

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 [Microsoft](#). 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 [Microsoft](#) 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, [here’s a link to the 180 day 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

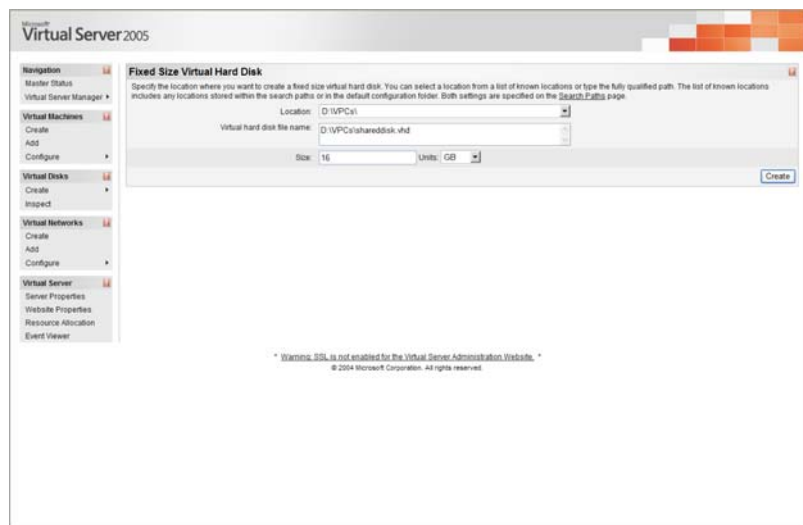
Actually, as long as you do a few things special with Virtual Server 2005 to trick Windows Server 2003 into thinking it’s running on two machines connected to shared storage, this is a fairly easy install. You must be running the [Release Candidate of Virtual Server 2005](#). Earlier builds did not include 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 [Clustering Community Site on Microsoft’s Web Site](#) or the [Clustering Technology Center on the Windows Server 2003 Site](#).

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 [Microsoft KB Article](http://support.microsoft.com/default.aspx?kbid=281662) here - <http://support.microsoft.com/default.aspx?kbid=281662>.

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:



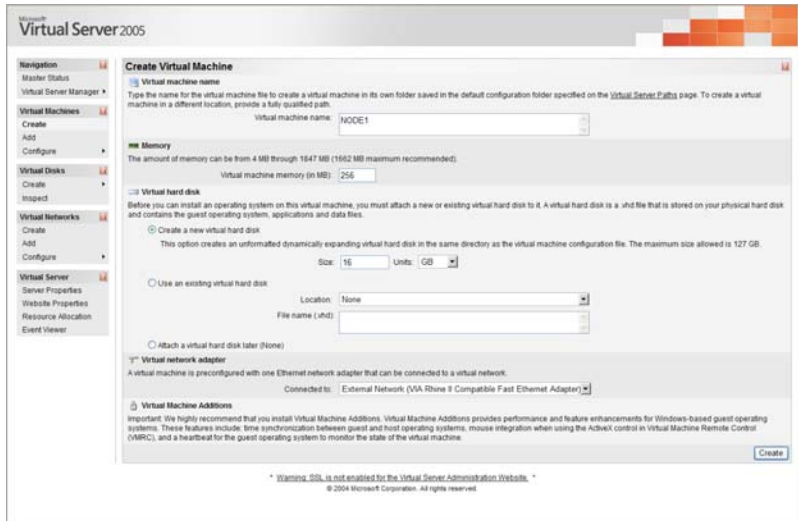
- Click "Create".

Setting Up The "Hardware"

- 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 least 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:

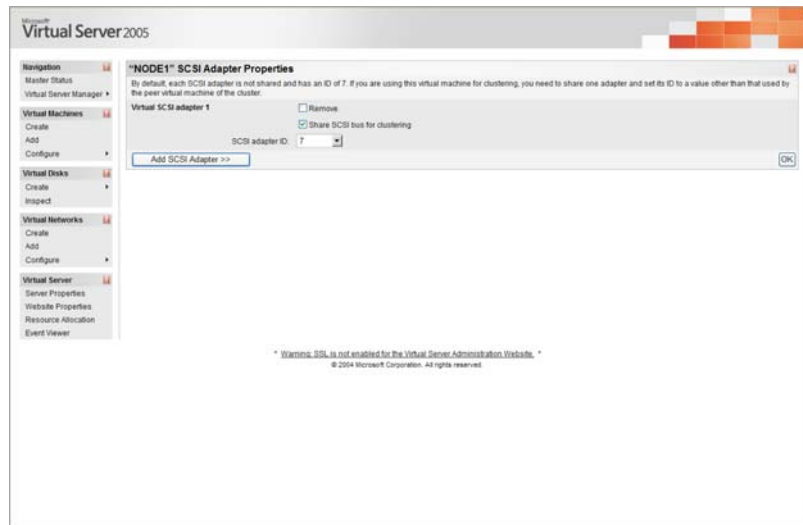


- Click Create. At this point, you should have a virtual machine configured with RAM, a 16GB IDE HDD, an IDE CDROM device and a NIC bridged through your host's network interface card.
- Next, we need to modify this virtual machine to accomplish two things: (1) add a SCSI controller as the interface to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

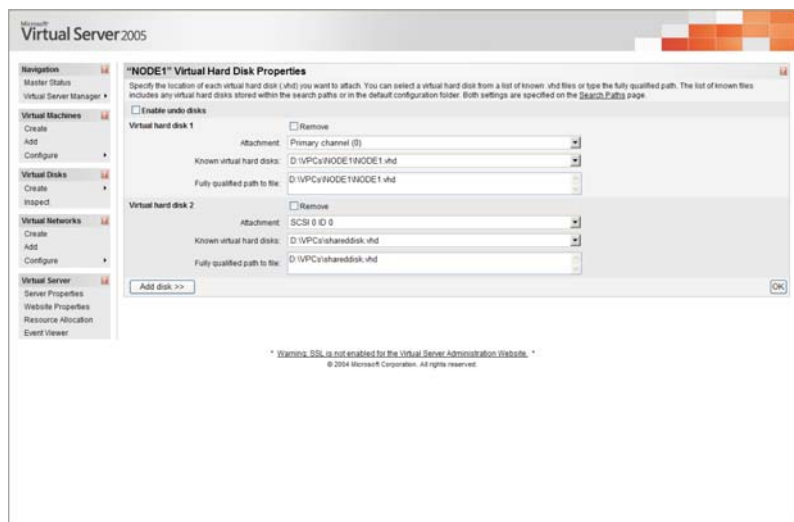
Adding the SCSI controller to the virtual machine configuration...

- 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:



- 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:

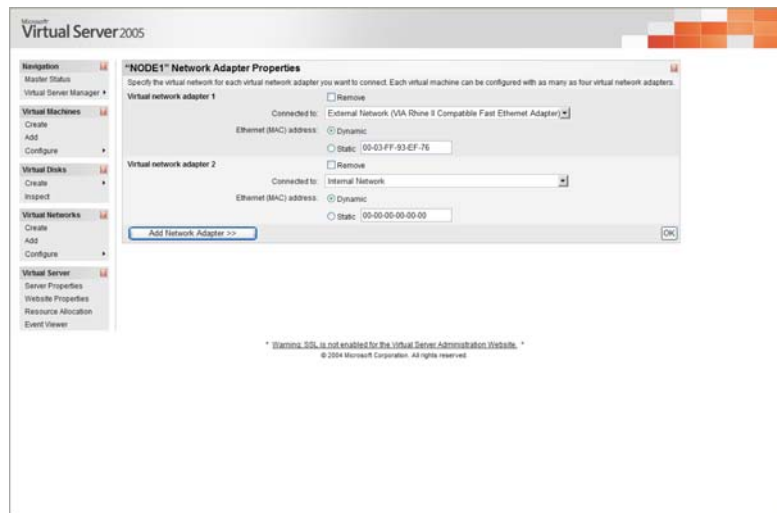


- Click "OK".

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:



- 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!

Example VS2005 Configurations for a 2-node MSCS Cluster

The screenshot displays the Microsoft Virtual Server 2005 administration console. On the left is a navigation pane with categories: Navigation, Virtual Machines, Virtual Disks, Virtual Networks, and Virtual Server. The main area is divided into two panes: 'NODE1' Status and 'NODE1' Configuration.

'NODE1' Status

Virtual machine status	Off
Running time	n/a
Physical CPU utilization	n/a
Heartbeat	n/a
Disk I/O	n/a
Network I/O	n/a
Guest operating system	n/a
Virtual Machine Additions	Additions information not available
.vmc file	D:\VPCs\NODE1\NODE1.vmc

'NODE1' Configuration

- General properties:** "NODE1"
When Virtual Server starts: Never automatically turn on virtual machine
When Virtual Server stops: Save state
- Virtual Machine Additions:** Virtual Machine Additions information not available
- Memory:** 256 MB
- Hard disks:** 2 virtual hard disks installed; Undo disks are disabled
 - 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
- 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
- COM ports:** 2 COM ports installed
 - COM port 1: Attached to none
 - COM port 2: Attached to none
- LPT ports:** 1 LPT port installed
 - LPT port 1: Attached to none

* Warning: SSL is not enabled for the Virtual Server Administration Website. *

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"NODE1" - <http://www.roudybob.net/images/node1.png>

The screenshot displays the Microsoft Virtual Server 2005 administration console. On the left is a navigation pane with categories: Navigation, Virtual Machines, Virtual Disks, Virtual Networks, and Virtual Server. The main area is divided into two panes: 'NODE2' Status and 'NODE2' Configuration.

“NODE2” Status

Virtual machine status	Off
Running time	n/a
Physical CPU utilization	n/a
Heartbeat	n/a
Disk I/O	n/a
Network I/O	n/a
Guest operating system	n/a
Virtual Machine Additions	Additions information not available
.vmc file	D:\VPCs\NODE2\NODE2.vmc

“NODE2” Configuration

- General properties**: "NODE2"
When Virtual Server starts: Never automatically turn on virtual machine
When Virtual Server stops: Save state
- Virtual Machine Additions**: Virtual Machine Additions information not available
- Memory**: 256 MB
- Hard disks**: 2 virtual hard disks installed; Undo disks are disabled
 - Virtual hard disk 1: Attached to primary channel (0); Virtual hard disk file "NODE2.vhd"
 - 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); Host drive "F"
- SCSI adapters**: 1 virtual SCSI adapter installed
 - Virtual SCSI adapter 1: SCSI adapter ID: 6; Attached to a shared SCSI bus
- 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-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
- COM ports**: 2 COM ports installed
 - COM port 1: Attached to none
 - COM port 2: Attached to none
- LPT ports**: 1 LPT port installed
 - LPT port 1: Attached to none

* Warning: SSL is not enabled for the Virtual Server Administration Website. *
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“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 - <http://www.roudybob.net/?p=119>.