

Using MSCS to Cluster VirtualCenter

VirtualCenter 2.0.1 Patch 2

In a default installation, VMware VirtualCenter 2.x runs on a single Windows-based server. In order to provide high availability, you can use clustering software so the VirtualCenter server process is automatically restarted on a standby server if the primary server fails.

This document describes the use of Microsoft Cluster Server (MSCS) to provide high availability for VirtualCenter. This capability is available in VirtualCenter 2.x starting with VirtualCenter 2.0.1 Patch 2. You can implement the clustering architecture described in this paper whether VirtualCenter runs on a physical server or in a virtual machine, although in the latter case you must adhere to the further restrictions on clustering virtual machines as documented in the Setup for Microsoft Cluster Service guide (see [“References”](#) on page 18).

This technical note covers the following topics:

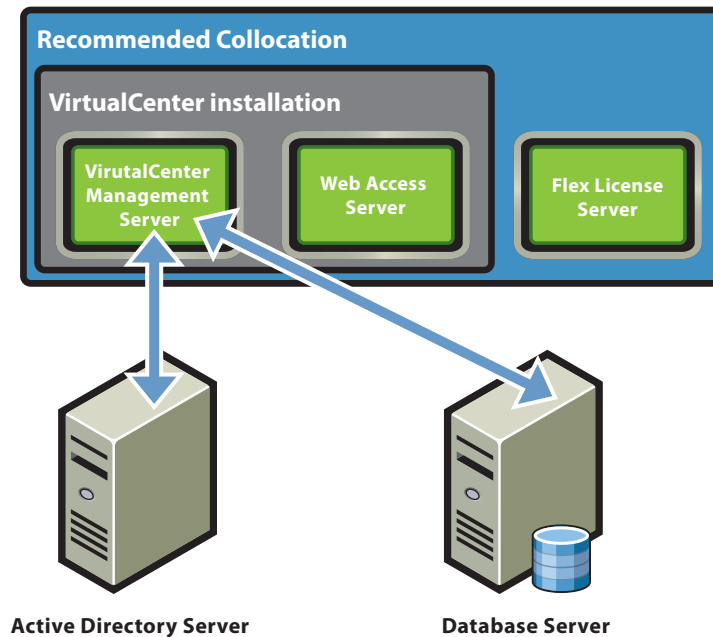
- [“VirtualCenter Stand-alone Server Architecture”](#) on page 1
- [“VirtualCenter Cluster Architecture”](#) on page 3
- [“Clustering Configuration Procedure”](#) on page 6
- [“Alternative Configurations”](#) on page 17

VirtualCenter Stand-alone Server Architecture

To cluster VirtualCenter properly, you should first understand the architecture of a stand-alone installation of VirtualCenter.

VirtualCenter Server Components and Network

VirtualCenter relies upon a number of components, as shown in Figure 1. The VirtualCenter database, which maintains most of the state for VirtualCenter, and the Active Directory infrastructure, which provides network-based authentication, are loosely coupled with the VirtualCenter Management Server. That is, the interaction between them and VirtualCenter occurs through a limited set of well-defined protocols and in a manner that permits them to be installed on separate systems. The other components, which include the Web access server and the license server, are tightly coupled with the VirtualCenter Management Server. This means VirtualCenter cannot run without them, or can run with only limited functionality. These components should run on the same system as the VirtualCenter Server software.

Figure 1. VirtualCenter Server components

High-Availability Considerations for Virtual Center Server Components

This technical note focuses on steps you must take to configure the VirtualCenter Management Server and the tightly coupled components for high availability. You must provide separate high-availability configurations for the two loosely coupled components. If your IT environment uses Active Directory, it is likely that you have already set it up using multiple redundant servers. Steps you should take to provide high-availability for the VirtualCenter database depend on the specific database you are using. For example, with SQL Server, you can use MSCS to provide high availability, using a separate cluster involving different systems from those used for the VirtualCenter cluster. For details on how to cluster the database, see the documentation for the database and the clustering software you are using.

Although it is possible to install the license server on a system separate from the VirtualCenter Management Server, the best practice is to run them on the same system. This makes the deployment less complicated and reduces the number of entities you must manage. If you need to keep the license server on a separate system, you can decide whether to put the license server in a separate cluster group or on a separate cluster. For descriptions of both alternatives, see [“Alternative Configurations”](#) on page 17.

VirtualCenter Server Data

Although VirtualCenter stores most of its state information in the VirtualCenter database, a few pieces of information reside on the VirtualCenter Server system itself. Table 1 describes this information and the files in which it may be found.

Table 1. VirtualCenter Server Data

Information	Description	Location on local disk of VirtualCenter Management Server host
Flex license files	License keys for all server-based licensed features.	All files in C:\Program Files\VMware\VMware License Server\Licenses
VirtualCenter configuration file	Governs the behavior of VirtualCenter Server and its interaction with ESX Server hosts as well as client programs, such as the Virtual Infrastructure Client.	C:\Documents and Settings\All Users\Application Data\VMware\VMware VirtualCenter\vpzd.cfg
SSL certificate	Certificate used to authenticate all communication with ESX Server hosts.	All files in C:\Documents and Settings\All Users\Application Data\VMware\VMware VirtualCenter\SSL

Table 1. VirtualCenter Server Data

Information	Description	Location on local disk of VirtualCenter Management Server host
Upgrade files	In special circumstances, you might need to make custom changes to the agent that is pushed to ESX Server hosts as they are added to the environment.	All files in C:\Program Files\VMware\VMware VirtualCenter 2.0\upgrade
Windows registry	Various entries related to VirtualCenter. Important only if manually changed from default values	Windows registry — see VirtualCenter Server Log Bundle for entries.

Clustering Considerations for VirtualCenter Server Data

For a clustered VirtualCenter configuration, you must also specify and maintain the VirtualCenter Server IP address. This is the IP address used to identify the VirtualCenter service, as opposed to the IP addresses of the individual cluster nodes. The VirtualCenter Server IP address may be specified in one of two locations:

- As an entry in the `vpxd.cfg` file
- As an entry in the Windows registry

The advantage of specifying the VirtualCenter Server IP address in the Windows registry is that the registry is a standard, well-known location for storing general cluster information. This means, for example, that a third-party tool can modify this value in a standard manner, instead of needing to know the location and format of `vpxd.cfg`, which is a product-specific file. However, if you have specified other VirtualCenter configuration changes in `vpxd.cfg`, and you want to minimize the number of places you need to make modifications for greater ease of management, you should specify the VirtualCenter Server IP address in the `vpxd.cfg` file. Both options are explained below.

To maintain the cluster configuration, you must ensure that the two nodes remain synchronized. In particular, if you make any changes to certain configuration information on the primary node, you must ensure that those changes are reflected on the secondary node.

In addition to the files in Table 1, if there are any VirtualCenter roles that are applied to locally defined users on the VirtualCenter Server Windows system, these users must be replicated on the secondary node.

VirtualCenter Cluster Architecture

To design a VirtualCenter cluster, you must determine the following:

- The cluster configuration
- The cluster group for VirtualCenter server
- The synchronization method for VirtualCenter data

This section describes each of these elements in detail.

Cluster Configuration

You may use either of two cluster configurations to host VirtualCenter Server:

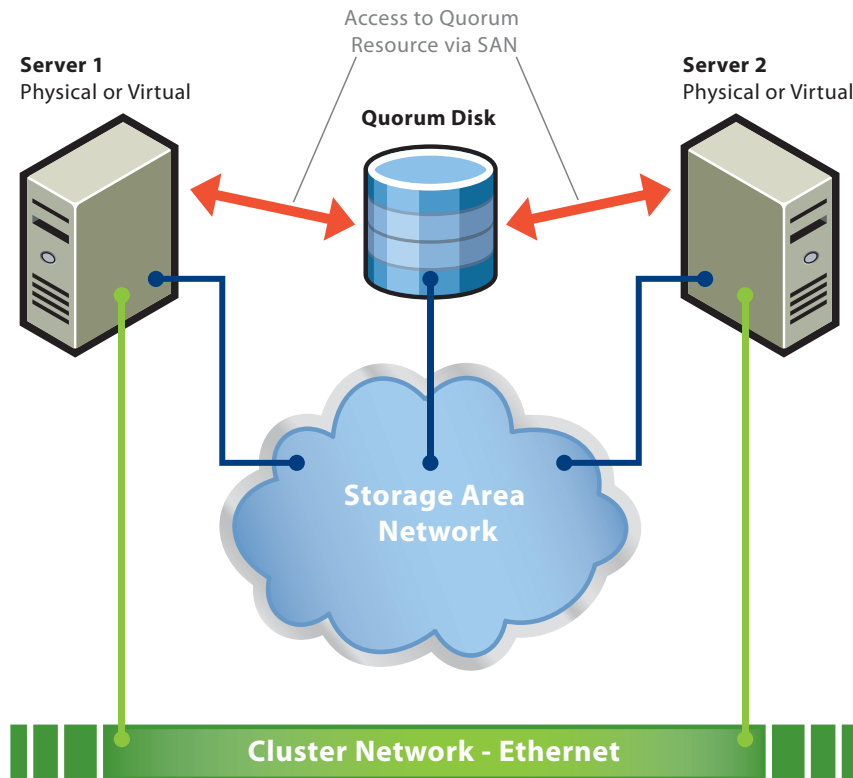
- Quorum disk cluster
- Majority node set (MNS) cluster.

There is no universal recommendation for one of these configurations. You must make your choice on the basis factors including availability of resources — for example, compatible storage hardware, SAN, or additional nodes — and environmental constraints, such as the distance between cluster nodes

The quorum disk cluster configuration, shown in Figure 2, requires a quorum disk accessible from both cluster nodes, connected via a storage area network (SAN). This requirement can be a determining factor when the cluster nodes are too far apart. If you are clustering virtual machines, you must meet certain requirements for clustering across physical hosts, including requirements for storage and networking. These are outlined in the

Setup for Microsoft Cluster Service guide in the section Setup Checklist (see ["References"](#) on page 18 for a link to this guide).

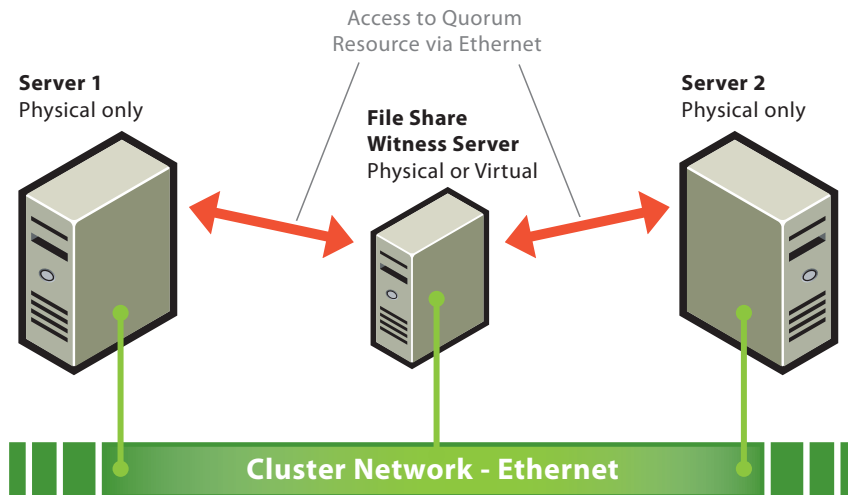
Figure 2. Clustered VirtualCenter Server hosts using a quorum disk cluster



The second configuration, shown in Figure 3, is the majority node set quorum cluster with witness share. This configuration is available with Windows Small Business Server 2003 R3.

NOTE VMware has not tested the use of virtual machines in a majority node set configuration cluster, so a fully supported configuration can have only physical servers as nodes.

The quorum resource is a share hosted by a third server. This server is not a cluster member and does not run any VirtualCenter software. Although the choice of which server to use for the witness share can depend on various factors, one ideal candidate is the VirtualCenter database server. Because this server plays a very important role in the VirtualCenter deployment, it is most likely to have clustering in place. You can leverage that clustering to assure that the witness share is also protected. Another alternative is to put the witness share server in a virtual machine and use VMware HA to protect it against host-level failures. The main drawback the majority node set configuration is that it requires three nodes and can tolerate the failure of only one node.

Figure 3. Clustered VirtualCenter Server hosts using MNS quorum cluster with witness share

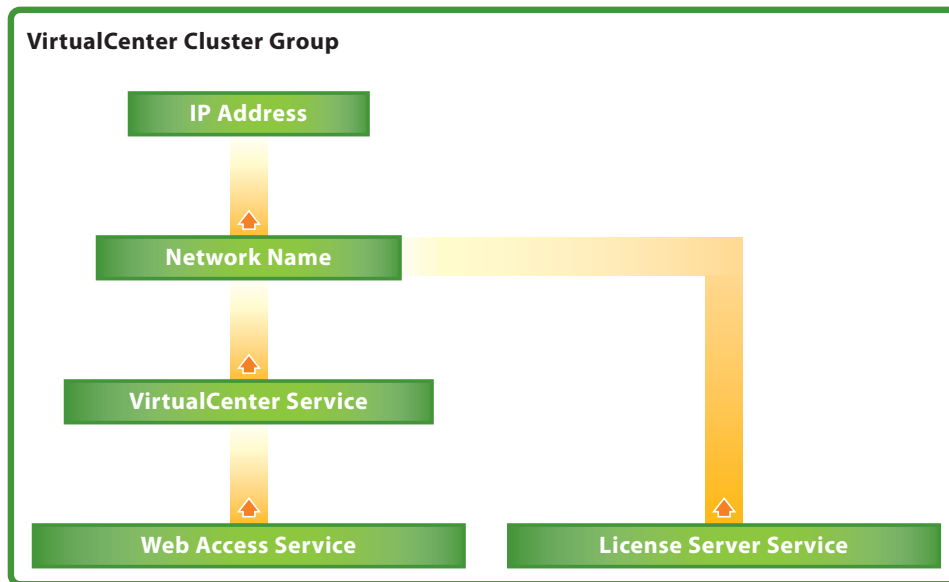
Cluster Group Design

For a cluster that provides high availability for VirtualCenter, you must create a number of cluster resources. Table 2 provides a summary, indicating each resource and its purpose. Place all these resources in a single resource group, which is then used to provide availability for the tightly coupled VirtualCenter components shown in Figure 1.

Table 2. MSCS resources for VirtualCenter group

Resource	Type	Purpose
VirtualCenter IP address	IP address	Provide the common VirtualCenter Server IP address that all ESX Server hosts use to connect with the currently-active VirtualCenter Server host.
Virtual Center network name	Network name	Provide the DNS network name used to access the license server and Web server.
VirtualCenter Server process vpxd	Generic service	Maintain the process that actually runs the VirtualCenter Server software.
VirtualCenter Web access server	Generic service	Maintain the Web server process that provides Web access
Flex license server	Generic service	Maintain the Flex license server process.

Dependencies among the resources in this group are shown in Figure 4.

Figure 4. Dependencies in the VirtualCenter group

VirtualCenter Server Data Synchronization

The data that resides on the VirtualCenter Server system, as shown in Table 1, must be replicated across the nodes. In addition to manually copying the files whenever a change is made, some suitable replication techniques include

- Continuous replication using DFS data replication
- Scheduled copy of data with the robocopy or xcopy utility

Clustering Configuration Procedure

This section details the process for setting up the MSCS cluster for VirtualCenter Server. It assumes that two physical servers or virtual machines are being configured in the cluster and does not consider whether any application other than VirtualCenter is installed in the cluster. In Microsoft terminology, the servers that make up a cluster are called nodes and the cluster group that includes both network name and IP address is called a virtual server.

Configuration Overview

Complete the following tasks to create a clustered VirtualCenter Server host:

- 1 Set up Microsoft Cluster Server, using one of the two cluster configurations described earlier.
- 2 Deploy a database to be used by VirtualCenter onto a separate host or cluster.
- 3 Install VirtualCenter software on the primary node. This task includes installation of the Flex license server on the same node and specification of the database deployed in the previous step.
- 4 Install VirtualCenter software on the secondary node in the same way you did on the primary node.
- 5 Create the VirtualCenter resource group and resources.
- 6 Synchronize the cluster and bring it online.
- 7 Test the VirtualCenter failover functionality.

Detailed instructions for these tasks are provided below.

Prerequisites

The following must be available before you set up VirtualCenter clustering:

Table 3. Prerequisites for VirtualCenter clustering

Requirement	Notes
Domain controller	Necessary for Microsoft clustering.
Two servers	Can be physical or virtual.
Quorum resource	Either a third server to hold the witness share or a SAN disk for disk quorum.

Set Up Clustering between Two Servers

The first task is to set up the servers to be used in the cluster, ensuring that the supporting network infrastructure—such as name resolution and domain model—is in place and that the requisite networking and storage hardware is configured. VirtualCenter clustering does not depend on the specific networking or storage hardware that is used.

After the infrastructure is in place, you can deploy the MSCS software and create the cluster.

This document assumes that you are already familiar with MSCS and can set up a cluster and test it for failover functionality. See “References” on page 18 for further information.

At the end of this step, you should have a fully functioning MSCS cluster and should have confirmed its operation by performing one of the tests suggested by Microsoft for verifying functionality, such as using Cluster Administrator to move a resource group.

Deploy the Database to be Used by VirtualCenter

The procedure for deploying the VirtualCenter database depends on the particular database you are using. For details, see the *Installation and Upgrade Guide*, Chapter 4, in the section “Preparing the VirtualCenter Database.” Ideally, you also configure the database for high availability, using your choice of clustering technology. In many environments, an existing database can be used for VirtualCenter. High availability might already be configured for that database. The procedure described in the *Installation and Upgrade Guide* shows how to prepare the database for use by VirtualCenter.

Install VirtualCenter Software on the Primary Node

Before installing the VirtualCenter software, make sure to copy the license file for your environment to the host’s local file system. Note the path to this file, so you can use it during the install procedure.

Follow the standard procedure described in the *Installation and Upgrade Guide*, Chapter 4, in the section “Installing the VirtualCenter Server.” During the installation, make the following choices:

- When configuring the database, select **Use an existing database server** and enter the information for the database deployed in the previous task, including the appropriate data source name (DSN).
- When configuring the license server, select **Install a local VMware License Server and configure VMware VirtualCenter to use it**. Specify the license file that you copied to this machine before you started the installation procedure.
- For all other steps, accept the default values unless you have a particular reason in your environment for making different choices and understand the implications of those choices.

At the end of this task, you should have a fully functioning installation of VirtualCenter Management Server up and running but with no ESX Server hosts connected. To verify functionality, you can deploy the VI Client to the host or another host on the local network and connect to VirtualCenter Server directly, or you can use a Web browser to connect to the VirtualCenter Web Access server.

Once you have verified functionality of VirtualCenter Management Server, shut it down before proceeding by taking the following steps on the Windows host machine:

- 1 Choose **Start > Programs > Administrative Tools > Services**.
- 2 Scroll through the list of services until you find the VMware VirtualCenter Server service control panel, choose it, then click **Stop**.

Verify that the VirtualCenter Server is down by attempting to connect once again with the VI Client. The client should not be able to connect.

Install VirtualCenter Software on the Secondary Node

Install VirtualCenter on the secondary node in the VirtualCenter cluster. Follow the same procedure as you did for the primary node, including the placement of the same license file on the local file system before starting the installation procedure. Make the same installation choices you did in the previous task.

After completing the installation, verify the functionality of this instance of VirtualCenter as described in the previous task, then shut down the VirtualCenter Server service and verify that it is no longer running, as you did in the previous task.

Create the Cluster Resource Groups and Resources for VirtualCenter

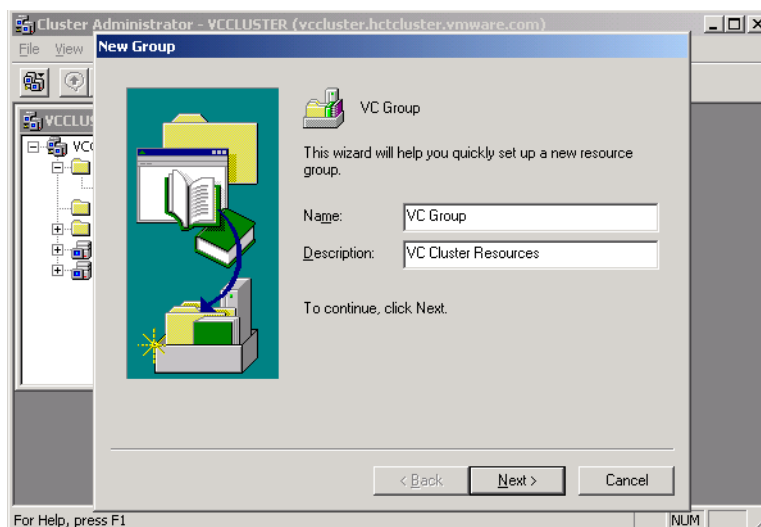
Before you begin, determine the host name, IP address, and netmask to be used by the cluster to provide a common network identity for the clustered VirtualCenter service.

Log in to begin configuration

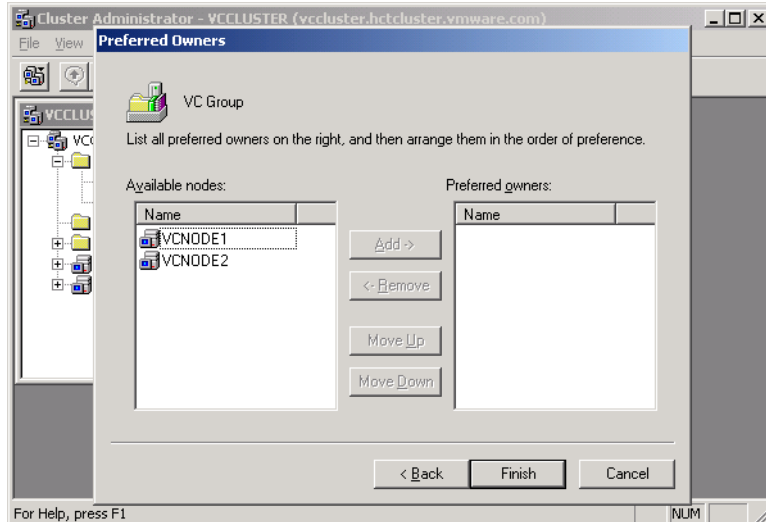
- 1 Log in to the first node in cluster. You must log in using an administrative account.
- 2 Choose **Start > Programs > Administrative Tools > Cluster Administrator**.
- 3 When prompted, type in the name of the cluster and click **OK**.

Create the VirtualCenter resource group

- 1 Right-click **Groups** and choose **New > Group**.
- 2 Enter an appropriate name for the new group, such as VC Group, then click **Next**.



- Do not select any preferred owners. Click **Finish**.

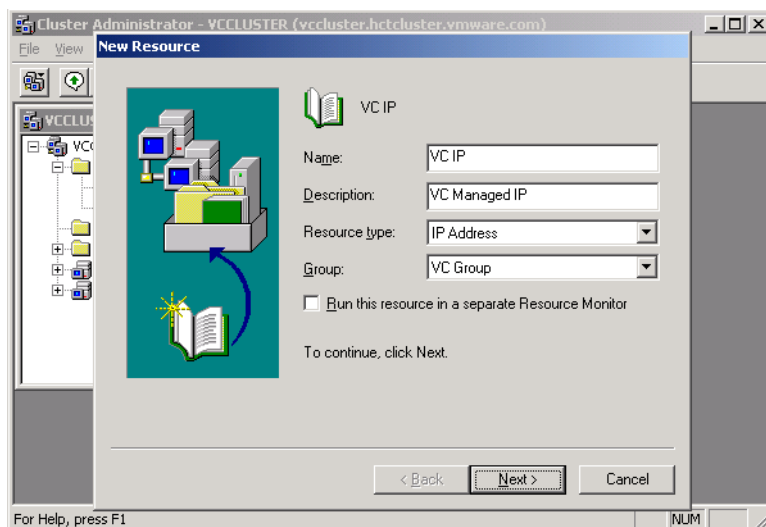


- The confirmation pane appears. Click **OK**.

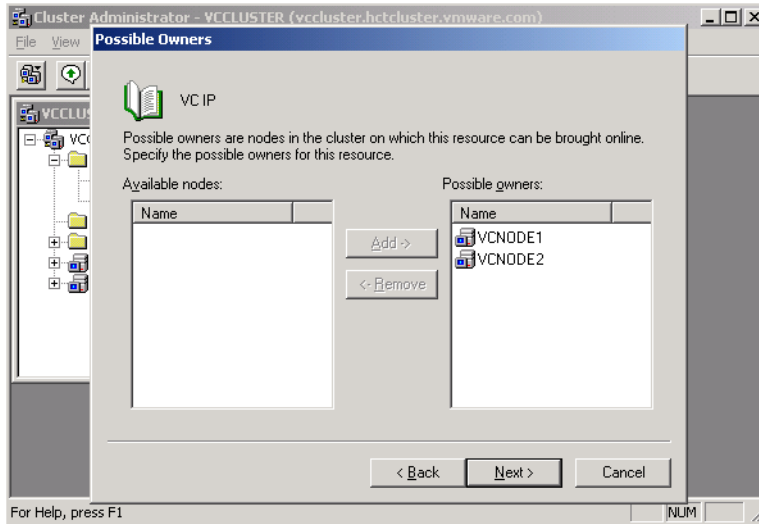
Create the VirtualCenter IP address resource

The resources needed for VirtualCenter clustering are listed in [Table 2, “MSCS resources for VirtualCenter group,”](#) on page 5. This procedure shows how to create one of these, the IP address resource. The resource group created in the previous process is referred to as the “VC group.”

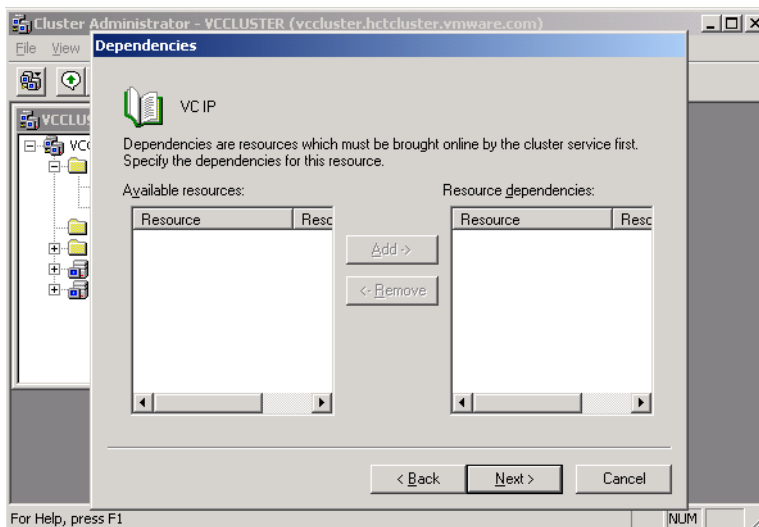
- In the left navigation menu, right-click the VC group, then choose **New > Resource**.
- Enter a name and description for the resource.
Select **IP Address** in the **Resource type** drop-down menu.
Select **Run this resource in a separate Resource Monitor**.
Click **Next**.



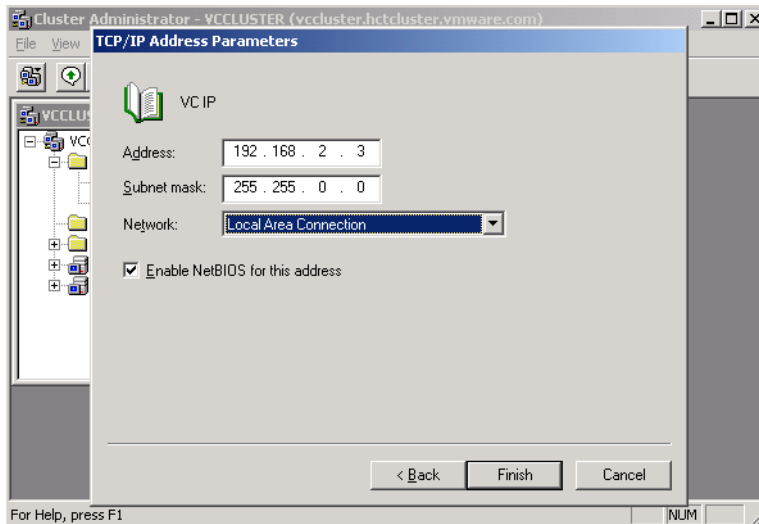
- 3 Verify that all of your cluster nodes are listed as possible owners, then click **Next**.



- 4 Do not add any dependencies. Click **Next**.



- 5 Enter the appropriate IP address and netmask information for the VirtualCenter Server, which you noted before installing the VirtualCenter software on the primary node. Select **Enable NetBIOS for this address**, then click **Next**.



- 6 Click **Finish**.
- 7 The confirmation panel appears. Click **OK**.

Create the remaining resources. The wizard-guided procedure is similar for all resources. For all resources, be sure to take the following steps:

- Select **Run this resource in a separate Resource Monitor**.
- Verify that all of your cluster nodes are listed as Possible owners.

Table 4 shows the configuration parameters that are unique for each resource, including those for the IP address. Enter these parameters in the appropriate wizard panels, which are similar to the ones shown in the procedure above. Enter values for the name and description of each resource that are appropriate for your environment.

Table 4. Resource configuration for VirtualCenter Server resources

Resource	Type	Dependencies	Additional Configuration
VirtualCenter IP address	IP address	none	
Virtual Center network name	Network name	VirtualCenter IP address	Use the name corresponding to the IP address as it appears in the naming service, for example, in DNS.
VirtualCenter Server	Generic service	Virtual Center network name	Use the service name vpxd. Leave Start Parameters blank. Select Use Network Name for computer name . Configure registry dependency only if the VirtualCenter Server IP address is specified in the registry.
VirtualCenter Web access server	Generic service	VirtualCenter Server	Use the service name webAccess. Leave Start Parameters blank. Select Use Network Name for computer name . Do not include any registry dependencies.
VirtualCenter license server	Generic service	VirtualCenter network name	Use the service name VMware License Server. Select Use Network Name for computer name . Do not include any registry dependencies.

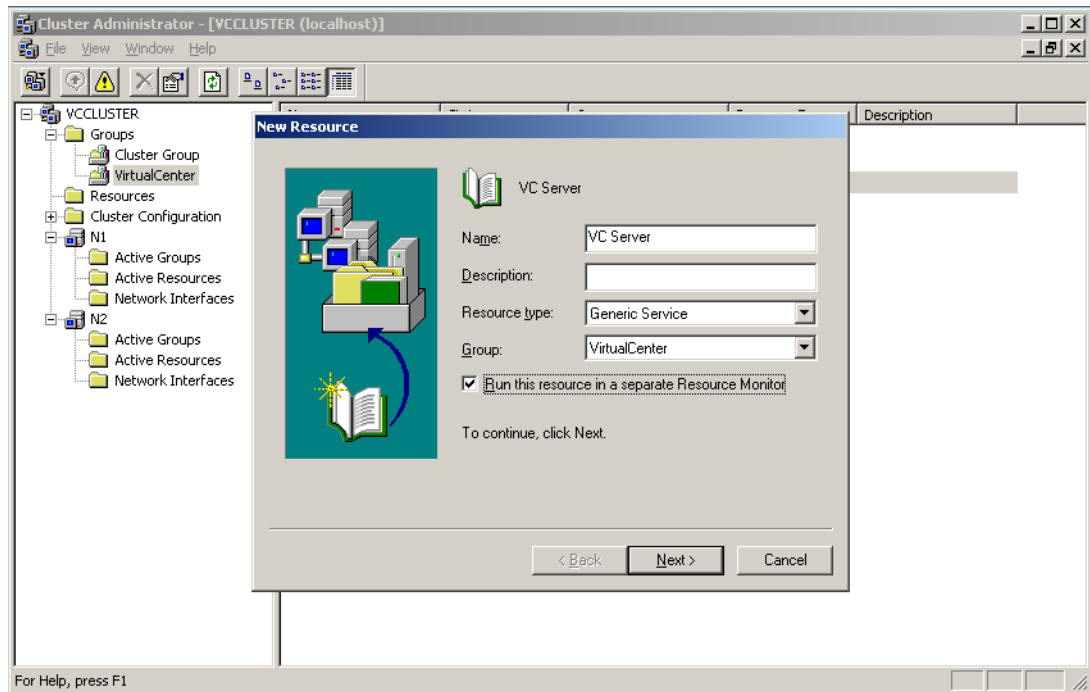
Create the network name resource

Make this resource dependent on the IP address resource.

Create the VirtualCenter Server resource

- 1 In the left navigation menu, right-click the VC group, then choose **New > Resource**.

The New Resource dialog box appears.



- 2 Enter a name and description for the resource.

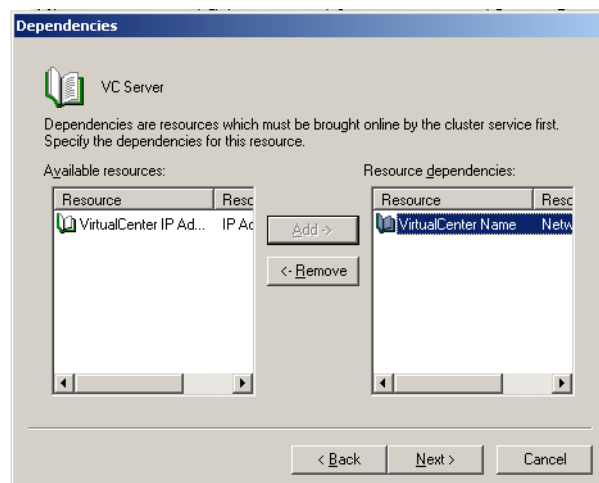
In the **Resource type** drop-down menu, choose **Generic Service**.

Select **Run this resource in a separate Resource Monitor**.

Click **Next**.

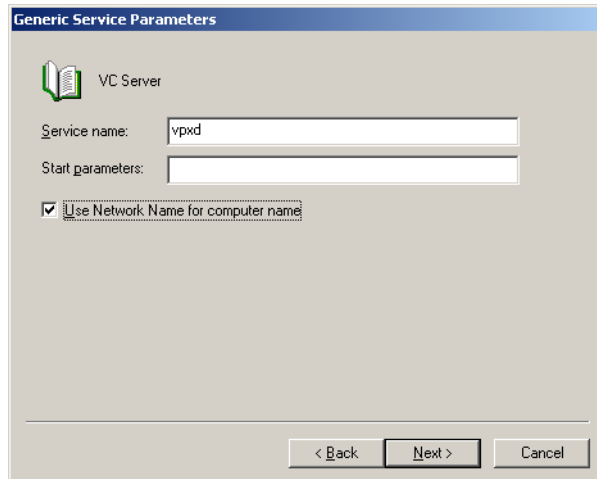
- 3 Verify that all of your cluster nodes are listed as possible owners, then click **Next**.

The Dependencies dialog box appears.



- 4 Add the VirtualCenter network name as a dependency. Click **Next**.

The Generic Service Parameters dialog box appears.



- 5 In the **Service name** field, enter vpxd. Leave the **Start Parameters** field blank.

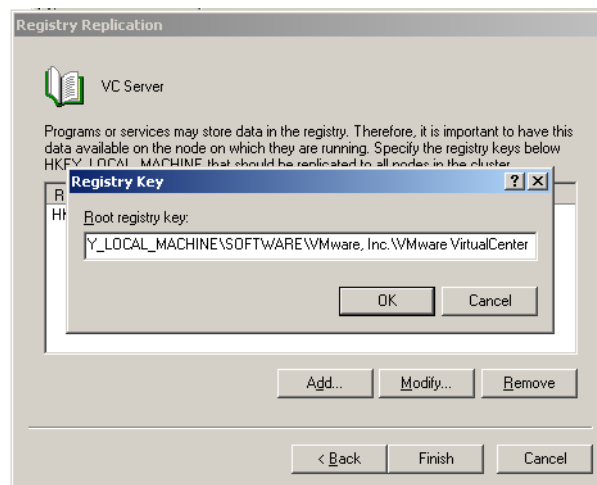
Select **Use Network Name for computer name**, then click **Next**.

The Registry Replication dialog box appears.

- 6 If you choose to specify the VirtualCenter Server IP address in registry, you must configure registry replication. If you choose to specify the VirtualCenter Server IP address in vpxd.cfg, skip this step.

Click **Add**, then enter the VirtualCenter registry key:

HKEY_LOCAL_MACHINE\SOFTWARE\VMware, Inc.\VMware VirtualCenter



- 7 Click **OK**, then click **Finish**.

Create the Web server resource

If you have chosen to enable Web services during the installation of VirtualCenter, create this as a generic service, giving it a suitable name such as VCWebServer. Make this resource dependent on the VirtualCenter Server resource.

Create the license server resource

Create this as a generic service, giving it a suitable name such as VCLicense. Make this resource dependent on the VirtualCenter Server resource.

Synchronize the Cluster and Bring it Online

In this section, you synchronize the primary node of the cluster with the cluster service, then synchronize the secondary node with the primary node. You then bring the cluster online. The specific steps depend on whether the VirtualCenter Server IP address is stored in `vpxd.cfg` or in the Windows registry. Follow the instructions below that correspond to the location of the VirtualCenter Server IP address.

Option 1: Synchronize when the IP Address is in `vpxd.cfg`

Use the following procedures if you store the VirtualCenter Server IP address in `vpxd.cfg`.

Synchronize the primary node with the cluster service

On the primary node, configure the VirtualCenter Server process to use the VirtualCenter Server IP address for operation by taking the following steps:

- 1 Navigate to the location of the `vpxd.cfg` file. By default, the `vpxd.cfg` file is in `C:\Documents and Settings\All Users\Application Data\VMware\VMware VirtualCenter`.
- 2 Use a text editor such as Notepad to open the `vpxd.cfg` file. The `vpxd.cfg` file is an XML-formatted text file that contains various configuration details for VirtualCenter Server.
- 3 Find the `<vpxd>` element.
Add a `<managedip>` opening tag as a child of the `<vpxd>` element.
- 4 Enter the IP address of the cluster, which is the same address you noted before installing the VirtualCenter software on the primary node.
- 5 Add a `</managedip>` closing tag.

The newly added section of the `vpxd.cfg` file should look similar to the following:

```
<managedip>
nnn.nnn.nnn.nnn
</managedip>
```

- 6 Save the file and exit the text editor.
- 7 On the Windows host, choose **Start > Programs > Administrative Tools > Services**.
- 8 Scroll through the list of services until you find the VMware VirtualCenter Server service, choose it, then click **Restart**.
- 9 Find the VMware Virtual Infrastructure Web Access service, choose it, then click **Restart**.

Synchronize the secondary node with the primary node

Copy the following files from the primary node to the secondary node

- `vpxd.cfg`—Copy this file from the location mentioned above on the primary node and overwrite the same file on the secondary node in the same location.
- SSL authentication files—Copy the three files located in `C:\Documents and Settings\All Users\Application Data\VMware\VMware VirtualCenter\ssl` and overwrite the same files on the secondary node in the same location.

Bring the cluster online

In Cluster Administrator, right-click the VC group and choose **Bring Online**. The state of the resources in the group should now be Online.

You have completed the configuration of clustering services for VirtualCenter.

Option 2: Synchronize when the IP Address is in the Windows Registry

Use the following procedures if you store the VirtualCenter Server IP address in the Windows registry.

Synchronize the primary node with the cluster service

- 1 Open the Windows registry editor
At the command prompt, enter `regedit`.
- 2 Navigate to the keys for VirtualCenter Server, under the following hierarchy:
`HKEY_LOCAL_MACHINE\SOFTWARE\VMware, Inc.\VMware VirtualCenter`
- 3 Create a key called `managedip` and give it a value equal to the IP address of the cluster
- 4 Save the changes to the registry and exit the editor.
- 5 On the Windows host, choose **Start > Programs > Administrative Tools > Services**.
- 6 Scroll through the list of services until you find the VMware VirtualCenter Server service, choose it, then click **Restart**.
- 7 Find the VMware Virtual Infrastructure Web Access service, choose it, then click **Restart**.

Synchronize the secondary node with the primary node

- VirtualCenter Server IP address—The cluster registry replication process automatically copies the necessary information.
- SSL authentication files—Copy the following file from the primary node to the secondary node
Copy the three files located in `C:\Documents and Settings\All Users\Application Data\VMware\VMware VirtualCenter\ssl` and overwrite the same files on the secondary node in the same location.

Bring the cluster online

In Cluster Administrator, right-click the VC group and choose **Bring Online**. The state of the resources in the group should now be Online.

You have completed the configuration of clustering services for VirtualCenter.

Set Up Data Synchronization

Configure data synchronization between the two nodes using one of the methods discussed earlier. To set up DFS data replication, see the following Microsoft TechNet article:

<http://technet2.microsoft.com/WindowsServer/en/library/469a9269-0b9b-48cc-8679-c3d68a0a25fe1033.mspx?mfr=true>

Test the VirtualCenter Failover Functionality

The easiest way to test failover of VirtualCenter clustering is to connect to VirtualCenter with the VI Client, force a failover, then reconnect the client to see if the state is maintained. Before you begin, install the VI Client on a host that can access the VirtualCenter Server IP address.

Test failover of the VirtualCenter Management Server

- 1 Connect the VI Client to the IP of your VirtualCenter Server cluster.
- 2 Place an ESX Server host under management.
Using VI Client, create a datacenter in VirtualCenter.
Connect an ESX Server host to VirtualCenter Server.
- 3 Using the Cluster Administrator tool, move the VC Group from the primary node to the secondary node.

In Cluster Administrator, right-click the VC Group and choose **Move Group**.

VI Client loses its connection to VirtualCenter Server.

- 4 Wait for the resources to move to the secondary node, as indicated in the Cluster Administrator window. There is a 120-second waiting period after the resources move to the other node before VirtualCenter Server restarts.

After 120 seconds, use VI Client to open another session to VirtualCenter Server. Check to see that the ESX Server host is in the inventory and is connected.

You can test failover of the Web Access server by repeating the above steps, except connecting to VirtualCenter Server using a Web browser instead of VI Client.

Test failover of the license server

- 1 Verify that the license server is running

On the primary (active) node, choose **Start > Programs > VMware > VMware License Server > VMware License Server Tools**.

Click **Server Status**.

Click **Perform Status Enquiry**.

In the same dialog box, find the log entry corresponding to the time at which you pressed the button.

Verify that you see the string "license server UP."

- 2 Point a stand-alone ESX Server host to the license server. This host should not be a member of your VirtualCenter datacenter.

Open a VI Client session directly to the stand-alone ESX Server host.

In the initial login dialog box, enter the host name or IP address of the host in the Server field.

Enter **root** for the user name, and enter the root password of the ESX Server host.

When the Summary dialog box appears, click **Configuration**.

Choose **Software > Licensed Features**.

Edit **License Sources**.

Select **Use License Server**.

Enter the IP address for your license server, using the following format: `nnn.nnn.nnn.nnn:27000`, where `nnn.nnn.nnn.nnn` is the IP address of the cluster as noted before you installed VirtualCenter on the primary node.

Check to see that no errors are generated.

- 3 Using the Cluster Administrator tool, move the cluster group hosting the license server resources from the primary node to the secondary node.

In Cluster Administrator, right-click VC group and choose **Move Group**.

VI Client loses its connection to VirtualCenter Server.

Wait for the resources to move to the secondary node, as indicated in the Cluster Administrator window

- 4 Verify that the license server is running on the secondary node.

Open VMware License Server Tools on the secondary node.

Click **Server Status**.

Verify that you see the string "license server UP."

- 5 Verify that the stand-alone ESX Server host is still able to reach the license server by connecting the VI Client to the ESX Server host, then looking at the licensed features summary as described in Step 2 above.

You have verified the failover of VirtualCenter, including both VirtualCenter Management Server and the license server.

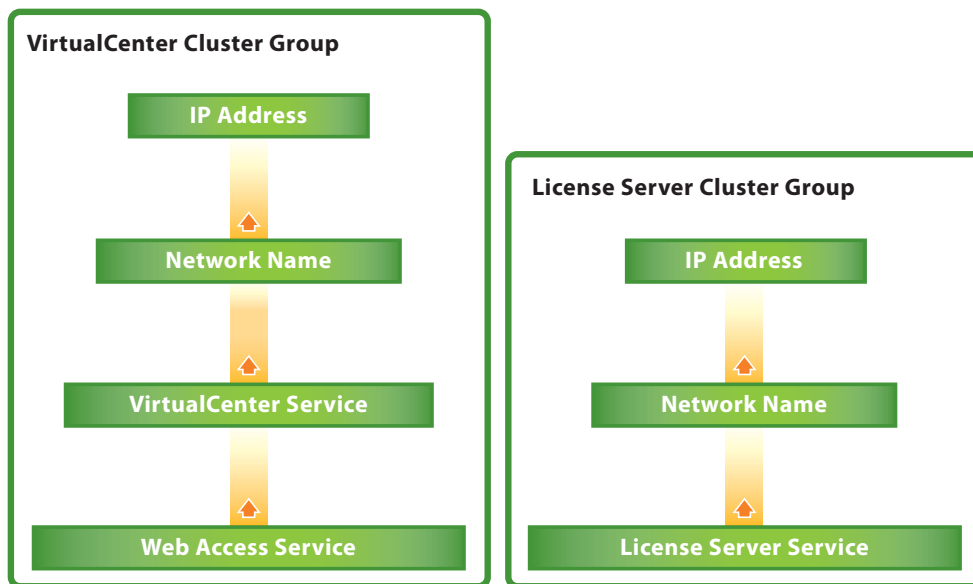
Alternative Configurations

This section discusses possible alternatives to the cluster configuration approaches described earlier in this technical note. It is intended for advanced cluster and VirtualCenter administrators. This paper does not include detailed procedures for these alternatives, but an administrator with sufficient expertise should be able to implement them.

Separate Resource Group for the License Server

You can create the license server in its own group. This approach provides additional flexibility and robustness to the clustered services. If the VirtualCenter Server terminates unexpectedly, all the resources in the resource group are restarted on the secondary node, even if the primary node itself is still functional. If the license server is in its own group, it can continue to run on the same host without interruption. Design of both cluster groups is shown in Figure 5

Figure 5. Cluster group design for separate license server group



You can use the `AntiAffinityClassName` property of both groups to prevent them from occupying the same cluster node if both nodes are available. The value for the `AntiAffinityClassName` cluster group property can be any character string. The important thing is that the two groups, for which you want to prevent affinity, have the same value for the `AntiAffinityClassName` property.

The following example shows how to prevent the named groups from occupying the same node if both nodes are available. Enter the following two lines at a Windows command prompt:

```
cluster group "VC Group" /property AntiAffinityClassName="VirtualCenter"
cluster group "LS Group" /property AntiAffinityClassName="VirtualCenter"
```

Data Synchronization Task as a Cluster Resource

You can configure the data synchronization task as a cluster resource, so the synchronization occurs automatically whenever the cluster is brought online. To do so, create a resource of type "generic application." Enter the command used for synchronization in the **Command Line** field, as shown in the following example:

```
cmd /k <Your Synchronization Command>
```

In the example, `<Your Synchronization Command>` can be either a single command, which is executed once, when the resource is brought online, or the name of a command script that can contain a permanent loop to perform a copy command continuously. If you use a script, you must copy it to both cluster nodes.

References

Setup for Microsoft Cluster Service

http://www.vmware.com/pdf/vi3_301_201_mscs.pdf

Technical Overview of Windows Server 2003 Clustering Services

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

Microsoft Cluster Service Installation Resources

<http://support.microsoft.com/kb/259267>

Guide to Creating and Configuring a Server Cluster Under Windows Server 2003

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

How to Install the Majority Node Set File Share Witness Feature

<http://technet.microsoft.com/en-us/library/aa998287.aspx>

DFS Replication

<http://technet2.microsoft.com/WindowsServer/en/library/469a9269-0b9b-48cc-8679-c3d68a0a25fe1033.mspx?mfr=true>

File Share Witness and Configurable Cluster Heartbeat for Windows Server 2003 Service Pack 1

<http://support.microsoft.com/kb/921181>

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Vsevolod (Seva) Semouchin joined VMware in 2005 as technical account manager in Munich, Germany, with special focus on enterprise computing, especially high availability and disaster recovery solutions. He has a long record of successful implementations of these solutions for major strategic customers. He is also particularly interested in enterprise management software, storage area networks, and ITIL. Prior to joining VMware, he worked for about 10 years with Digital, Compaq, and HP in a variety of consulting roles. He received a Diploma in Mathematics from Latvian University in 1985 and holds a VCP3 certification as well as an IT Service Manager certification and six other certifications from leading software and hardware vendors.

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