Storage Capability** defined in the first step; in this example, **Gold**:

🛃 Assign User-Defined S	itorage Capability 🛛 🗙
Name	
Gold	•
	New
Description     Gold Storage Capability	
Help	OK Cancel

Click **OK.** Stay in the **Datastores and Datastore Clusters** view and select the **Summary** tab for the datastore that was assigned the storage capability. You should observe that the **Gold** capability is now visible:

rai	Capacity
tion: ds:///vmfs/volumes/cddce238-279021 e: NAS ber of Hosts Connected: 3 Ial Machines and Templates: 0	Refresh           Capacity:         262.85 GB           Provisioned Space:         187.07 MB           Free Space:         262.67 GB           Last updated on:         6/1/2011 1:21:09 PM
er of Hosts Connected: 3 I Machines and Templates: 0	Last updated on: 6/1/2011 1:21:09 PM Storage Capabilities
rends refresh	Refresh System Storage Capability: N/A User defend Storage Capability: Cald

**Create a Virtual Machine Storage Profile Containing the User-Defined Storage Profile** From the **vCenter Home** view, once again select **VM Storage Profiles**.

1 4					
1 -					
ր 🖧					
		<u></u>			
d Clusters VMs and Templates	Datastores and Datastore Clusters	Networking			
		2	<b>—</b>		Q3
ions Licensing	System Logs	vCenter Server Settings	vCenter Solutions Manager	Storage Providers	vCenter Service Status
1	3		B		
ents Maps	Host Profiles	VM Storage Profiles	Customization Specifications Manager		
	ions Licensing	Templates Datastore Clusters	Templates     Datastore Clusters       Image: System Logs     Image: System Logs       Image: System Logs     VCenter Server Settings       Image: System Logs     VCenter Server Settings       Image: System Logs     Image: System Logs       Image: System Logs     Image: System Logs <td>Templates     Datastore Clusters       Image: System Logs     Image: System Logs       Image: System Logs     VCenter Server Settings       Image: VCenter Server Settings     VCenter Solutions Manager       Image: Maps     Image: Maps       Image: Maps     Host Profiles       Image: VM Storage Profiles     Customization Specifications Manager</td> <td>Templates     Datastore Clusters       ions     Image: Construction of the server server server server server server server server manager     Image: Construction of the server server server manager       Image: Ima</td>	Templates     Datastore Clusters       Image: System Logs     Image: System Logs       Image: System Logs     VCenter Server Settings       Image: VCenter Server Settings     VCenter Solutions Manager       Image: Maps     Image: Maps       Image: Maps     Host Profiles       Image: VM Storage Profiles     Customization Specifications Manager	Templates     Datastore Clusters       ions     Image: Construction of the server server server server server server server server manager     Image: Construction of the server server server manager       Image: Ima

Click the **Create VM Storage Profile** button, located in the toolbar underneath the navigation bar at the top left of the window:

File Edit View Inventory Administration Plug-ins Help						
💽 🔝 🍐 Home 🕨 📹 Management 🕨 🊱 VM Storage Profiles 👂 💋 pml-pod13-vc.pml.local						
🛃 Create VM Storage Profile 🛛 🔊	Edit VM Storage Profile 🛛 🖉 Delete VM Storage Profile	🇞 Manage Storage Capabilities	🔅 Enable VM Storage Profiles			
📁 VM Storage Profiles	Getting Started Summary VM Storage Profiles	ani ilali kan dali dari 💷				

This launches the **Create New VM Storage Profile** wizard. The first step is to provide a name and an optional description to the profile; in this example, **Gold-Profile**:

🛃 Create New VM Storage Pro	Create New VM Storage Profile				
VM Storage Profile Propert Enter the name and the d	ies escription of this profile below.				
Profile Properties Select Storage Capabilities Ready to Complete	Name         Gold->rofile         Description         Storage Profile for VMs that should reside on Gold storage				

Click **Next** to proceed to the **Select Storage Capabilities** window. At this point, there is only a single userdefined storage capability, **Gold.** Check the adjacent box to select it:

🕜 Create New VM Storage Profi	le			
Select Storage Capabilities Select the storage capabilities that will be used with this VM storage profile.				
Profile Properties	Storage Capabilities -			
Select Storage Capabilities	Name Name	Туре		
Ready to Complete	Gold	User-defined		

Click **Next.** Then click **Finish** to complete the creation of the VM Storage Profile. In the **Inventory** panel, select the newly created **Gold-Profile** and **Summary** tab to view the details of the VM Storage Profile.

灯 Create VM Storage Profile	荐 Edit VM Storage Profile	🕂 Delete VM Storage Profile 🛛 👸	Manage Storage Capabilities 🛛 💭 Enable VM Storage Profiles
E 📂 VM Storage Profiles	Getting Started Sum	mary Virtual Machines	
	General		Storage Capabilities
	Name:	Gold-Profile	Gold
	Description:	Storage Profile for VMs that sho	h
	Associated VMs:	0	
	Non-compliant VMs:	0	
	Commands		
	Edit VM Storage Pr	rofile	

#### Assign a VM Storage Profile to a Virtual Machine

There is an assumption made here that there is a virtual machine available in your environment. In this evaluation guide, we will be associating a VM Storage Profile with an already existing virtual machine. However, VM Storage Profiles can also be associated with a virtual machine during its initial creation, meaning that the virtual machine can be placed on "compatible" storage from the outset.

First, go to the **Hosts and Clusters** view. Identify a virtual machine that you want to use as part of the VM Storage Profiles evaluation. This virtual machine requires a disk but can have any guest OS installed. In this example, I have chosen a virtual machine running Windows 2008 R2 (64-bit).

**B** Win2K3Ent\_x6 Provisi Power Þ Not-sh but-of-date) Guest Used § Snapshot Stora Open Console 8 Gen. (Xeon® Core™2) A 6 Edit Settings... 4 Migrate... pml.local <u>\*</u> Netwo Clone... Template ٠ 9 4 Fault Tolerance Þ ۲ VM Storage Profile Manage Profiles... Check Profiles Compliance Add Permission... Ctrl+P

Right-click the virtual machine and select VM Storage Profile. Then select Manage Profiles.

This opens a new **Profiles** tab in **Virtual Machine Properties.** From the drop-down list, select the profile that you created earlier. In this example, it is called Gold-Profile. You will also see a button called **Propagate to disks**. By default, the VM Storage Profile applies only to the virtual machine's configuration files. You must use the **Propagate to disks** button to also include the virtual machine's disks (VMDKs) in the profile. Click the **Propagate to disks** button. The hard disk(s) of the virtual machine are included in the profile.

Win2K3Ent_x64 - Virtual Machine Properties					
Hardware Options Resources	Profiles vServices	Virtual Machine Version: 8			
Profile	Summary	Home VM Storage Profile			
VM Storage Profiles		The home VM storage profile applies to the virtual machine configuration files.			
		Gold-Profile 💌			
		Propagate to disks			
		VM storage profiles for virtual disks			
		Select a virtual disk and apply a separate VM storage profile to it.			
		Disk VM Storage Profile			
		Hard disk 1 Gold-Profile			

Click **OK**.

#### Check Whether the Virtual Machine Is Running on "Compliant" Storage

In the VM Summary tab, click the Refresh button in the VM Storage Profiles window.

Refresh

Now we have a datastore with the user-defined storage capability called **Gold**. We also have a VM Storage Profile called **Gold-Profile** with the same capability, and now we have a virtual machine with that profile attached. However, because the virtual machine currently resides on a datastore *without* that storage capability, the virtual machine is deemed noncompliant; that is, it is not on a datastore with the necessary storage capabilities. The following is what is reported when we refresh the VM Storage Profiles window:

VM Storage Profiles				
VM Storage Profiles:	Gold-Profile			
Profiles Compliance:	Noncompliant (6/1/2011 2:13:17 PM)			

Further details about the reason for noncompliance can be found back in the VM Storage Profiles view. Select the **Gold-Profile** and then the Virtual Machines tab. Because we have only one virtual machine, the display will be short:

VM Storage Profiles     Gold-Profile	Getting Started Su	mmary Virtual Machines		
	Name	Compliance Status	Last Checked	Compliance Failure
	Win2K3Ent_x64	Noncompliant     Noncompliant	6/1/2011 2:13:17 PM 6/1/2011 2:13:17 PM	Capability mismatch Capability mismatch

There are two entries displayed here. One entry is for the virtual machine's configuration files and the other one is for the virtual machine's hard disk.

#### Bring a Virtual Machine into Compliance

To bring this virtual machine into VM Storage Profile compliance, you must migrate it to a datastore that has the correct storage capabilities. The easiest way to do this is via Storage vMotion, which will enable you to migrate a running virtual machine from one datastore to another.

To initiate a Storage vMotion instance, select the virtual machine from the **Hosts and Clusters** view. In the **Summary** tab, select the **Migrate** option in the **Commands** window:

Comr	ommands								
	Shut Down Guest								
	Suspend								
0	Restart Guest								
3	Edit Settings								
2	Open Console								
	Migrate								
20	Clone to New Virtual Machine								

🚱 Migrate Virtual Machine		
Select Migration Type Change the virtual machin	e's host, datastore or both.	
Select Migration Type Storage Ready to Complete	C Change host Move the virtual machine to another host.	
	Change datastore     Move the virtual machine's storage to another datastore.	
	<ul> <li>C Change both host and datastore.</li> <li>Move the virtual machine to another host and move its storage to another datastore.</li> <li>A The virtual machine must be powered off to change the VM's host and datastore.</li> </ul>	

When the **Select Migration Type** window appears, choose the option to **Change datastore**:

VM Storage Profiles are integrated into the migration wizard. On the next screen, select the destination storage. VM Storage Profiles are used to ensure that only those datastores that contain the storage capabilities as defined in the storage are presented as **Compatible**. In this example, only datastore VSADs-0 has the **Gold-Profile**:

🚱 Migrate Virtual Machine								_ 🗆 🗵
Storage Select the destination storage for this virtual machine migration.								
<u>Select Migration Type</u> <b>Storage</b> Ready to Complete	Select a virtual disk for Same format as source Select a destination sto VM Storage Profile:	mat: 9 prage for the virtue Do not change the	al machine files: profiles	•				
	Name	Drive Type	Capacity	Provisioned	Free	Туре	Thin Provisioning	
	Compatible							-
	VSADs-0	Unknown	262.85 GB	187.07 MB	262.67 GB	NFS	Supported	
	Incompatible							
	👔 local-380-15	Non-SSD	546.75 GB	534.75 GB	12.00 GB	VMFS5	Supported	
	VSADs-1	Unknown	262.85 GB	20.18 GB	242.66 GB	NFS	Supported	
	VSADs-2	Unknown	262.85 GB	8.18 GB	254.67 GB	NFS	Supported	

Because this virtual machine already has a VM Storage Profile called **Gold-Profile** associated with it, the **Do not change the profiles** option is identical to selecting Gold-Profile from the pull-down menu. This is also identical to the **Storage** window one would see during the initial creation of a virtual machine, so the correct **Compatible** storage can be chosen for the virtual machine right from the start.

By choosing the compatible datastore from the list, when our migration completes we will know that the virtual machine will reside on a datastore that has the same storage capabilities as those defined in the VM Storage Profile, that is, **Gold**.

Click Next and Finish to start the migration. Observe the status of the Storage vMotion via the Recent Tasks view:

Recent Tasks								
Name	Target	Status	Details	Initiated by	vCenter Server	Requested Start Ti 둤	Start Time	Completed Time
Relocate virtual machi	Win2K3Ent_x64	27% 💶 🗌	Migrating t	PML\Administ	pml-pod13-vc	6/1/2011 2:50:03 PM	6/1/2011 2:50:03 PM	

After the virtual machine has completed migrating to the new **Compliant** datastore, **Refresh** the **Storage Profiles** window of the virtual machine again to check whether it is in compliance. It should be compliant this time.

VM Storage Profiles						
VM Storage Profiles: Gold-Profile Profiles Compliance: 📀 Compliant (6/1/2011 6:58:48 PM)	Refresh					

As a final step, again use the VM Storage Profiles view. As before, select the Gold-Profile and then the Virtual Machines tab to see the compliance state of your virtual machine. You will probably need to click the Check Compliance Now button, located in the upper right-hand corner of the screen:

#### Check Compliance Now

After you have run the compliance check, the virtual machine's configuration files and disk should both be in compliance:

File Edit View Inventory Administration Plug-ins Help								
💽 🔯 Home 🕨 i Management 🕨 🍪 VM Storage Profiles 🕨 🚱 pml-pod13-vc.pml.local								
👩 Create VM Storage Profile 🛛 🧛 E	🥂 Create VM Storage Profile 🦻 Edit VM Storage Profile 🥙 Delete VM Storage Profile 💿 Manage Storage Capabilities 🙃 Enable VM Storage Profiles							
ØV VM Storage Profiles     Gold-Profile	Getting Started Sum	many Virtual Machines						
	Name	Compliance Status	Last Checked	Compliance Failure				
	Win2K3Ent_x64							
	m home	Compliant	6/2/2011 11:39:57 AM					
	Hard disk 1	🤣 Compliant	6/2/2011 11:39:57 AM					

This completes the **Profile-Driven Storage** evaluation steps.

#### Evaluating Storage I/O Control

#### Introduction

Storage I/O Control enables cluster-wide control of disk resources, which prevents a single virtual machine from monopolizing all the I/O to a particular datastore. In this part of the evaluation guide, we will see how one can tune the IOPS that a particular virtual machine can generate to a shared datastore.

Priority is established using shares, although specific limits based on IOPS can also be implemented. In this part of the storage evaluation guide, we will examine the features of SIOC and how they can assist you in ensuring "fairness" across all your virtual machines from an I/O perspective.

#### Create a Virtual Machine on a Datastore

To look at the performance of the SIOC, we will deploy two virtual machines to the datastores in your environment. We must deploy the virtual machines on different ESXi 5.0 hosts. In this example, virtual machines running Microsoft Windows 2003 x64 as the guest OS are deployed. These virtual machines have two disks. One (the boot disk) is on one NFS datastore; the other (the data disk) is on another NFS datastore. The data disk of each virtual machine is placed on the same datastore.

The ability to use SIOC on NFS datastores is a new feature of vSphere 5.0. **Iometer** (http://www.iometer.org) has also been installed onto the guest OS of each virtual machine, so that a certain amount of I/O load can be driven to the virtual machine's data disk.

d w	🛿 Win2K3Ent_x64 - Virtual Machine Properties								
Hard	ware Options Resources Profi	es vServices	Virtual Machine Version: 8						
	Show All Devices	Add Remove	Disk File [VSADs-0] Win2K3Ent_x64/Win2K3Ent_x64.vmdk						
Hard	jware	Summary							
100	Memory	2048 MB	Disk Provisioning						
	CPUs	1	Type: Thick Provision						
	Video card	Video card	Provisioned Size: 20 🛨 GB 💌						
	VMCI device	Restricted	Maximum Size (GR): 262,67						
0	SCSI controller 0	LSI Logic Parallel	Pressinging and Capit						
	Hard disk 1	Virtual Disk	Virtual Device Node						
	Hard disk 2	Virtual Disk							
2	CD/DVD drive 1	CD/DVD drive 1	JSCSI (0:0) Hard disk 1						
	Network adapter 1	VM Network							
4	Floppy drive 1	Floppy drive 1	Mode Independent						

Disk 1: Boot Disk - resides on first NFS datastore.

Disk 2: Data Disk - resides on second NFS datastore. This must be the same for both virtual machines.

@w	🛿 Win2K3Ent_x64 - Virtual Machine Properties							
Hard	ware Options Resources Prof	iles VServices	Virtual Machine Version: 8					
	Show All Devices	Add Remove	Disk File [VSADs-2] Win2K3Ent_x64/Win2K3Ent_x64_1.vmdk					
Hard	jware	Summary						
100	Memory	2048 MB	Disk Provisioning					
	CPUs	1	Type: Thick Provision					
	Video card	Video card	Provisioned Size: 8 🛨 G8 💌					
	VMCI device	Restricted	Maximum Size (GB): 262.67					
0	SCSI controller 0	LSI Logic Parallel	Linearing and Capit					
	Hard disk 1	Virtual Disk	Virtual Device Node					
	Hard disk 2	Virtual Disk						
	CD/DVD drive 1	CD/DVD drive 1	JSCSI (U:1) Hard disk 2					
	Network adapter 1	VM Network						
<b>.</b>	Flonov drive 1	Floony drive 1	Mode					

#### Generate I/O to the Datastore from the Virtual Machine

Power up both virtual machines, and open a console to each of them. On the desktop of each one, there is an **lometer** icon. We will use lometer to generate I/O to the shared datastore. Launch lometer. Select the virtual machine from the **Topology** view. Then select the **Disk Targets** tab. Finally, select the disk on the second NFS datastore. In this example, it is the **E: New Volume** drive.



Next, select the **Access Specifications** tab. This will show that we are doing **4K** I/Os, **75% Read, 0% random** (sequential) operation.

lo Iometer			×						
Topology 문 杰 Al Managere 한 월 WitterCentTydea	Disk Targets   Network Targets   Acces - Assigned Access Specifications	Specification         Results Display         Test Setue           Elobal Access Specifications         Stable Access Specifications           ST 5128: 1007 Read, 0% random         E.64           ST 5128: 1007 Read, 0% random         E.64           ST 5128: 1007 Read, 0% random         E.64           ST 5128: 25% Read, 0% random         Delete           ST 5129: 1007 Read, 0% random         E.64           Remove 300         St 640 (% random           ST 640 (% random         St 640 (% random							

Finally, select the **Results Display** tab. You should see that the **Update Frequency** is set to 2 seconds. Click the **green flag icon** to start the I/O. Save the results file to the default location. In the **Results Display** tab, you can now begin to see IOPS and latency information being updated every 2 seconds.

lo Iometer					===>
	<b>T</b> -   *   •   <b>2</b>	<b>1 HE 5</b>	?		
Topology  All Managers  B. S. WIN2K3ENT-064	Disk Targets Network Targets Acc Drag managers and workers from the Topology window to the progress bar of your choice.	Results Since C Start of Test C Last Update	Update Frequency (seco 1 2 3 4 5	ands) 10 15 30 45	· , 60 00
	⊂ Display Total I/Ds per Second	All Managers	671.41		1000 >
	Total MBs per Second Average I/O Response Time (ms)	All Managers	1.4966		> 10 >
	Maximum I/O Response Time (ms)	All Managers All Managers	22.8184		100 > 10 %
	Total Error Count	All Managers	0		) 10 )
	D			Run 1 of 1	

A better view can be seen by clicking the arrows [>] at the end of the **lometer** display screen. Tune the display using the **Range** value in the lower left-hand corner.



Repeat these steps using the same configuration setup (4K I/Os, 75% Read, 0% Random) on the other virtual machine on the other ESXi server. Leave lometer running on both virtual machines. I/O is now being generated to the same shared datastore from two virtual machines on two different ESXi hosts.

The I/O on the first virtual machine should start to gradually decrease because there is now additional contention on the shared datastore. This is normal.

Now we can start to look at the Storage I/O Control feature.

#### Enable Storage I/O Control

Now that both virtual machines, from different ESXi 5.0 hosts, are generating I/O to the same shared datastore, we can enable SIOC on that datastore. This will allow us to manage which virtual machine's I/O gets priority on the datastore.

In the VMware vSphere® Client<sup>™</sup>, select **Home.** In the **Inventory**, select **Datastores and Datastore Clusters.** Next, select the shared datastore to which the virtual machines are issuing I/O. In the **Configuration** tab, in the upper part of the display, you will see details on which ESXi 5.0 hosts are using the datastore. In this case, there are three ESXi hosts that have this NFS datastore mounted:

VS	vsAbs-2								
Ge	Getting Started Summary Virtual Machines Hosts Performance, Configuration Tasks & Events Alarms Permissions Storage Views								
Th	The following hosts are connected to this datastore (select a host from the list to view the details):								
P	lame	Datastore	State	Status	% CPU	% Memory	Memory Size	CPU Count	NIC Count Uptime
	ts03-h380-15.pml.local	Mounted	Connected	A Warning	0	10	24565.73 MB	2	4 12 days
	ts03-h380-14.pml.local	Mounted	Connected	🦁 Normal	1	9	24565.73 MB	2	4 12 days
	ts03-h380-16.pml.local	Mounted	Connected	A Warning	0	10	24565.73 MB	2	4 12 days

In the lower half of the display, details regarding the actual configuration of the datastore are shown:

Datastore Details								
VSADs-2 Server: 10.20.196.119 Folder: /exports/31bb7049-56d6-4a31-a788-f3d203b4b360 Refresh Storage Capabilities System Storage Capability: N/A User-defined Storage Capability: N/A	262.85 GB Capacity 8.18 GB 🔲 Used 254.67 GB 🔲 Free							
Storage I/O Control Disabled								

Storage I/O Control is currently disabled. To enable it, click on the **Properties** link, located to the right of the **Datastore Details** box. This will open the datastore **Properties** window. On the left side of the window is a checkbox for **Storage I/O Control.** Click **Enabled** and then **Close** the **Properties** box.

VSADs-2 Properties		×
Storage I/O Control		
Edit Congestion Threshold - Congestion Threshold:	30 ms	Reset
A Setting improper conges detrimental to the perfo	tion threshold valu rmance of the data	es might be astore.
	Close	Help

Immediately, a new task is launched to enable Storage I/O Control. If you want to modify the congestion threshold (that is, the latency value at which SIOC is activated), click the **Advanced** button. We will not be modifying this value during this exercise, but you can verify that the current threshold is **30ms**. This means that if cluster-wide I/O latency to this datastore exceeds 30ms, SIOC will commence.

However, our latency value for I/O driven by lometer is very low, typically **2–3ms,** well below the 30ms threshold that exists by default to trigger SIOC.

We will next modify the lometer configuration to generate a much larger number of I/Os. This will also cause the I/O latency value to rise above the SIOC trigger value of 30ms.

#### Monitoring the Effect of Limiting IOPS

To see the effect of SIOC's being used to limit IOPS, we must first do some configuration steps on the virtual machine resources. In the vSphere Client, go to **Home.** From **Inventory**, select **Hosts and Clusters.** Click the first Windows 2003 virtual machine. In the **Summary** tab, click **Edit Settings**.

🕜 Win2K3E	nt_x64_2 - Virtual	Machine Properties		
Hardware (	Options Resources	Profiles vServices		Virtual Machine Version: 8
Show /	All Devices	Add Remove	1011 GB	Memory Size: 2 - GB V
Hardware	ry	Summary 2048 MB	512 GB -	Maximum recommended for this
CPUs	card	1 Video card	256 GB	Maximum recommended for best performance: 24564 MB.
SCSI of	device controller 0	Restricted LSI Logic Parallel	64 GB-	Default recommended for this guest OS: 1 GB.
Hard of Hard o	disk 1 disk 2 40 disko 1	Virtual Disk Virtual Disk CD/DVD diava 1	32 GB-	Minimum recommended for this guest OS: 512 MB.
Netwo	ork adapter 1 y drive 1	VM Network Floppy drive 1	8 68 -	

Next, select the **Resources** tab. In the **Settings** list, select the **Disk** entry.

Win2K3Ent_x64_2 - Virtual Machine Properties						
Hardware Options Resources Profiles vServices Virtual Machine Version:						8
Settings	Summary	Resource Allocation				
CPU	0 MHz	field to change its value.				
Memory	0 MB					
Disk	Normal	Disk	Shares	Shares Value	Limit - IOPs	
Advanced CPU	HT Sharing: Any	Hard disk	Normal	1000	Unlimited	
Advanced Memory	NUMA Nodes: 2	Hard disk	Normal	1000	Unlimited	

The **Hard disk 2** entry is the disk on the shared datastore that has SIOC enabled. The **Shares** value is set to **Normal** and the **Limit – IOPS** value is set to **Unlimited.** The settings are identical on the other virtual machine. This means that even if SIOC did trigger on this shared datastore, the two virtual machines would get equal priority when it came to I/O to the datastore.

We will now look at SIOC's enforcing of the IOPS limit. Check back to the **vSphere Client Performance** tab or the virtual machine's lometer results to see the number of IOPS currently being generated. The value in this exercise is approximately 500–600 IOPS.

lo Iometer					
	19 3	h 86 🛛	?		
Topology  Al Managers WIN2K3ENT-X64  Wolker 1	Disk Targets Network Targets According to the progress bar of your choice.	Results Since Up Start of Test Last Update	s Display Test Setup   odate Frequency (seconds , , , , 2 3 4 5 10	)  15 30 45 60 ×	0 - 1
	Display Total 1/0s per Second	All Managers	604.13	1000	>
	Total MBs per Second	All Managers	2.36	10	>
	Average I/O Response Time (ms)	All Managers	1.6542	10	2
	Maximum I/O Response Time (ms)	Airmanagers	307.0236	1000	>
	% CPU Utilization (total)	All Managers	3.59 %	10 %	>
	Total Error Count	All Managers	0	10	>
				Run 1 of 1	

For the first virtual machine, modify the **Resource Allocation** entry for **Disk** and set the **Limit – IOPS** to **100**. Simply select the **Unlimited** value and type **100** into the **Limit – IOPS field.** Click **OK**.

🖁 Win2K3Ent_x64_2 - Virtual Machine Properties 📃 🗆 🗙						
Hardware Options Resources Profiles VServices Virtual Machine Version: 8						
Summary	Resource A	llocation	o bh e Bab h alaon a	and shall also the second		
0 MHz	Select a virtual hard disk from the list below and click the Shares field to change its value.					
0 MB						
Normal	Disk	Shares	Shares Value	Limit - IOPs		
HT Sharing: Any	Hard disk	. Normal	1000	Unlimited		
NUMA Nodes: 2	Hard disk	. Normal	1000	100		
	tachine Properties Profiles Summary 0 MH: 0 MB Normal HT Sharing: Any NUMA Nodes: 2	tachine Properties Profiles   VServices   Summary O MHz O MHz O MB Normal HT Sharing: Any NUMA Nodes: 2	tachine Properties Profiles   vServices   Summary O MHz O MHz O MB Normal HT Sharing: Any NUMA Nodes: 2	Bachine Properties           Profiles         Summary           Summary         Select a virtual hard disk from the list below it           0 MHz         Field to change its value.           0 MB         Disk         Shares           Normal         Hord disk Normal         1000           Hard disk Normal         1000		

Now click the first virtual machine's console and monitor lometer's **Total I/Os per Second.** You will see a very gradual decrease in the IOPS being generated by this virtual machine.

Conversely, if you monitor the second virtual machine's console and watch the lometer display for IOPS, you should observe a gradual increase in the IOPS.

These are very gradual decreases and increases in IOPS in each of the virtual machines over a long period of time. They do not immediately limit the IOPS, because this could have an adverse effect on any running applications.

Take a few moments to observe this operation before continuing with the next part of the evaluation.

#### Monitoring the Effects of Shares

After monitoring the IOPS' reducing on the first virtual machine and increasing on the second virtual machine, stop lometer and change the **Limit – IOPS** value from **100** back to **Unlimited.** Restart lometer and enable the IOPS' returning to a very similar value on both virtual machines.

Next, to see the effect of shares on the I/O, modify the shares value on one of the virtual machines to be **High** (2000) rather than the default **Shares** value of **Normal (1000).** Because the I/O value is not causing any latency issues, this won't have any effect on the I/O of your virtual machines. (If you are observing changes in the IOPS, this might be due to the last exercise.)

🛿 Win2K3Ent_x64_2 - Virtual Machine Properties 📃 🔲						I ×
Hardware Options Resources	Profiles VServices			1	virtual Machine Versio	n: 8
Settings	Summary	Resource	Allocation		and shall blog the sear	
CPU	0 MHz	Select a virtual hard disk from the list below and click the Shares field to change its value.				
Memory	0 MB		······			
Disk	Normal	Disk	Shares	Shares Value	Limit - IOPs	
Advanced CPU	HT Sharing: Any	Hard disk.	Normal	1000	Unlimited	
Advanced Memory	NUMA Nodes: 2	Hard disk.	High	2000	Unlimited	

Next, we will modify the lometer settings. We will set the value for outstanding I/O to be **64.** This should mean that the latency value for I/Os becomes high enough (greater than 30ms) to trigger congestion. This should also mean that SIOC will consider the virtual machine with 1000 shares to have a lower priority than the virtual machine with 2000 shares regarding the scheduling of I/O.

Open the console to the first virtual machine. Launch Iometer. Open Iometer configuration file **iometer.icf**. On the main **Disk Targets** tab, change the **# of Outstanding I/Os per target** from **1** to **64**. Restart the I/O by clicking the **green flag icon**.

lo Iometer	
Topology Al Managers B- B WIN2XSENTX64	Disk Targets Network Targets Access Specifications Results Display Test Setup
	Run 1 of 1

Repeat this on the other virtual machine. Go to the **Results Display** tab and click the **green flag icon** to start I/O. The latency value will now increase with both virtual machines on two separate ESXi hosts driving I/O. Latency in this example is now in the **30-40ms** range, but this might be different in your case. It doesn't matter. The point is to go above the latency threshold defined in SIOC.

lo Iometer				_ 🗆 🗵
	<b>76</b>   <b>7</b>   <b>0</b>   <b>2</b>	<b>1 16 5</b>	1 ?	
Topology  All Managers  WIN2K3ENT-X64  Worker 1	Disk Targets Network Targets Acc Drag managers and workers from the Topology window to the progress bar of your choice.	ess Specifications Re Results Since Start of Test C Last Update	suts Display Test Setup   Update Frequency (seconds) 1 2 3 4 5 10 15	 30 45 60 ∞
	Total I/Os per Second	All Managers	1787.85	10000
	Total MBs per Second	All Managers	6.98	10
	Average I/O Response Time (ms)	All Managers	35.8181	100
	Maximum I/O Response Time (ms)	All Managers	187.7404	1000
	% CPU Utilization (total)	All Managers	15.24 %	100 %
	Total Error Count	All Managers	U	10
			Run 1	of 1 //.

Again, there will be a gradual movement towards the prioritizing of shares. You should observe a gradual increase in the IOPS for the virtual machine with 2000 shares and a gradual decrease in IOPS for the virtual machine with 1000 shares. Take a few moments to observe these changes. This completes the evaluation of **Storage I/O Control**.

# Summary

VMware vSphere 5.0 adds many new storage features to an already rich set of capabilities supported in vSphere 4.1. It reduces complexity while providing greater scalability. Virtual machine provisioning historically has imposed operational challenges. Monitoring and manually balancing workloads, or provisioning virtual machines based on I/O capacity and space utilization, have proven to be very difficult and have often been neglected, leading to hot spots and over- or underutilized datastores. vSphere Storage DRS provides smart virtual machine placement and load balancing mechanisms based on I/O and space capacity. VM Storage Profiles can be used during the provisioning of virtual machines and disks, enabling placement based on the requirements of the virtual machines and the offered storage tiers. These features result in a decrease in the operational effort associated with the provisioning and monitoring of virtual machines and storage environments.

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