Setting Up A Windows Server 2003 Cluster in VS 2005 - Part I

Before virtualization technology on the Intel platform, (It has been around for YEARS in the IBM mainframe / midrange world!) the prospect of setting up your own server cluster just to "mess around" with things was an expensive endeavor. This is pretty straightforward to do with VMWare but has, until now, been impossible with any of the virtualization technologies from <u>Microsoft</u>. That's because Virtual PC was missing one of the big prerequisites - SCSI device support. With the release a couple of weeks ago of the Release Candidate of Virtual Server 2005, mere mortals now have all the tools necessary to configure a server cluster based on MSCS - without all of the expense of multiple physical machines and shared disk storage.

First off, what is MSCS?

MSCS stands for <u>Microsoft</u> Clustering Services - a technology supported since Windows NT Server 4.0 that allows for high availability by "failing over" the services from one physical machine to another in the event of a catastrophic problem. It is different from NLB (Network Load Balancing) - this is used mainly to distribute load across multiple servers. NLB is most commonly used for large web farms. MSCS, on the other hand, is meant for applications where you need to maintain "state" - in other words, you have data on the back-end: SQL and Exchange are good examples.

- To implement MSCS, you need the following:
- 2 to 8 computers (or in this case Virtual Servers, although VS 2005's SCSI implementation will only allow for 2 nodes) each one does not have to be identical other than each should meet the minimum requirements for the OS. Note that Windows Server 2003 will support up to 8 nodes in a cluster Windows Server 2000 only supported 2 nodes unless you were running Datacenter Edition.
- Some sort of shared storage between those two computers either shared SCSI or Fibre Channel Storage.
- A copy of Windows Server 2003 Enterprise Edition for each node in the cluster you're building. You must have Enterprise Edition to use MSCS. Standard Edition does not include this functionality. If you're just messing around, <u>here's a link to the 180 day</u> evaluation copy of Windows Server 2003 Enterprise Edition.
- An Active Directory implementation. MSCS requires that the cluster nodes be a member of a domain so you need to have this in place before you proceed.
- A user account that the clustering service can use. This DOES NOT need to be a domain administrator account a regular domain user account will work just fine. The clustering setup will add this user to the local administrators group on each cluster node.
- IP addresses you need one for each node in the cluster and at least one more for the "virtual server" that will represent the cluster to the public network. DHCP won't work here, folks.

Note: It's also recommended that you have two NICs in each server. One will communicate with the LAN and the other will be used for a private network between the cluster members for the "heartbeat" traffic. It's not required, but it will improve reliability and performance.

How To Implement a 2-node MSCS Cluster in Virtual Server 2005 - Part I

Actually, as long as you do a few things special with Virtual Server 2005 to trick Windows Server 2003 into thinking it's running on two machines connected to shared storage, this is a fairly easy install. You must be running the <u>Release Candidate of Virtual Server 2005</u>. Earlier builds did not include the SCSI controller support.

For the rest of this article, I will describe the process as best as I can. If you are having issues related to MSCS, you might try visiting the <u>Clustering Community Site on Microsoft</u>'s Web Site or the <u>Clustering Technology Center on the Windows Server 2003 Site</u>.

I'm assuming that most readers will be familiar with the install of Windows Server 2003 and that they will know enough about Virtual Server 2005 to create and configure virtual machines. It also assumes that Virtual Server 2005 has been installed and is functioning properly. As the requirements for MSCS state, there must already be an Active Directory Domain Controller configured and functioning on the network. If this is not an option, it is possible to configure the cluster nodes as domain controllers - see the <u>Microsoft</u> KB Article here - <u>http://support.microsoft.com/default.aspx?kbid=281662</u>.

Setting Up The Shared Disk

- First, we must create the virtual hard disk (VHD) that will become the quorum disk. The quorum disk is used in a Windows Server cluster to store state information and configuration information between the nodes. This disk doesn't have to be large - usually ~1GB will do the trick.
- From the master status page of the Virtual Server 2005 Administration Website, click "Create", then "Fixed Size Virtual Hard Disk". **IMPORTANT:** You must use a Fixed Size Hard Disk - you cannot share a Dynamically Expanding Virtual Hard Disk in Virtual Server 2005 for the purpose of clustering. Type a name and location for the virtual hard disk. Here is my example:

Navigation Master Status	H	Fixed Size Virtual Hard Disk Specify the location where you want to create a fixed si	virtual hard disk. You can select a location from a list of known k	cations or type the fully qualified path. The list of known locations
Virtual Server Mana		includes any locations stored within the search paths Location	in the default configuration folder. Both settings are specified on D-IVPC+I	The Search Paths page
Vertual Machines Create Add	м	Virtual hard disk file name:		
Configure		Sca	i6 Units G8 🔳	
Virtual Disks Create Inspect	-			Create
Virtual Networks Create Add Configure				
Virtual Server Server Properties Website Properties				
Server Properties		* Warnes J	Lince excise to the lifest face of second strains to be lifested. * # 2014 Normal Colorado. Al right rearves.	
Server Properties Website Properties Resource Allocation		* Watton J		

• Click "Create".

<u>Setting Up The "Hardware"</u>

- Next, we need to configure the servers that will run Windows Server 2003 and the clustering service. To do this, go to the Virtual Server 2005 Administration Website. Then do the following:
- Click "Create" under "Virtual Machines" on the left navigation bar.
- Fill in all the necessary information to configure this virtual machine:
- The virtual machine name for the first node I used "**NODE1**". The amount of memory you wish to allocate to this virtual machine. Remember, you are going to need enough physical RAM to run at lease two nodes and a domain controller. I used 256MB of RAM.
- Select "Create a new virtual hard disk".
- Select a virtual network adapter to assign to this node. When you install Virtual Server 2005, it creates two virtual network adapters by default for use by virtual machines. One

should be labeled "External Network" and should be bridged to the physical network interface card (NIC) in the host machine. The second should be labeled "Internal Network" and should only allow communication between virtual machines. You may have others as well depending on how many physical NICs you have in your host. We'll end up using both the internal and external NICs - but for now, just select the external one.

• Here's a screenshot of what this virtual machine's configuration should look like:

lavigation	14	Create Virtual Machine			
Maoter Status		Mitual machine name			
Virtual Server Manag	per +	Type the name for the virtual machine file to create a virtual m	nachine in its own folder saved in the defa	at configuration folder specified on the Virtual Server Path	a page. To create a vetual
Artual Machines	M	machine in a different location, provide a fully qualified path.			
Create		Virtual machine name:	NODE1		
dd					
Configure		mit Memory			
	14	The amount of memory can be from 4 MB through 1847 MB (1662 MB maximum recommended)		
irtual Disks	1.4	Virtual machine memory (in MB):	256		
Dreafe		I Virtual hard disk			
nsped		Before you can install an operating system on this virtual mar	chine, you must attach a new or existing v	rhual hard disk to it. A virtual hard disk is a vhd file that is s	itored on your physical hard dis
irtual Networks	14	and contains the guest operating system, applications and d	iata files.		
ireate		Create a new virtual hard disk.			
4dd		This option creates an unformatted dynamically exp	anding virtual hard disk in the same dire	tory as the virtual machine configuration file. The maximu	n size allowed is 127 GB.
Configure		Size	16 Units G8 +		
irtusi Server	12				
Server Properties	-	O Use an existing virtual hard disk			
Neballe Properties		Location:	Note	-	
Resource Allocation	1.1	File name (und)			
Fuerd Viewer					
		O Attach a virtual hard disk later (None)			
		T" Writial network adapter			
		A virtual machine is preconfigured with one Ethernet network	adapter that can be connected to a writer	network	
			External Network (VIA Rhine II Comp		
			Excernal Network (VVA Horne & Comp	Role Fatt Ethemet Adapter)	
		O Virtual Machine Additions			
		important. We highly recommend that you install Virtual Mach systems. These features include, time synchronization belies (VMRC), and a heartbeat for the guest operating system to m	een guest and host operating systems, m		
					Creat

- Click Create. At this point, you should have a virtual machine configured with RAM, a 16GB IDE HDD, an IDE CDROM device and a NIC bridged through your host's network interface card.
- Next, we need to modify this virtual machine to accomplish two things: (1) add a SCSI controller as the interface to our Quorum disk and (2) add a second NIC for private cluster communication.

Adding the SCSI controller to the virtual machine configuration...

- From the master status page of the Virtual Server 2005 Administration Website, hover over the virtual machine name (NODE1) with the cursor and click on "Edit Configuration".
- On the configuration page, click on the hyperlink for "SCSI Adapters".
- Click "Add SCSI Adapter >>".
- Set the SCSI adapter ID to "7". Check the option "Share SCSI bus for clustering".

• Your configuration should look similar to this:

Navigation Master Status Virtual Server Mana	til ger +	"NODE1" SCSI Adapter Properties By detail, each ICSI adapter and shared and has an ID of 7. If you are using this virtual machine for dustering, you need to share one adapter and set its ID to a virtual provide the dustance of the outsing.	alue other than that used by
Artual Machines Create Add	ы	Verset SCR adapter 1 Brance SCR adapter 2 Brance SCR basis for clustering SCR adapter 10 7 Brance SCR basis for clustering	
Configure		Add SCSI Adapter >>	QK
Virtual Disks Create Inspect	-		
Virtual Networks Create	-		
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- Click "OK".
- Now that the SCSI controller has been added, we need to attach the quorum disk ("shared disk") to this controller so that it's visible to the virtual machine. From the configuration page, click the "Hard disks" hyperlink.
- Click "Add Disk >>".
- For Virtual Hard Disk 2, enter the path to the shared disk (quorum disk) that was created above in the "Fully qualified path to file:" text box.
- For Virtual Hard Disk 2, select "SCSI 0 ID 0" from the "Attachment" drop-down list.
- Your configuration should look similar to this:

Navigation Master Status	14	"NODE1" Virtual Hard Disk Prope			14
Virtual Server Manager	•	Specify the location of each virtual hard disk (includes any virtual hard disks stored within th	ind) you want to attach. You can select a virtual hard doa in search paths or in the default configuration folder. Bott	I from a list of known vtid files or type the fully qualified path. The list of known tiles In settings are specified on the <u>Search Paths</u> page.	
Virtual Machines	14	Enable undo disks			
Create		Virtual hard disk 1	Remove		
Add		Attachment	Primary channel (0)	<u>.</u>	
Configure	*	Known virtual hard disks:	D WPCsWODE1WODE1 vhd	3	
Create	1	Fully qualified path to file.	D:WPCyWODE1WODE1 vHd		
insped		Virtual hard disk 2	Remove		
	16	Atachment	SCSI 0 ID 0	2	
Create Add		Known virtual hard disks:	D WPCs/shareddisk vhd	-	
Configure	•	Fully qualified path to the	D WPCs\shareddisk.vhd		
	١đ	Add disk >>>			OK
Server Properties Website Properties Resource Allocation Event Viewer		Connection of the second se			
		• w	aming: SSL is not enabled for the Virtual Server Administ © 2004 Microsoft Corporation. All rights reserved		

• Click "OK".

Add the second virtual NIC...

- From the configuration page for the virtual machine, click the "Network Adapters" hyperlink.
- Click "Add Network Adapter >>".

- Change the "Connected To:" option for the second virtual network card to the "Internal Network" interface.
- Your configuration should look similar to this:

Wandie Worksons in Addie State	Wated Electrics Electrical Electricad	Master Status Virtual Server Manager +	"NODE1" Network Adapter Properties Specify the vitual network for each vitual network adapter Virtual network adapter 1	you want to connect. Each virtual machine can be confl	igured with as many as four virtual network adapters.
		Create Add		External Network (VIA Rhine II Compatible Fast 6 Dynamic	themet Adapter) ¥
Add Teleford Addgeter >> (OK) (M) (M)	Add Teleford Addgeter >> (OK) (M) (M)	irtual Disks M	Connected to:	Remove Internal Natwork	
Server Tropestens Workship Properties Resource Allocation Exert Vrewer * Warmou 20L, III. ord enabled for the Votual Extra Adamout aton Workship. *	Server Tropestens Workship Properties Resource Allocation Exert Vrewer * Warmou 20L, III. ord enabled for the Votual Extra Adamout aton Workship. *	Create Add	Add Network Adapter >>	State 00-00-00-00-00	OK
		Server Properties Website Properties Resource Allocation			
					talle. *

- Click "OK".
- Repeat the process above (Just the "Setting Up The Hardware" portion, not creating the shared disk...) again to build the second node in the cluster. Remember to give this one a different virtual machine name I used "NODE2". IMPORTANT: When configuring the SCSI Adapter for the second virtual machine, be sure to use SCSI ID 6 instead of 7. Although both nodes must have the option set for "Share SCSI bus for clustering", they should have different SCSI IDs to avoid a conflict!

Wirtual Serve	er 2005	
Navigation	"NODE1" Status	
Master Status		
Virtual Server Manager 🕨		NODE1
Virtual Machines		· · · ·
Create	Virtual machine status	Off
Add	Running time	n/a
Configure •	Physical CPU utilization	n/a
-	Heartbeat	n/a
/irtual Disks 🛛 📓	Disk I/O	n/a
Create +	Network I/O	n/a
Inspect	Guest operating system	n/a
Virtual Networks 🛛 📔	Virtual Machine Additions	Additions information not available
Create	.vmc file	D:/VPCs/NODE1/NODE1.vmc
Add	"NODE1" Configuration	
Configure	General properties	"NODE1"
/irtual Server		Never automatically turn on virtual machine
	When Virtual Server stops:	
Server Properties	S Virtual Machine Additions	Virtual Machine Additions information not available
Website Properties	Memory	256 MB
Resource Allocation		2 virtual hard disks installed; Undo disks are disabled
Event Viewer	Hard disks	
	Virtual hard disk 1	Attached to primary channel (0)
		Virtual hard disk file "NODE1.vhd"
		Maximum size is 16 GB; Currently expanded to 2 MB
	Virtual hard disk 2	Attached to SCSI 0 ID 0
		Virtual hard disk file "shareddisk.vhd"
		Maximum size is 16 GB; Currently expanded to 34.5 KB
	CD / DVD	1 virtual CD / DVD drive installed
	Virtual CD / DVD drive 1	Attached to secondary channel (0)
		ISO image "Windows2003-Enterprise32bit-SELECT.ISO"
	SCSI adapters	1 virtual SCSI adapter installed
	Virtual SCSI adapter 1	SCSI adapter ID: 7
		Attached to a shared SCSI bus
	The Network adapters	2 virtual network adapters installed
	Virtual network adapter 1	Connected to "External Network (VIA Rhine II Compatible Fast Ethernet Adapter)
		Current Ethernet (MAC) address: 00-03-FF-93-EF-76
	Virtual network adapter 2	Connected to "Internal Network"
		Current Ethernet (MAC) address: 00-03-FF-9E-EF-76
	Scripts	Scripts disabled
	Floppy drive	No media captured
	GOM ports	2 COM ports installed
		Attached to none
	COM port 1	
	COM port 2	Attached to none
	S LPT ports	1 LPT port installed
	LPT port 1	Attached to none

Example VS2005 Configurations for a 2-node MSCS Cluster

Varning: SSL is not enabled for the Virtual Server Administration Websil © 2004 Microsoft Corporation. All rights reserved.



Navigation		"NODE2" Status	
Master Status			
Virtual Server Manag			NODE2 Click the thumbnail to turn on this virtual machine
Virtual Machines	2	Virtual machine status	Off
Create		Running time	n/a
Add		Physical CPU utilization	n/a
Configure	•	Heartbeat	n/a
Virtual Disks	2	Disk I/O	n/a
Create	*	Network I/O	n/a
Inspect		Guest operating system	n/a
mopeu		Virtual Machine Additions	Additions information not available
Virtual Networks	2	.vmc file	D:\VPCs\NODE2\NODE2.vmc
Create			
Add		"NODE2" Configuration	
Configure		General properties	"NODE2"
Virtual Server	2		Never automatically turn on virtual machine
Server Properties	Carl I	When Virtual Server stops:	
Website Properties		월 Virtual Machine Additions	Virtual Machine Additions information not available
Resource Allocation		Memory	256 MB
Event Viewer		Hard disks	2 virtual hard disks installed; Undo disks are disabled
Event newer		Virtual hard disk 1	Attached to primary channel (0)
			Virtual hard disk file "NODE2.vhd"
			Maximum size is 16 GB; Currently expanded to 34.5 KB
		Virtual hard disk 2	Attached to SCSI 0 ID 0
		THE OF OF OF OF OF	Virtual hard disk file "shareddisk.vhd"
			Maximum size is 16 GB; Currently expanded to 34.5 KB
		O CD / DVD	1 virtual CD / DVD drive installed
		Virtual CD / DVD drive 1	Attached to secondary channel (0)
		Vitual CD7 DVD drive 1	Host drive "F"
		SCSI adapters	1 virtual SCSI adapter installed
		Virtual SCSI adapter 1	SCSI adapter ID: 6
			Attached to a shared SCSI bus
		The Intervented and a second address and a second address and a second address	2 virtual network adapters installed
		Virtual network adapter 1	Connected to "External Network (VIA Rhine II Compatible Fast Ethernet Adapter
			Current Ethernet (MAC) address: 00-03-FF-90-EF-76
		Virtual network adapter 2	Connected to "Internal Network"
			Current Ethernet (MAC) address: 00-03-FF-91-EF-76
		Scripts	Scripts disabled
		Floppy drive	No media captured
		9 COM ports	2 COM ports installed
		COM port 1	Attached to none
		COM port 2	Attached to none
		S LPT ports	1 LPT port installed
		LPT port 1	Attached to none

"NODE2" - http://www.roudybob.net/images/node2.png

You're now done with the Virtual Server 2005 specific portion of creating the cluster. If you are familiar with Windows Server 2003 and MSCS, you should easily be able to install Windows Server 2003 Enterprise Edition on each node and configure MSCS.

Continue to Part II - <u>http://www.roudybob.net/?p=119</u>.