

Clustering VirtualCenter 2.5 Using Microsoft Cluster Services

This paper documents the steps to successfully implement a high availability solution for VirtualCenter 2.5 using Microsoft's cluster services. There are some basic requirements to start the process. Microsoft requires Active Directory for cluster services. Additionally, Windows 2003 Enterprise server or higher will be necessary. This document was compiled from several sources. It demonstrates creating a VC cluster on the same ESX host (cluster-in-a-box) with a SAN-based quorum disk. The hyperlinks at the end of the document has more detailed information for other types of configurations, such as, cluster-across-boxes and physical-to-virtual.

Note: *This is not an official VMware whitepaper or document. This is simply a record of one man's journey to satisfy the quest for knowledge. Please use at your own discretion.*

This document assumes the following configuration:

- VirtualCenter 2.5
- ESX 3.5
- Windows 2003 R2 Enterprise server
- Active Directory Domain

Creating the First Node of the Cluster

In this section, creating the first node of the cluster requires pre-creating an `eagerzeroedthick` virtual disk, and then creating a virtual machine using that pre-created disk, and lastly installing the operating system.

1. Start by creating directory in the datastore to which the virtual machine's boot disk will reside. For example, using PuTTY, change to the local VMFS and type:

```
#cd /vmfs/volumes/sc-esxhost\:/LocalVMFS/  
#mkdir VCnodeA  
#cd VCnodeA
```

2. Now create a vmdk for the virtual machine's boot disk using `vmkfstools` and the `eagerzeroedthick` argument. This will create 4GB virtual disk:

```
#vmkfstools -c 4G -d eagerzeroedthick -a lsilogic vcnodea.vmdk
```

3. When finished, create a new virtual machine using the existing disk created in step 2.



4. Make sure to install VMware Tools and disconnect CD-ROM. Shut down VCNodeA.

Creating the Second Node of the Cluster

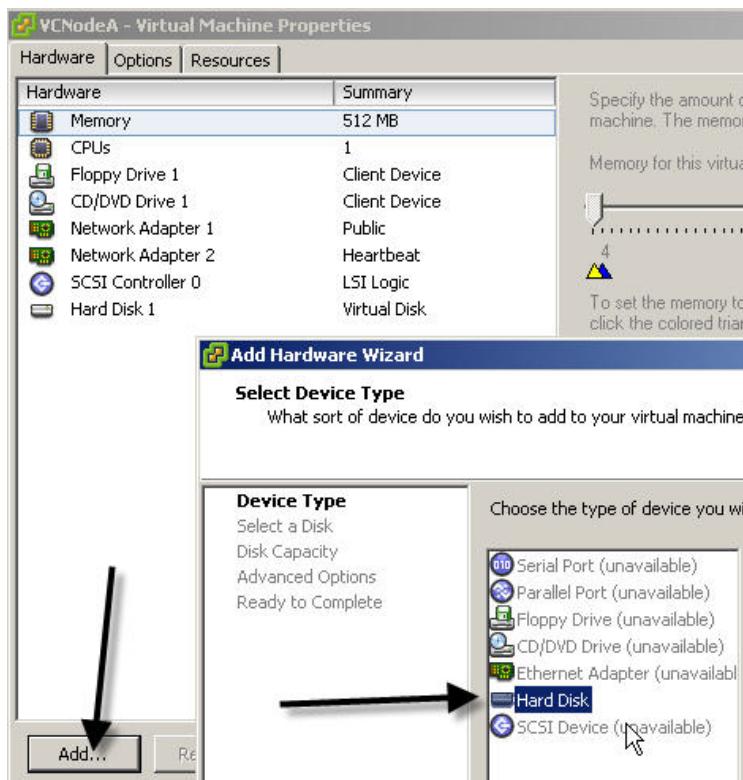
1. Cloning the first node and customizing it for uniqueness is the fastest way to create the second cluster node.
2. Join both nodes to the Active Directory domain.

Adding the Quorum Disk to the Cluster Nodes

1. Create a quorum disk to be used by Microsoft Cluster services using the same `vmkfstools` command previously. Locate this disk locally or on a shared LUN.

```
#vmkfstools -c 2G -d eagerzeroedthick -a lsilogic  
/vmfs/volumes/SharedLUN/quorum/quorum.vmdk
```

2. Power off both nodes. Start with VCNodeA by going to **VM > Edit Settings** and click the **Add..** button and select **Hard Disk** from the device listing. Click **Next**.

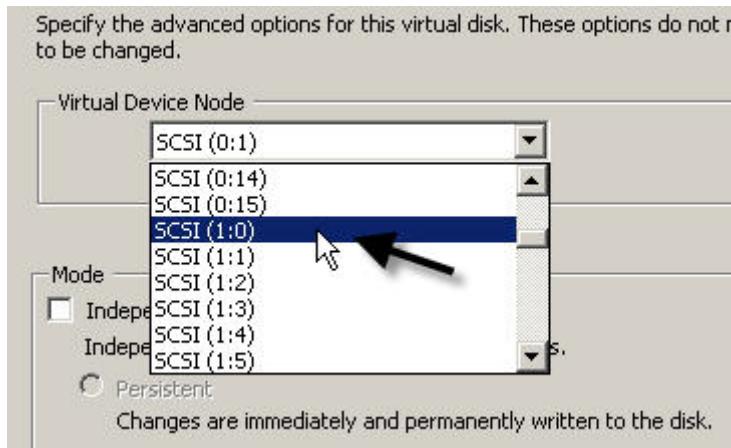


3. On the **Select a disk** page, choose the radio button, **Use an existing disk** and click **Next**.
4. Browse to the location of the quorum disk, select it and click **Next**.

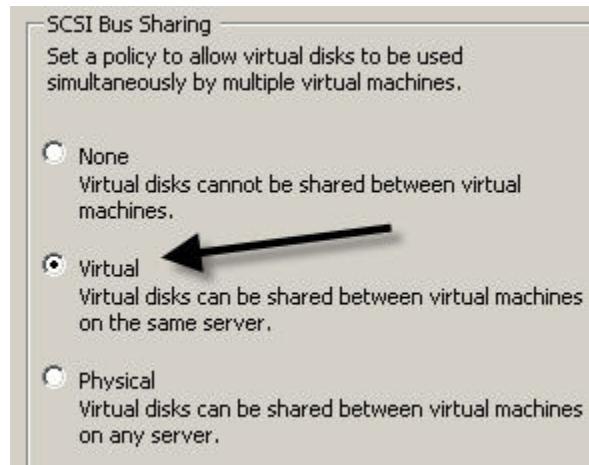


5. On the **Specify Advanced Options** page, choose a *new* SCSI device node. The quorum disk *must* reside on a different SCSI controller. Use **SCSI(1:0)**, for example. Click **Next**, then **Finish**.

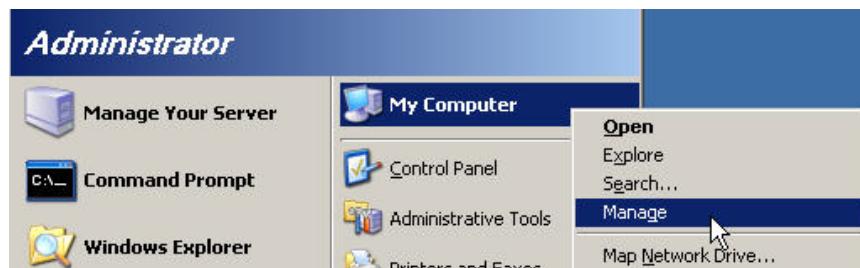
Note: These must identical setting for both nodes!



6. Now select the newly added SCSI controller. For the **SCSI Bus Sharing**, choose **Virtual**, then click **Ok**.



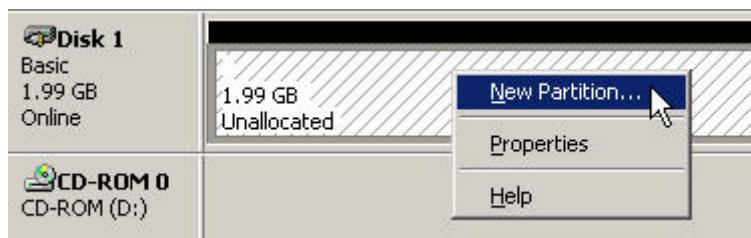
7. Power on VCNodeA.
8. Click the **Start** button, then right-click **My Computer** and choose **Manage**.



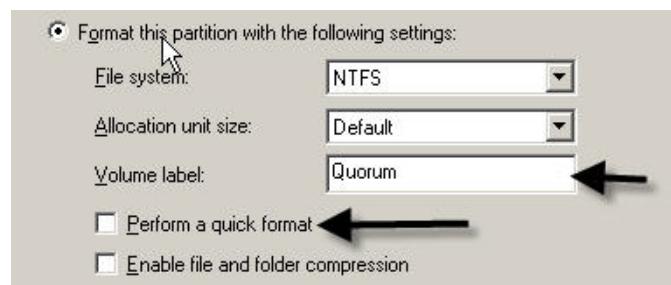
9. Select **Disk Management** in the left pane. An **Initialize and Convert Disk Wizard** should begin. The quorum disk that was just added is not initialized nor formatted. Click **Next** to begin.



10. At this point, the quorum disk should be initialized, but **not** converted. To do this, click **Next** twice, then **Finish**.
11. Now that the disk is online, select the unallocated disk, right-click then **New Partition...**



12. Click **Next** four times. At the **Format Partition** dialog box, change the volume label to **Quorum** or whatever name and check **Perform a quick format**. Click **Next**, then **Finish**.



12. Close all windows and shut down VCNodeA.

13. Repeat steps 2-10 for VCNodeB, if necessary, making sure the same drive letter is assigned.

Note: At this point, it is important to not allow both nodes to be powered on simultaneously. After the Cluster Services configuration is complete, both nodes with support running at the same time.

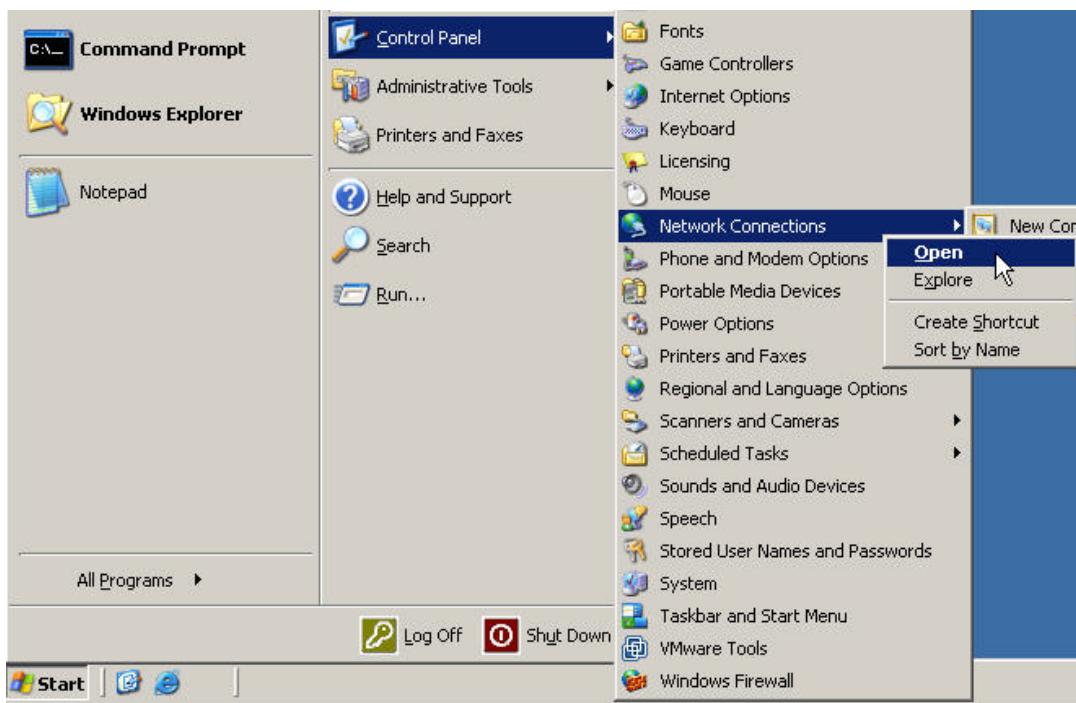
Preparing for Microsoft Cluster Services

In this section, several steps will need to be performed on both nodes to support Cluster Services. Many of the following procedures are considered by Microsoft to be best practices.

Networking

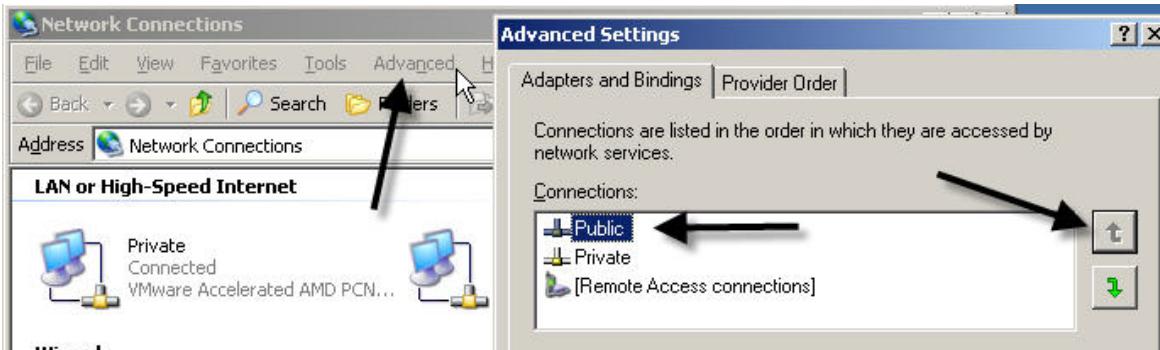
Perform the following operations on both cluster nodes. Power only one on at a time.

1. On both nodes, add a second NIC connected to its own private network. On the ESX host, create a virtual machine port group called, such as **Private**.
2. Both NICs in both virtual machines should have static IP addresses.
3. Change the binding order of the NICs in each virtual machine. Make sure to list the **Public** connection first followed by the **Private** connection. From within the operating system of each node, click **Start > Control Panel**, right-click **Network Connections > Open**.



2. To change the binding order, select the menu option, **Advanced > Advanced Settings...**

3. Using the elevator buttons, adjust the network connections so that **Public** is listed first, followed by **Private**. Click **Ok**.



Repeat this for the second node.

4. Next, modify the **Private** connection's TCP/IP settings by right-clicking and choosing **Properties**. Double-click **Internet Protocol (TCP/IP)** in the list and then **Advanced...**
5. Click the **DNS** tab and verify there are no DNS addresses. Make sure **Register this connection's address is registered** and **Use this connection's DNS suffix in DNS registration** boxes are deselected.



6. Select the **WINS** tab and verify that **Enable LMHOSTS lookup** is unchecked and **Disable NetBIOS over TCP/IP** is selected.
7. Close all dialog boxes and shutdown the virtual machine.
8. Repeat these steps for VCNodeB.

Creating a Cluster User Account

1. Launch the Active Directory Users and Computers on the domain controller and create a new domain user using the following:
 - a. **User Cannot Change Password**
 - b. **Password Never Expires**

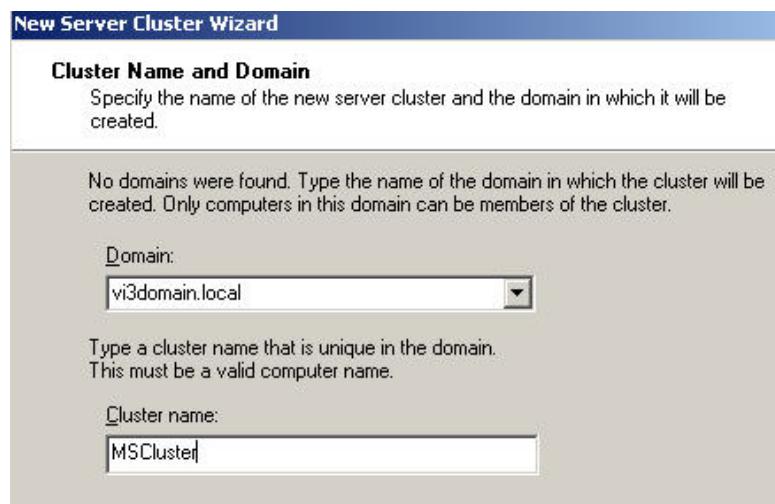
Configuring Microsoft Cluster Services

Configuring the First Cluster Node

1. Start VCNodeA.
2. Click **Start > All Programs > Administrative Tools > Cluster Administrator**.
3. Once the application starts, choose **Create a cluster** from the drop-down menu and click **Ok**.

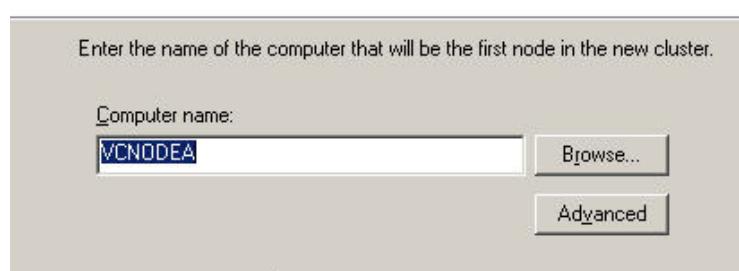


4. Click **Next** on the wizard page. Choose the domain from the drop-down list and enter a name for the MSCS cluster. Click **Next**.



5. If the first cluster node does not default to the computer's name, browse the correct node and click **Next**.

Select Computer
The computer must be a member of the domain you specified.





6. At this point, Cluster services will be installed and configured on VCNodeA. When it completes, click **Next**.

Analyzing Configuration
Please wait while the wizard determines the cluster configuration.



- + ✓ Checking for existing cluster
- + ✓ Establishing node connection(s)
- + ✓ Checking node feasibility
- + ✓ Finding common resources on nodes
- + ✓ Checking cluster feasibility

Tasks completed.

[View Log...](#) [Details...](#) [Re-analyze](#)

Click Next to continue. Click Back to change the configuration.

7. Enter an address that will represent the MS cluster's managed IP. This is not the application's managed IP address. Click **Next**.
8. Enter the service account's credentials created earlier in the domain. Click **Next**.
9. Review the Summary page and click **Next**.
10. Again, when complete the cluster should be green.

Creating the Cluster
Please wait while the cluster is configured.



- + ✓ Reanalyzing cluster
- + ✓ Configure cluster services
- + ✓ Configure resource types
- + ✓ Configure resources

Tasks completed.

[View Log...](#) [Details...](#) [Retry](#)

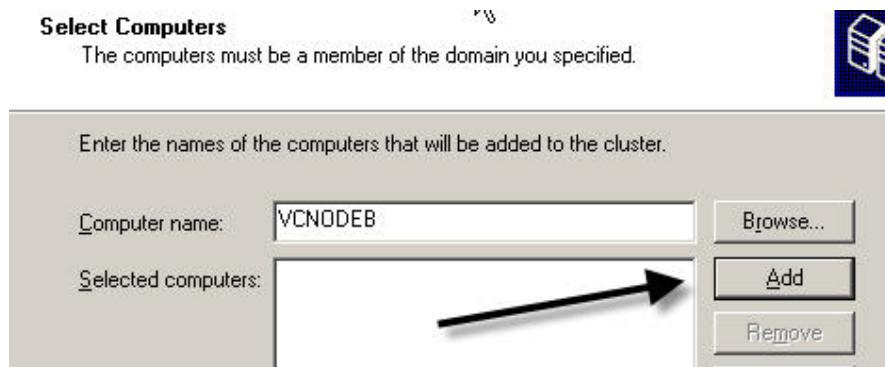
11. Click **Next** and **Finish** to complete the VCNodeA cluster setup.
12. Within the Cluster Administrator application, verify that VCNodeA is online.

Configuring the First Cluster Node

1. If VCNodeB is not already powered on, do so now.
2. From the Cluster Administrator menu, choose **File > New > Node**



3. Using the wizard, browse to the second node and choose **Add**. Click **Next**.



4. When the configuration completes, click **Next**.
5. Enter the password for the cluster service account. Click **Next** twice.
6. Again, click **Next** followed by **Finish**.
7. That completes the Microsoft Cluster Services. The next task will be to cluster VirtualCenter.

Note: Make sure that Host (A) records are added to the DNS zone for both the MS cluster managed IP address and the VirtualCenter cluster managed IP address

Modifying the Windows Operating System

As a Microsoft best practice, set the I/O timeout value to 60 seconds or more within the cluster nodes operating system. To verify this, use the Windows registry editor, `regedit.exe`, and check the value:

```
HKLM\System\CurrentControlSet\Services\Disk\TimeOutValue
```

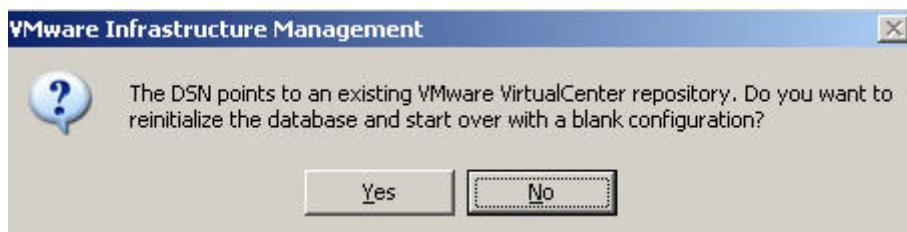
Clustering VirtualCenter Services

Although VirtualCenter is not a “cluster aware” application, its supporting services can be set up in an active-passive configuration. The first section starts this configuration assuming VirtualCenter is installed into the first node, VCNodeA, and is using a SQL server database on a separate server. Of course, SQL Server is a “cluster aware” application and can be setup to be clustered as well.

1. Verify that VirtualCenter works by logging in VI client. Once that's complete, stop the VirtualCenter service and the License server service in VCNodeA.

Start > All Programs > Administrative Tools > Services

2. Install VirtualCenter into VCNodeB using the same ODBC connector, database and license file. When prompted to reinitialize the existing VirtualCenter repository, click **No**.



3. Click **Ok** twice to accept the notifications. Next, browse to the license file and click **Next** three times.
4. Click **Install** to begin.
5. Once the install is complete and the services have been verified, stop the VirtualCenter service and License server as before.
6. Go back to VCNodeA and start the VirtualCenter service and License service.

Copying the Certificates for VirtualCenter

In order to successfully failover in a cluster configuration, both nodes in the VirtualCenter cluster have to have identical certificates. This will not cause a conflict since VirtualCenter does not permit two VirtualCenter instances to simultaneously access the same database. They do, however, have to present the same credentials to the database. With the release of VirtualCenter 2.5, the database password is now stored in encoded form using the certificate. The challenge is that the certificate is generated for each VirtualCenter instance. It will be necessary to reset the database password on the first node, copy it over to the second node and reset it there as well. Once that is complete, both nodes will have the same encoded password in their respective certificates and the failover should be seamless.

1. Once the services have been restarted on VCNodeA, open a command prompt and navigate to:



C:\Program Files\VMware\Infrastructure\VirtualCenter Server

2. Now execute, vpxd.exe -p to reset the database password to whatever you want.
3. Now stop the VirtualCenter service again on VCNodeA.
4. On VCNodeA, navigate to:

C:\Documents and Settings\All Users\Application
Data\VMware\VMware VirtualCenter\SSL

5. Copy the certificates in this directory over to VCNodeB replacing that node's certificates.

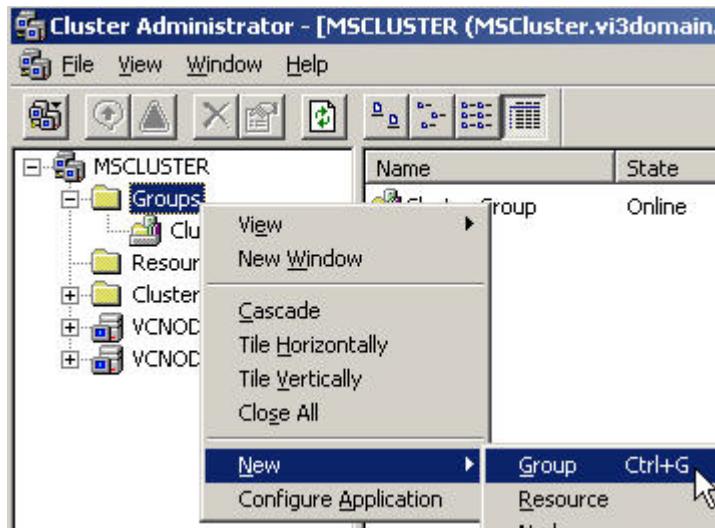
Note: It might be a good idea to rename VCNodeB's certificates first in case they need to be referred back.

6. On VCNodeB, perform steps 1-2 using the same password as VCNodeA.
7. Start the VirtualCenter service and make sure VI client can connect.
8. Stop the VirtualCenter service on VCNodeB and restart VCNodeA's.

Creating a VirtualCenter Cluster Group in MSCS

Although cluster services previously implemented, that was to establish the nodes involved and identify an owner of the cluster services. It is now necessary to create a new cluster group to specifically manage clustering for VirtualCenter and supporting services separately.

1. Start the Cluster Administrator on VCNodeA.
2. Right-click **Groups** and select **New > Group**.



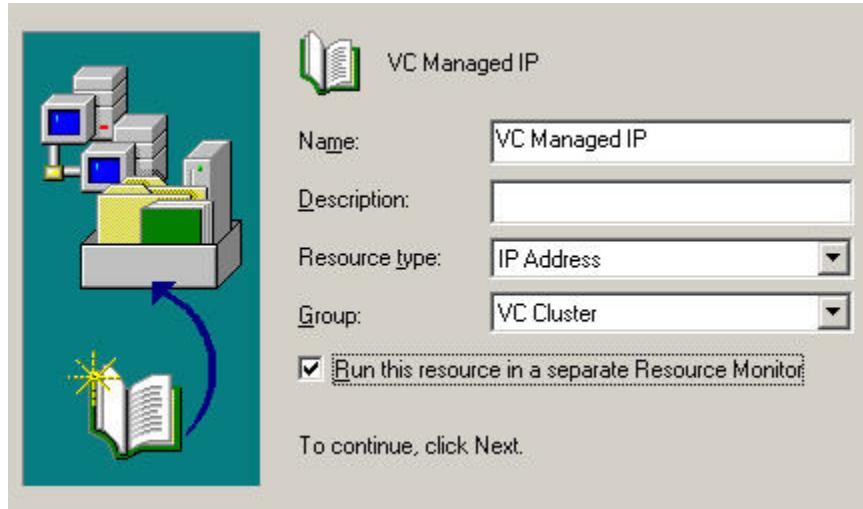
3. Enter a name and/or description for the VirtualCenter cluster and click **Next**.
4. Click **Finish** without adding any owners. Click **Ok**.



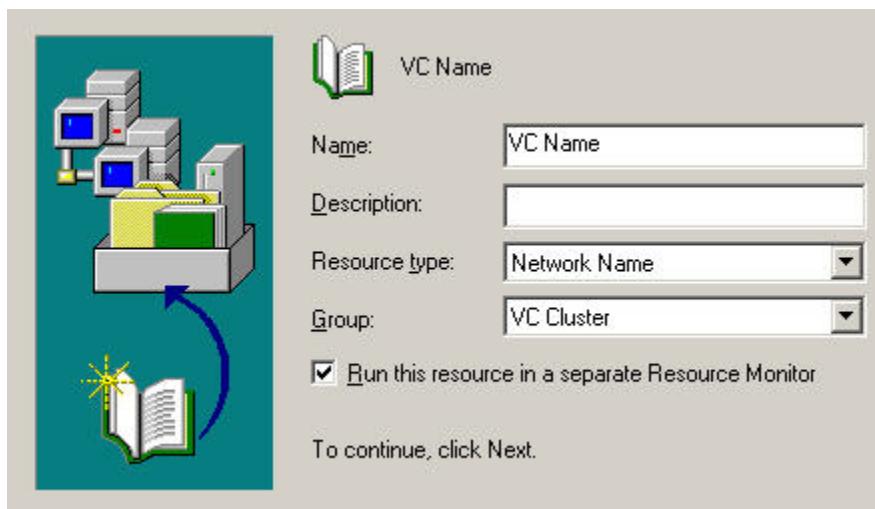
5. Select the newly created cluster group, then right-click and choose **New > Resource**.
6. The first step is create a single, managed IP address to be used for accessing the VirtualCenter cluster.

Note: Make sure that the IP address being assigned has a Host (A) record in the DNS zone.

Enter a name and choose **IP Address** from the drop-down list. Check the box, **Run this resource in a separate Resource Monitor**. Click **Next** three times.



7. Now enter the IP address to be used for managing access to the VirtualCenter cluster. Pick the appropriate public facing network and click **Finish**. Click **Ok**.
8. Create another resource per step 5. The **Resource Type** should be **Network Name**. Click **Next** twice.



In the **Dependencies** screen, add the **VC Managed IP** resource as a dependency. Select the box **Run this resource in a separate Resource Monitor**. Click **Next** three times.

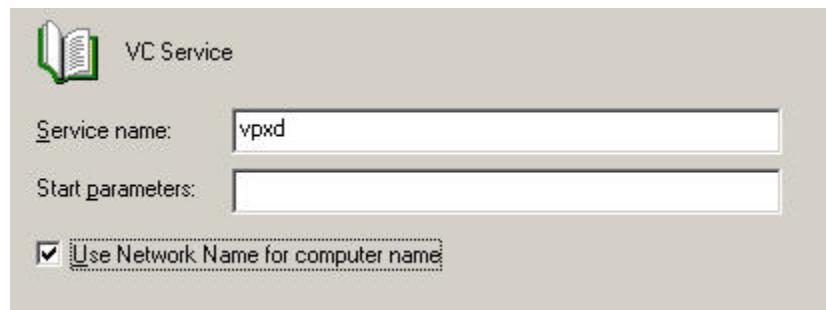


9. Enter the name defined for the Host (A) record in step 6. Check both boxes and click **Finish** and **Ok**.

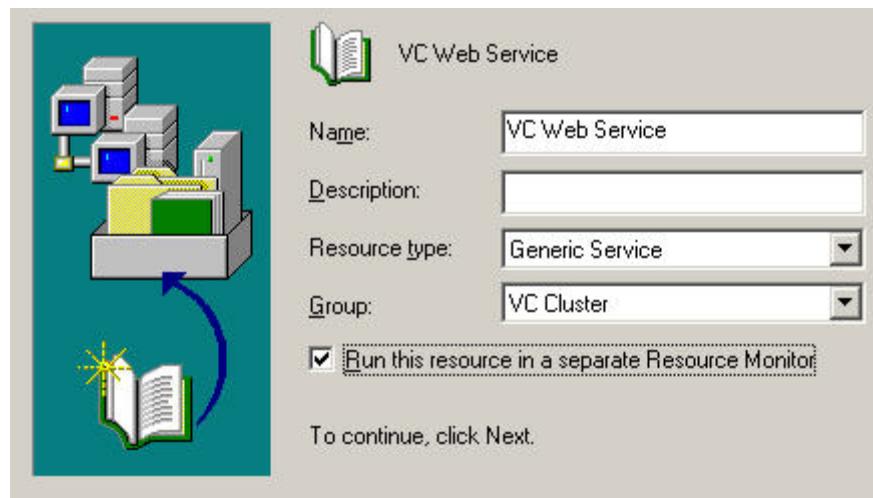


10. Create another resource for the VirtualCenter service. Choose **Generic Service**, check the box and click **Next** twice.

11. Add the VC Name as its dependency. Enter vpxd as the **Service Name** and check **Use Network Name from computer name**. Click **Next** and **Finish** and then **Ok**.



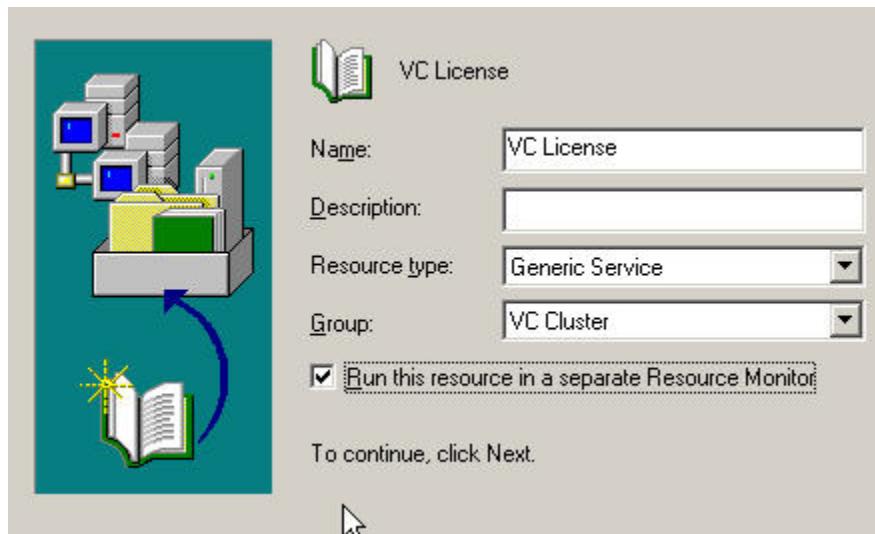
12. Create a resource for the web service. Choose **Generic Service**, check the box and click **Next** twice.



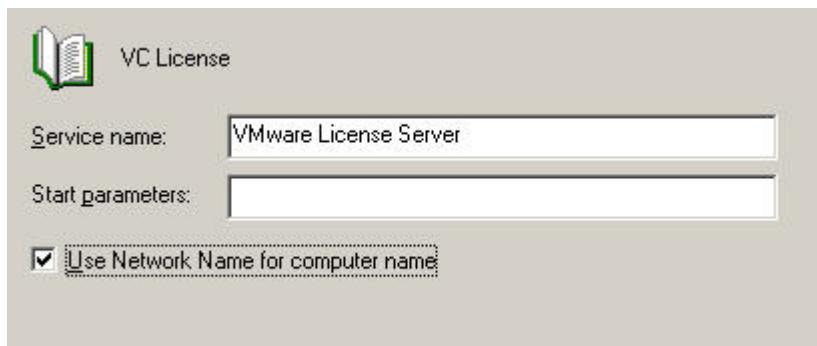
13. Add the VC Service as its dependency. Enter webAccess as the **Service Name** and check **Use Network Name from computer name**. Click **Next** and **Finish** and then **Ok**.



14. Create the last resource for the license service. Choose **Generic Service**, check the box and click **Next** twice.



15. Add the VC Service as its dependency. Enter VMware License Server as the **Service Name** and check **Use Network Name from computer name**. Click **Next** and **Finish** and then **Ok**.



16. That will complete the cluster group for the VirtualCenter server and its supporting services.

17. Lastly, launch the VI client, log into VCNodeA, and enter the managed IP address defined for the VirtualCenter cluster. Click **Administration > VirtualCenter Management Server Configuration...** from the menu. Select **Runtime Settings** and enter managed IP address defined in step 7. Click **Ok**.



Select VirtualCenter Runtime Settings

What are the unique runtime settings for this VirtualCenter installation?

These settings allow multiple VirtualCenter Servers to operate in a common environment. Use caution when changing these parameters.

Unique ID

VirtualCenter Server Unique ID: 55

Requires manual restart of VirtualCenter Server

Port

VirtualCenter Server TCP/IP Port: 902

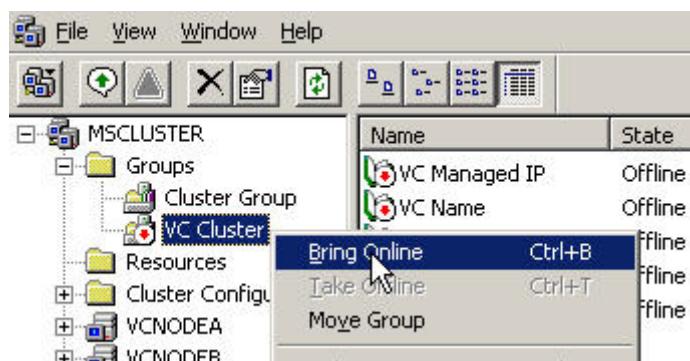
Requires manual restart of VirtualCenter Server

Managed IP Address

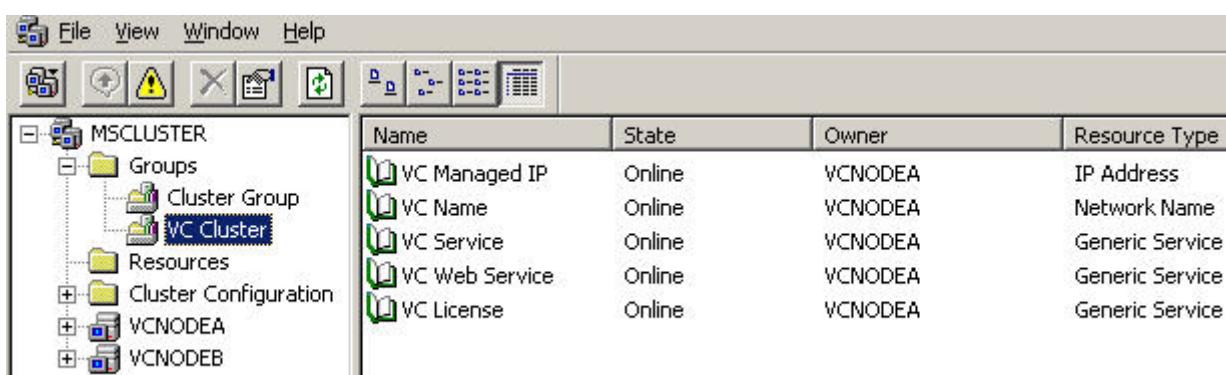
VirtualCenter Server Managed IP: 172.16.0.75

Does not require manual restart of VirtualCenter Server

18. Back in the Cluster Administrator application, bring the VC cluster online. Right-click the **VC Cluster** group and choose **Bring Online**.



19. At this point, the cluster should be online and running.





20. To test the VirtualCenter cluster, right-click the **VC Cluster** and choose **Move Group**. This should take the VCNodeA offline and bring the VCNodeB online.

Name	State	Owner	Resource Type
VC Managed IP	Online	VCNODEB	IP Address
VC Name	Online	VCNODEB	Network Name
VC Service	Online	VCNODEB	Generic Service
VC Web Service	Online	VCNODEB	Generic Service
VC License	Online	VCNODEB	Generic Service

21. Log into VirtualCenter with VI client using the managed DNS/IP address defined for the cluster and register the ESX hosts.

Additional Resources

The following are additional links to some documents that can provide additional information and alternatives, such as physical-to-virtual and cluster-across-box configurations. Additionally, there are some links to VMware whitepapers which provided some of the inspiration for this project.

Using MSCS to Cluster VirtualCenter (VirtualCenter 2.0.1 Patch 2)

http://www.vmware.com/pdf/VC_MSCS.pdf

Guide to Creating and Configuring a Server Cluster under Windows 2003

<http://www.microsoft.com/downloads/details.aspx?familyid=96F76ED7-9634-4300-9159-89638F4B4EF7&displaylang=en>

Technical Overview of Windows Server 2003 Clustering Services

<http://www.microsoft.com/windowsserver2003/techinfo/overview/clustering.mspx>